

Impact of Extreme Weather Events and Climate Change on Surf Life Saving Services

A Road Map for Adaptive Action

coastal zone management pty ltd

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Acronyms

ABSAMP	Australian Beach Safety and Management Program
ADB	Asian Development Bank
AEP	Adaptive Entry Point
AGO	Australian Greenhouse Office
CCA	Climate Change Adaptation
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CZM	Coastal Zone Management
DCCEE	Department of Climate Change and Energy Efficiency
GIS	Geographic Information System
ICZM	Integrated Coastal Zone Management
ILS	International Life Saving Federation
IPCC	Intergovernmental Panel on Climate Change
LT	Long Term
MoU	Memorandum of Understanding
NCCOE	National Committee on Coastal and Ocean Engineering
OECD	Organisation for Economic Co-operation and Development
SEA	State Emergency Authority
SLSA	Surf Life Saving Australia
SLSC	Surf Life Saving Club
TA	Technical Assistance
UKCIP	UK Climate Impacts Programme
ZPI	Zone of Potential Instability

EXECUTIVE SUMMARY

This report presents a *Climate Change Adaptation Road Map* for Surf Life Saving Australia (SLSA). The objective of the project was to assess the range of risks climate change might pose to SLSA, review available strategies to address the identified risks and develop a program of works to implement the identified strategies. The program of works is encapsulated within the *Climate Change Adaptation Road Map*. The Road Map is an important first step for SLSA in preparing an integrated response to the impacts of climate change.

Motivation

The coastal zone of Australia is likely to experience significant impacts as a result of climate change in the course of this century, even if the efforts expected from the international community to stabilise atmospheric greenhouse gas concentrations eventuate. Importantly, without future reductions in the emissions of greenhouse gases, impacts will increase. The overwhelming scientific consensus is that climate change will drive increased temperatures, mean sea level rise, altered wave climates, modified rainfall patterns and changes to the frequency and intensity of storms. The impacts of climate change are now widely acknowledged and accepted by a range of public, private and not-for-profit organisations within Australia. In particular, climate change presents a critical challenge for organisations whose operations are focused largely in the coastal zone. Surf Life Saving Australia (SLSA) is one such organisation, whose focus is on patrolling Australia's beaches and providing rescue services to beach users. Consequently, there is a recognised need for SLSA to adopt a proactive approach to adaptive planning. The development of a Climate Change Adaptation Road Map is an important first step in this regard.

Approach

An evaluative methodology was applied to identify adaptation strategies for SLSA to address the projected impacts of climate change. The approach entailed:

- Gaining an understanding of the problem to be addressed (needs assessment);
- Identifying the desired results or future vision to be achieved through program implementation;
- Identifying factors that influence change; and
- Outlining strategies for best practice that will achieve expected results.

A risk-based approach was adopted to complete the needs assessment. Projected changes in climate and associated impacts in the coastal zone were reviewed. In addition, the capacity of SLSA to manage projected changes was analysed. The outcome was a strategic-level understanding of issues influencing vulnerability of SLSA to projected climate changes.

Findings

Almost all Surf Life Saving Clubs (SLSCs) in Australia are located at the forefront of the coastal zone, often within meters of the shoreline. Understandably, the vast majority of SLSCs are located on sandy beaches, which provide high amenity and support recreational use. Sandy coastal zones are vulnerable to coastal erosion and thus sensitive to the impacts of climate change. Over 63 per cent of SLSCs nationally are situated on coastal areas classified as zones of potential instability. Projected impacts of climate change include coastal erosion leading to asset exposure and changes in coastal beach safety through

altered beach form. In addition, increased mean annual temperatures and change in precipitation may result in altered dynamics of beach use and implications for occupational health and safety for SLS staff and volunteers as well those participating in coastal recreation. The capacity of SLSA to manage such impacts is dependant upon:

- Access to information;
- Flexibility in decision (including human and financial resources; and
- Susceptibility to non-climate risks.

The assessment of sensitivity to projected changes and capacity to manage identified risks indicated high variability in the vulnerability of SLSCs to the impacts of climate change. While some clubs have access to resources that support decision-making, others do not. Further, while some clubs are situated in coastal zones susceptible to the impacts of climate change, others are less prone to erosive forces. This differential vulnerability provides a complex picture for management of the impacts of climate change. Therefore, it is vital that SLSA understands the differential circumstances so that adaptive support can be appropriately targeted.

Overall, finite human and financial resources, combined with a high workload on volunteer staff, broad geographic region of service delivery, and a federated style of governance, results in challenges in coordinating a systematic response to the impacts of climate change. Consequently, the goal of the Road Map is to: *achieve proactive and coordinated management of long-term changes in mean and extreme climate across the SLSA organisation (from club to national levels).*

Adaptive strategies to achieve this goal were defined through an assessment of: (i) the current situation; (ii) projected climate impacts; and (iii) best practice approaches to adaptation. The outcome was a number of adaptive actions that would enhance the resilience of SLSA to projected climate changes, namely:

Adaptive Action
1. Strengthen partnerships with organisations to share and access information that supports coastal management and climate change adaptation.
2. Enhance communication across the organisation through development of a communication plan.
3. Enhance clubs access to information that will raise awareness by publishing information on readily accessible locations, such as the Ecosurf website
4. Promote on-ground adaptive action by identifying case studies of good practice, such as management actions to reduce the impacts of extreme events or long term chronic beach change.
5. Mainstream climate change into operational procedures to facilitate integrated management of climate risks.
6. Undertake awareness raising activities to enhance organisational commitment to addressing the impacts of climate change.
7. Assess the vulnerability of SLS clubs to climate changes (through completion of a first pass vulnerability assessment) to: (i) understand differential exposure and capacity; and (ii) provide case for financial support to aid adaptation.
8. Establish mechanisms to monitor the impacts of climate change and other risks across the organisation (i.e. a climate risk reporting framework).
9. Identify funding sources to provide dedicated financial support for adaptive action and establish criteria for equitable dispersal of funding.
10. Investigate opportunities to establish coordinated support systems for clubs to access in times of emergency and to support long-term planning.

Adaptive Action
11. Assess the adaptive capacity of SLS clubs to facilitate the delivery of targeted support based on individual needs.

The adaptive actions were collated under overarching strategies for climate change adaptation. The strategies provide broader guidance on the actions and align to current adaptive frameworks. The strategies for adaptation for SLSA include:

1. Build capacity to respond to the impacts of climate change by raising awareness, enhancing partnerships and mainstreaming climate change adaptation.
2. Enhance the capacity of SLS clubs and support services to understand and assess their climate change risks and provide an equitable means to allocate resources to address the identified risks.
3. Provide financial support to SLS clubs, support services and branches to adaptively manage climate change and extreme events.
4. Provide coordinated support mechanisms to clubs and support services to access both in times of emergency and to support long-term planning, contributing to (i) a coordinated response to business continuity following extreme events; and (ii) targeted guidance and direction to clubs and support services based on an understanding of current capability.

These strategies address the identified issues that reduce adaptive capacity and constrain adaptive decision-making. The strategies are captured within the SLSA Climate Change Adaptation Road Map providing details on the resources, activities and outputs required in the delivery of each strategy to achieve the anticipated impacts.

Conclusion

The Climate Change Adaptation Road Map is an important first step in adapting to the impacts of climate change. Importantly, it is just one step in an ongoing journey of adaptive management of climate risks for SLSA. The Road Map outcomes will facilitate adaptive action through presentation of a justifiable case of adaptation programming. Obtaining the internal and external support required to facilitate implementation of the Road Map recommendations remains an upcoming task for SLSA.

1. INTRODUCTION

The coastal zone of Australia is likely to experience significant impacts as a result of climate change in the course of this century, even if the efforts expected from the international community to stabilise atmospheric greenhouse gas concentrations eventuate. Importantly, without future reductions in the emissions of greenhouse gases, impacts will increase. The overwhelming scientific consensus is that climate change will drive increased temperatures, mean sea level rise, altered wave climates, modified rainfall patterns and changes to the frequency and intensity of storms (IPCC 2007). In addition, algal blooms and the incidence of jellyfish may further multiply as a consequence of higher temperatures. These impacts of climate change are now widely acknowledged and accepted by a range of public, private and not-for-profit organisations within Australia. In particular, climate change presents a critical challenge for organisations whose operations are focused largely in the coastal zone. Surf Life Saving Australia (SLSA) is one such organisation, whose focus is on patrolling Australia's beaches and providing rescue services to beach users.

Surf Life Saving Australia (SLSA) is Australia's major water safety, drowning prevention and rescue authority. The highly federated and geographically dispersed organisation is made up of 309 separately incorporated local surf life saving clubs delivering services across Australia's seven state and territory centres (Figure 1). The coastal zone in which SLSA operates is highly diverse and dynamic (Geoscience Australia 2010) containing a range of coastal types such as sandy shores, wetlands, estuaries, lagoons, deltas, reefs and rocky cliffs. An estimated 85 per cent of Australia's population lives along the coastline, a proportion that is expected to be maintained or increase in the future (DCCEE 2009). In addition, residents and tourists favour the coast and beaches of Australia for recreation, whether for bathing, swimming, surfing, boating or a range of other activities.

The high population density within the coastal zone is reflected in the distribution of Surf Life Saving Clubs (SLSC) around Australia with clubs predominantly concentrated along the more densely populated eastern and south-eastern coast (Figure 1). The range of coastal climate drivers, including sea level rise and changes in intensity and frequency of extreme events, will cause markedly different impacts, depending on both the magnitude of these changes around the coast and local coastal sensitivities. Many of the SLSA clubs are located on sandy beaches making them susceptible to change into the future. The impacts of climate change may include a heightening of weather event intensity and sea level rise, which in combination could have far reaching effects for coastal recreation, beach safety service provision and surf lifesaving facilities and services. In this respect, the potential impacts of climate change represent a significant challenge for SLSA.

In recognising the challenge that climate change may pose, SLSA commissioned a study to develop a Climate Change Adaptation Road Map that would assist in the proactive management of projected climate change impacts (the Project). The objective was to understand the range of risks posed by climate change, review available strategies to address the identified risks and develop a program of works to implement the identified strategies. An evaluative methodology was adopted to assist in determining the type of program that was required to meet the Project objectives (Owen and Rogers 1999). The outcome is a Climate Change Adaptation Road Map for SLSA, which outlines strategies that will increase the resilience of SLSA to the projected impacts of climate change. The outcomes represent an important first step for SLSA in preparing for the impacts of climate change.

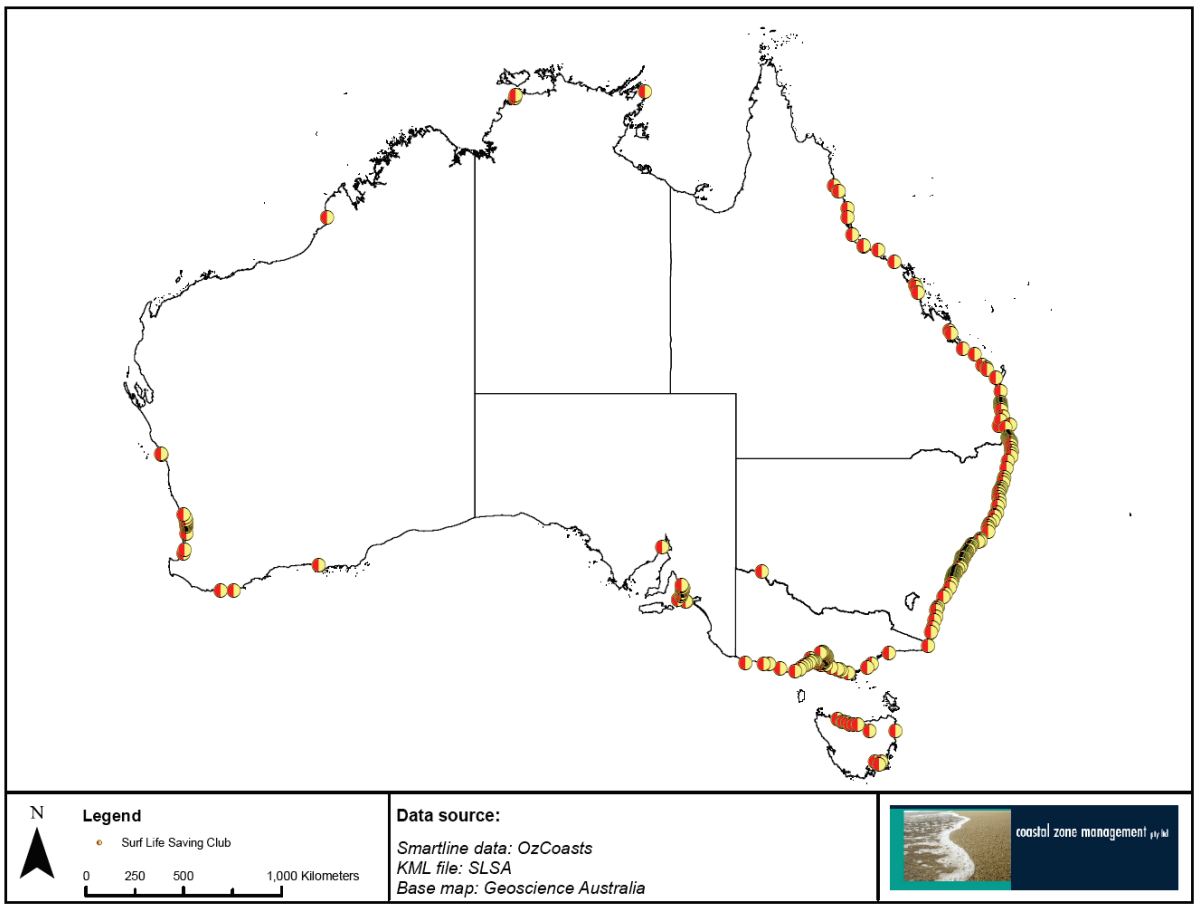


Figure 1: Distribution of SLSCs in Australia

1.1. Report Structure

The report provides outcomes of the activities conducted towards the production of the *Climate Change Adaptation Road Map*[1]. The report commences with an overview of the approach adopted to develop the Road Map (Section 2). The impacts of climate change in the coastal zone are reviewed in Section 3 to support identification of the key issues to be addressed in Road Map design. The results to be achieved through implementation of the Road Map are outlined in Section 4. In Section 5, examples of good practice climate change adaptation are reviewed to identify factors that influence change and facilitate adaptation. Section 6 contains the adaptive actions, adaptive strategies and the Climate Change Adaptation Road Map. Finally, Section 7 discusses implementation and next steps.

[1] This Full Report provides baseline information on the activities that supported the development of recommendations contained within the Road Map. It contains details on the methodology adopted; outcomes of the strategic vulnerability and risk assessment; presentation of the strategies to address the identified impacts and descriptive rationale behind the selection each strategy. In addition, example project profiles have been produced to support implementation of the Road Map recommendations. The partnering report, *Impact of Extreme Weather Events and Climate Change on Surf Life Saving Services: Summary Report*, is a succinct report containing only the Road Map recommendations with limited background information.

2. APPROACH

The work reported on in this Report was carried out between October 2010 and March 2011. Information contained in this document was collated through desktop review, focused on publicly available information, and consultation with SLSA stakeholders. An evaluative methodology was applied to identify the most appropriate strategies for SLSA to address the projected impacts of climate change (Box 1).

Box 1: Evaluative Methodology

Proactive evaluation in program development is undertaken on the assumption that policy or program development should be informed by the best and most appropriate evidence about the problem to be addressed (Owen and Rogers 1999). Proactive evaluation enables an analytical and rationale approach to the allocation of resources and is concerned with:

- The extent of the need among a defined population for a program in a given area of provision (Needs Assessment)
- Synthesising what is known about existing research and related literature about an identified issue or problem (Research Review)
- Critically reviewing ways in which an identified issue or problem has been solved through programs mounted in other locations (review of Best Practice - benchmarking).

According to this approach, a 'need' consists of:

- Desired or ideal condition or state of affairs, or what ought to be;
- The present or actual condition or state of affairs;
- Reasons for the discrepancies; and
- Deciding which needs should be given priority for action through a treatment or program.

The approach can be summarised in four key steps (see Figure 2):

1. Gaining an understanding of the problem to be addressed and the context for Road Map development (needs assessment);
2. Identifying the desired results, or future vision, by describing what achievements are expected in the short and long term;
3. Identifying the factors that influence change; and
4. Outlining strategies for 'best practice' that achieve the expected results.

An assessment of the situational context of SLSA provided the baseline understanding of the current condition. Projected changes in climate were then considered in conjunction with an assessment of the susceptibility and adaptive capacity of SLSA to those projected changes (Box 2). The outcome was an understanding of the range of risks that climate change may pose to the SLSA organisation (the identified need). Subsequently, the goal of the program (the intended vision) was defined and the activities that would achieve the desired program results were identified.

Each step is discussed in more detail below.

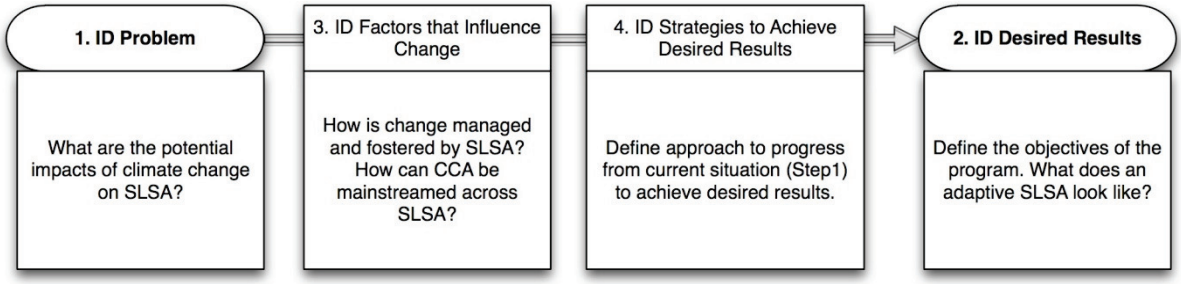


Figure 2: Approach to Road Map Development

Box 2: Vulnerability Assessment

Vulnerability as applied here is defined as: "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity'' (McCarthy et al., 2001, p. 995). Exposure is the degree to which a system experiences environmental or socio-political stress. Sensitivity is the degree to which a system is modified or affected by perturbations; while adaptive capacity is the ability of a system to evolve in order to accommodate environmental hazards or policy change and to expand the range of variability with which it can cope (Adger 2006).

Different frameworks have been developed and applied to assess climate change vulnerability and support adaptation decision-making around the globe. Three key themed approaches to vulnerability and adaptation assessment include: sensitivity analysis, impact assessment and risk assessment (Figure 3). All of these approaches support planned adaptation, however, the specific framework selected for application will depend on the key policy question to be addressed (Lu 2006). The output of analysis is an understanding of the sensitivity, impact or risk to the system, which can support the development of adaptation recommendations in the form of adaptation options, measures, and actions.

A risk-based approach was adopted in the needs assessment component of Road Map formulation to align with the widespread adoption of this approach in Australia (AGO, 2007).

2.1. Step 1: Needs Assessment

A risk-based approach was adopted to complete the needs assessment (Box 2 and Figure 3). The risk-based approach to climate change vulnerability assessment is designed to answer the question: how do we effectively manage climate change? The question is answered by (i) reviewing projected changes in climate; (ii) assessing the impacts that the projected changes will have on the system under assessment and (iii) reviewing strategies to address the identified impacts.

APPROACH	POLICY QUESTION	METHODS, TOOLS, DATA
Sensitivity analysis	Does climate change really matter?	Trends analysis, synthetic scenarios
Impact assessment	What are the potential impacts of unmanaged climate change?	Top down, scenario driven, sectoral assessment, climate change scenarios
Risk assessment	How do we effectively manage climate change?	Critical threshold, coping capacity, stakeholder analysis, uncertainty, communication and management, integrated scenarios

Figure 3: Themed approaches to vulnerability and adaptation (Lu, 2006)

SLSA delivers its services in the coastal zone. Consequently, the physical sensitivity of the coastal zone to changes in climate is of key concern. In addition, the capacity of SLSA to

manage these impacts will ultimately determine the vulnerability of the organisation to climate change. Shortfalls between the physical impacts of climate change and the capacity (termed adaptive capacity) of SLSA to manage those impacts will lead to organisational risks such as decline in service delivery and potential health and safety concerns. Consequently, the risk-based approach to the assessment required an understanding of the physical sensitivity of the coastal zone to projected climate changes and an understanding of the adaptive capacity of the SLSA organisation to manage such changes.

Physical sensitivity was established through desktop assessment[2]. The Smartline Geomorphic mapping tool developed by Sharples et al (2009) for the report *Climate Change Risks to Australia's Coast: A First Pass National Assessment* (DCCEE 2009) was applied to determine the sensitivity of the coastal zone. The coast was classified into areas susceptible to erosion (called zones of potential instability – ZPI) versus areas of coast less susceptible to change. Next, the location of each SLSC nationally was overlayed upon the Smartline data to classify whether it was located in a zone of potential instability (ZPI). The output was a mapping file (.shp format and .kml format) that classified each SLSC as situated in either a zone of potential instability (erodible coastline) or a zone of stability (stable coastline). In addition, a desktop visual assessment of the coastal characteristics in the vicinity of each SLSC was undertaken applying Google Earth imagery. Information collected included distance from vegetation line, buffer typology, buffer dimensions, presence of offshore reef, beach type, presence of rock, presence of dune and presence of controlling structures (Appendix 2).

The adaptive capacity of SLSA was defined through desktop assessment focused on assessing the decision-making processes of SLSA (the who, when, when, where and why of decision–making)[3](Figure 4). The objective was to understand how SLSA currently manage climatic and non-climatic impacts or perturbations. The human and financial resources available to the organisation, flows of information and patterns of communication are just some of the elements that will influence organisational adaptive capacity. There were two components to the assessment:

1. Understanding the decision making architecture of SLSA:
    - Understand the *what* and *why* of the organisation: organisation vision, mission and objectives.
    - Understanding the *how* of the organisation: organisational governance, decision process and delivery mechanisms.
    - Understand the *when* and *where* of the organisation: delivery, distribution and interrelationships.
2. Reviewing how the decision-making architecture informs management of climatic and non-climate risks.

[2] Refer to Appendix 1 for more details.

[3] Adaptive capacity of an organisation is defined by the social environment in which it is situated (Kasperson et al 2005; Tuner II et al 2003). This is also termed that socio-economic context. Socio-economic context incorporates elements such as political, social, economic and cultural conditions. The assessment of adaptive capacity was limited to a consideration of the internal socio-economic context of SLSA as an organisation. The socio-economic characteristic's of the external environment in which SLSA operates was not considered as a component of this assessment.

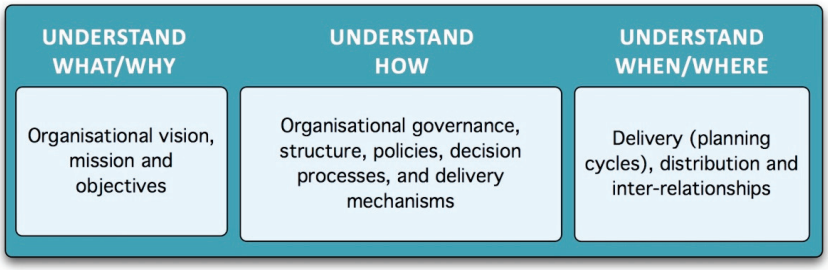


Figure 4: Elements considered in assessment of adaptive capacity

2.2. Step 2: Desired Program Results

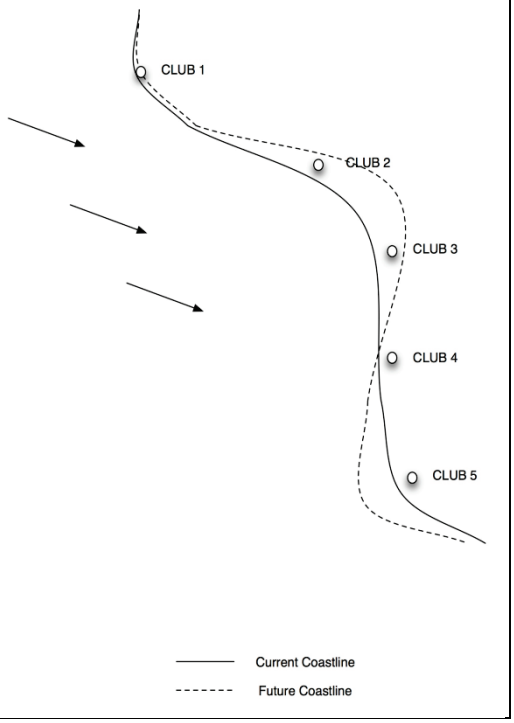
The outcomes to be achieved through Road Map implementation were defined through consultation with SLSA representatives. Storytelling tools were applied to examine the projected future management issues that may result from climate change. The objective was to elicit information on how such issues may be managed and whether the current decision-making environment could facilitate such management. The tools assisted stakeholders in considering potential futures and thus a 'future vision'. The output was an understanding of what an adaptive SLSA might look like. Defining the intended program goal or vision was critical to determining the most appropriate strategies for adaptation. An example of the storytelling tool is presented in Box 3.

Box 3: Storytelling Tool

There are five SLSCs situated along a stretch of coast. This stretch of coast is impacted by rising sea levels and coastal erosion. Each club along the coast will face different issues associated with the coastal changes.

Clubs 2 and 3 would be faced with the option to close, relocate or merge with neighbouring clubs. Club 1 may lose its ability to provide surf life saving services due a complete loss of usable beach. The nature of the club could change over time. The social value of the club may be maintained even if it cannot provide lifesaving services. Clubs 4 and 5 would see a likely increase in beach use from members of the surrounding clubs and districts placing pressure on their operational capacity.

How will the clubs manage such changes? Are the existing management approaches (local, state and national scale) capable of supporting adaptive management of such impacts?



2.3. Step 3: Factors that Influence Change

Implementation of adaptive strategies may require organisational change: change in perception; change in management practices; change in service delivery; and/or change in budgetary processes. While many changes can be readily implemented, the development of adaptive strategies should consider the most effective means to facilitate implementation. This requires an understanding of how change is managed and adopted across an organisation.

Critically reviewing the ways in which organisations have previously dealt with climate change impacts and implemented adaptation strategies can provide insight into approaches to facilitate change. Desktop review of approaches to climate change adaptation implemented by organisations similar to SLSA was undertaken. The review focussed on answering three questions:

- What examples of best practice climate change adaptation in the field of SLS or coastal safety provision can be identified?
- How have other organisations or entities facilitated climate change adaptation?
- What are the key barriers to change and how can these be addressed?

2.4. Step 4: Adaptive Strategies

Adaptive strategies were defined through production of a problem-solution map. A problem-solution map makes the alignment between the identified problems (as derived through Step 1: needs assessment) and the actions that will address the problems and achieve the objectives of the program (as derived through Step 2: desired program results) explicit. Actions to progress from the identified problems to the desired program results were identified through a brainstorming activity. The output of the brainstorming activity was a list of potential actions for implementation. The actions were reviewed in conjunction with the outcomes of Step 3 (factors that influence change) and refined based on this review to develop adaptive strategies that would enhance the resilience of SLSA to the impacts of climate change.

3. UNDERSTANDING THE PROBLEM

3.1. Impacts of Climate Change in the Coastal Zone

The potential impacts of climate change on the coastal zone are far reaching and have become a major concern at an international level. Sea level rise as a result of climate change will have a number of different physical and ecological effects on coastal systems including direct inundation, flood and storm damage, loss of wetlands, erosion, saltwater intrusion of coastal aquifers and associated rising water tables. Other effects of climate change, such as higher sea water temperatures, changes in precipitation patterns, and changes in storm tracks, frequency, and intensity, will also affect coastal systems, both directly and through interactions with sea-level rise.

These bio-geophysical effects will, in turn, have direct and indirect socio-economic impacts on tourism, human settlements, agriculture, freshwater supply and quality, fisheries, financial services, and human health in the coastal zone (Nicholls, 2004). Importantly, the severity of the impacts will depend on the level of greenhouse gas mitigation (GHG) adopted by the international community and the physical susceptibility and the adaptive capacity of the location in question. A generic summary of the projected impacts of climate change in the coastal zone is presented in Table 1.

Table 1: Impacts of Climate Change (adapted from Abuodha and Woodroffe, 2006)

Climate Change Impacts	Effects on the Coastal Environment
Higher sea levels Higher sea temperatures Changes in precipitation patterns and coastal runoff Changed oceanic conditions Changes in storm tracks, frequencies and intensities	**Bio-geophysical effects** Displacement of coastal lowlands and wetlands Increased coastal erosion Increased flooding Salinisation of surface water and groundwater **Socio economic impacts associated with climate change include*:*** Loss of property and land Increased flood risk/loss of life Damage to coastal protection works and other infrastructure Loss of renewable and subsistence resources Loss of tourism, recreation, and coastal habitats Impacts on agriculture and aquaculture through decline in soil and water quality Impacts on aquatic recreation in rivers, seas and oceans due to decline in water quality associated with land runoff and pollutants **Secondary impacts of accelerated sea level rise:** Impact on livelihoods and human health Decline in health/living standards as a result of decline in drinking water quality Threat to housing quality **Impacts on infrastructure and economic activity:** Diversion of resources to adaptation responses to sea level rise impacts Increasing protection costs Increasing insurance premiums Political and institutional instability, and social unrest Threats to particular cultures and ways of life

The Australian coastline contains a diverse range of coastal geomorphologic types (see Appendix 4) and is exposed to differential metocean processes (such as wind, wave and swells), which influence coastal form. An assessment of the projected changes in climate (refer to Appendix 3 for details) provides insight into the range of coastal climate change impacts that may be felt by SLSA.

Sea level rise will exacerbate erosion and result in inundation of low-lying areas. Clubs situated in coastal areas sensitive to physical coastal change will be vulnerable to projected climate changes. Coastal zones sensitive to erosive coastal processes include those situated in coastal areas classified as zones of potential instability (ZPI), following the Smartline (2009) classification. Importantly, over 60 per cent of all SLSCs are situated in coastal areas classified as zones of potential instability (Table 2). An overview of the exposure of SLSCs to projected climate changes (see Appendix 3) and the associated impacts, per state, are presented below.

Table 2: Percent of clubs, per state and region, located in zones of potential instability

State	Number of clubs within ZPI	Number of clubs not considered to be within ZPI	Total clubs	Percentage of clubs in ZPI
New South Wales	**60**	**68**	**128**	**47%**
Far North Coast	6	4	10	60%
North Coast	7	1	8	88%
Mid North Coast	5	3	8	63%
Lower North Coast	5	1	6	83%
Hunter	5	8	13	38%
Central Coast	7	8	15	47%
Sydney Northern Beaches	5	16	21	24%
Sydney	5	10	15	33%
Illawarra	5	12	17	29%
South Coast	6	2	8	75%
Far South Coast	5	2	7	71%
Northern Territory	**2**	**1**	**3**	**67%**
Queensland	**40**	**19**	**59**	**68%**
North Queensland	2	3	5	40%
North Barrier	7	1	8	88%
Wide Bay Capricorn	3	5	8	38%
Sunshine Coast	11	4	15	73%
South Coast	10	2	12	83%
Point Danger	8	3	11	73%
South Australia	**16**	**2**	**18**	**89%**
Tasmania	**8**	**1**	**9**	**89%**
Victoria	**48**	**9**	**57**	**84%**
Far East	4	0	4	100%

State	Number of clubs within ZPI	Number of clubs not considered to be within ZPI	Total clubs	Percentage of clubs in ZPI
South East	3	3	6	50%
Central	28	2	30	93%
South West	10	0	10	100%
Far West	3	4	7	43%
Western Australia	**12**	**10**	**22**	**55%**
South Coast	1	2	3	**33%**
South West Coast	2	0	2	100%
Perth Coast	7	7	14	50%
Mid West Coast	2	0	2	100%
Far North Coast	1	0	1	100%
NATIONAL TOTAL	**186**	**111**	**297**	**63%**

New South Wales

The New South Wales coastline has a total of 128 SLSCs spread across 11 regional branches. Across the state, 47 per cent of clubs are located in coastal zones classified as a zone of potential instability (ZPI). A high per cent of these clubs are located in the northern part of the state (Mid North, North Coast, Far North Coast Branches). Conversely, the Central, Northern Sydney, Sydney, and Illawarra coast are less exposed to unstable coastlines. The most densely populated coastal areas along the Central branches also contain the greatest number of clubs. Hotspots susceptible to coastal erosion in New South Wales are located in the Far South Coast and the North and Far North Coast, and include clubs such as Cudgen Headland SLSC.

Cudgen Headland SLSC has been recently impacted by the occurrence of storm events. Chronic erosion following a series of storms caused shoreline recession in front of the club premises and along the adjoining beach, resulting in decreased amenity for beach users and impacts on interclub surf carnivals. As a result, the club worked together with the Tweed Shire Council to establish temporary protection measures, including seawall construction and sand renourishment. These actions combined with natural sediment renourishment from the Cudgen creek has improved the condition of the beach adjacent the club.

Cases such as at Cudgen Headland SLSC highlight the impact of natural climate variability on coastal condition; and the associated impacts and management strategies adopted by clubs to maintain provision of surf life saving services. Projections for climate change, including rise in mean sea level, are likely to exacerbate existing management issues and generate new management challenges. Coastal processes, such as sediment transport may be altered, inhibiting natural sand replenishment. Such changes may have implications for the cost and effectiveness of management controls currently in place.

Cudgen Headland SLSC

The Cudgen Headland SLSC is recognised as particularly vulnerable to future changes in climate. Located on Kingscliff Beach in NSW the beach surrounding the club has been actively eroding since 2009 with a loss of up to 60 meters of vegetated foredune lost (Tweed Shire Council. 2011). Erosion is continuing around the club and a temporary geotextile seawall has been constructed to improve the protection of the club provided by a pre-existing underground pile seawall. The sandy beach geomorphology in combination with exposure to metocean processes including storm surges has contributed to the erosion problem

Kingscliff Beach, August 2010 (Source: Tweed Shire Council)

Kingscliff Beach, State SLS Championships, March 2011 (Source: Tweed Shire Council)

Queensland

Queensland has a total of 59 SLSCs spread across six regional branches. In the Northern Barrier branch, 88 per cent of clubs are located on coastline classified as a ZPI. There is also a high percent (73 to 83 per cent) of clubs located in the ZPI within the southern branches, which include the Sunshine Coast and Gold Coast. Specific clubs in these areas include Caloundra and Northcliffe, respectively. The high percent of clubs located on coastline classified as a ZPI in the South Coast and Point Danger branches is consistent with the areas in northern New South Wales identified as potentially unstable (particularly

Far North Coast and North Coast branches in New South Wales). This suggests that the northern New South Wales and southern Queensland coastline is susceptible to change.

Clubs in this area are predominantly situated on sandy beach morphology and have a high level of exposure to storm surge from Ex-Tropical Cyclones and East Coast Lows (ECLs) (Figure 5). Acute coastal erosion is often an outcome of such events. The impacts of coastal erosion in this area are amplified due to the high level of membership and year round activity of the clubs. One club situated within a ZPI is Currumbin Beach Vikings. The club is located on a rock outcrop (Elephant Rock) roughly in line with the high water mark and has been inundated in the past during storm events (see Figure 6). Another extreme example is Moore Park Beach, where in 2010 the clubhouse was due to be demolished, as a result of severe beach erosion.

Figure 5: Arcadian SLSC, Townsville, following cyclone Yasi (February, 2011) Photo Credit Norman Farmer

Projections of change in climate signify that erosion and inundation will be increasingly important management issues for SLSCs nationally. Clubs such as Moore Park SLSC and Seaspray SLSC have attempted to manage erosion and inundation through temporary coastal protection measures. However, other clubs (for example, Seaspray SLSC, Victoria) have decided that they must manage their risk to extreme events by relocating and rebuilding (commonly due to chronic erosion). The issue of whether to manage, relocate or accommodate will become an increasingly important management concern.

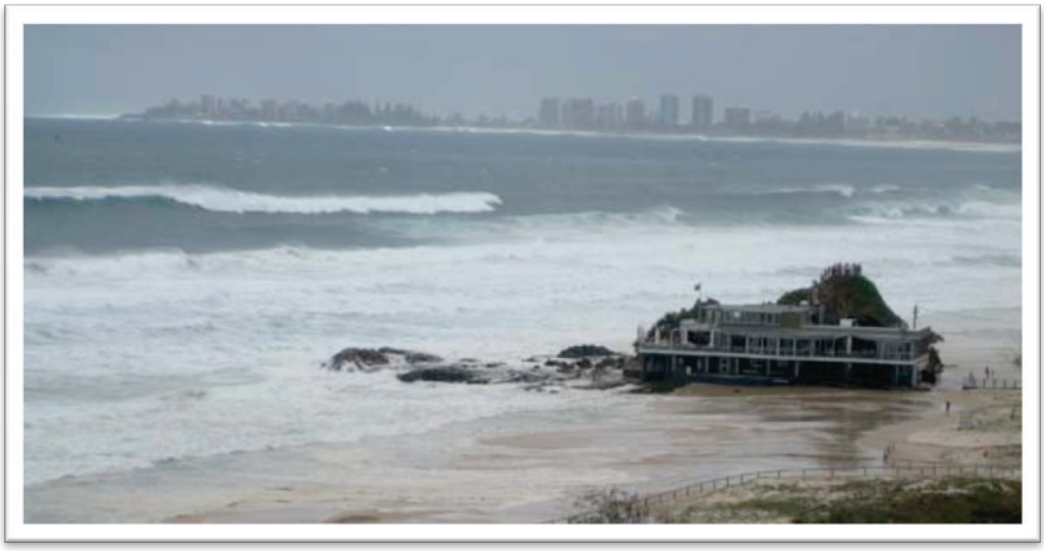


Figure 6: Currumbin Beach SLSC during storm event (December, 2007) Photo Credit Jennifer Marohasy

Moore Park Beach Surf Lifesaving Club

During strong storm events in early 2010, the Moore Park Beach club was significantly damaged, with a section of the clubhouse foundations washed away due to erosion (shown below). Members attempted unsuccessfully to save the structure by placing sandbags at the front of the building. However, in June 2010, members decided the best option would be to demolish the club and build a new club at the site, 30 meters back from the original clubhouse, built in 1968. The coasts sandy beach morphology and exposure to storm surge from Tropical Cyclones to the North have contributed greatly to the problem.

Moore Park Beach SLSC Clubhouse (Source: Norman Farmer, SLSA)

Victoria

Victoria has a total of 57 Life Saving Clubs spread over five main geographic regions. A majority of the SLSCs in Victoria are located within Port Phillip Bay along the south east metropolitan area. Ninety three percent of these clubs are located in coastal areas classified as ZPI. In the South West region, all clubs are located within a ZPI. Consequently, a very high percent (84 per cent) of SLSCs in Victoria are situated on coast potentially more susceptible to erosion than any other state along Australia's east coast. Hotspots in Victoria include clubs located in Port Phillip Bay (Beaumaris, Seaford and Bon Beach), on the Surf Coast (Lorne), and on the Gippsland Coast (Seaspray and Waratah Beach).

In February 2011 the Seaspray SLSC received State Government funding to rebuild its clubhouse, which was severely affected by storm impacts in 2007. The funding contributed to the re-development of the club in an area 'less susceptible to storm impacts' (LSV News 2011). The Wollongong City Beach SLSC (NSW) also undertook clubhouse relocation. The relocation was driven by club deterioration and exposure to historic storm impacts. A hazard study was undertaken to inform site selection for the redevelopment of the clubhouse (Douglas 2006).

Western Australia

Within Western Australia, most SLSCs are located along the Perth Metropolitan coast. Half of the 14 clubs located along this coastline are located on coastline identified as a ZPI. In total 55 per cent of SLSCs in WA are located within the ZPI. Hotspots susceptible to coastal erosion in Western Australia include clubs located in the South Coast and the Southwest Coast. As per the findings derived from other States, impacts of storm events are a key driver of erosion and inundation for Western Australian SLSCs. However, consultation with SLSCs in Western Australia noted that service delivery has not been impacted by extreme events in recent years.

There is demonstrated evidence of clubs proactively incorporating climate change into their long-term decision-making. For example, Fremantle SLSC undertook in-depth discussions with the Local Government Authority (City of Fremantle) and the State Planning Commission when planning the development of a new clubroom at Leighton Beach, to ensure the development was mindful of climate change. Such proactive planning for climate change risks (also demonstrated by Inverloch SLSC, Victoria) is commonly driven by local government planning requirements (Water Technology 2010; and Fremantle SLSC *pers comm*).

Seaspray SLSC

The Seaspray SLSC is situated on 90-mile beach in southeast Victoria. In July 2007 a large storm system caused severe erosion and scarping of the dune face undermining the front decking and access area.

Reponses

Short term

Immediately following the event sandbags and branches were placed as a makeshift erosion control. Shortly after the storm event, the club received funding through the Victorian Department of Sustainability and Environment to reconstruct the dune and access to the club.

Long term

As of January 2011 the Victorian State Government had committed funds towards the construction of a new SLSC to be set back from its current location.

South Australia and the Northern Territory

The majority of SLSCs in South Australia are concentrated along the Adelaide metropolitan area on the St Vincent gulf. In total 89 per cent of clubs in SA are located on coast identified as a ZPI. Importantly, the Adelaide metropolitan coast is structurally reinforced, with almost all SLSCs in the region having some form of coastal protection. The ZPI classification does not account for the presence or absence of coastal protection features. Consequently, some of these clubs may be less exposed to erosive processes than indicated via the classification. However, the ability of the coastal protection structures to accommodate future changes in climate is not evaluated. Further, despite coastal protection structures, beach change is inevitable. If erosion is dominant, the coastal foreshore may be lost, reducing coastal recreational use and increasing risks to public safety. Consequently, club long-term viability may become an issue.

There are three SLSCs located in the Northern Territory. Two of these clubs are situated on potentially unstable coast (Darwin SLSC and Arafura SLSC). The impact of climate

variability and issues faced in managing projected climate change on clubs in the North Territory was not identified during stakeholder consultations.

Tasmania

Eighty nine percent of SLSCs in Tasmania are located on coastline classified as a ZPI. A majority of the SLSCs in Tasmania are concentrated on the North Coast with a small number of clubs located around the Hobart and Frederick Henry Bay areas. The Mid North Coast represents a hotspot susceptible to coastal erosion. Specific clubs include Ulverstone (Mid North Coast), Devonport (Mid West Coast) and Burnie (Mid North Coast).

Importantly, erosion leading to impact on clubs assets, as experienced at Devonport and Burnie SLSCs, is not the only coastal management issue that affects SLS service delivery. Clifton Beach SLSC has had significant problems with winter storm erosion exposing and eroding bedrock. This has caused problems in holding events due to the presence of rock outcrops and gutters along the beach (SLS Tasmania, *pers comm*.). The impacts of club assets in Devonport and Burnie have been managed through active management controls such as clubhouse redevelopment in an alternate location (Devonport) and seawall construction and maintenance (Burnie SLSC). The ability of protective measures to continue to manage the impacts of storm events and inundation under scenarios for sea level rise must be assessed on a case-by-case basis. However, it is clear that existing management issues are likely to be exacerbated by projected climate changes.

Such issues have gathered increased attention at global, regional and local scales. Australian local governments are increasingly active in ensuring climate change is considered as a component of planning and broader decision making. Consequently, SLSCs are requested to provide reports and assessments of the potential impacts of climate change on their club premises when planning to refurbish, extend or renovate (for example, Bridport SLSC has been requested to provide an environmental impact plan that addresses global warming concerns). The human and financial resources required to fulfil this commitment will be an increasingly important management issue.

3.1.1. Summary

The discussion above highlights a range of management issues currently faced by SLSCs and how these are projected to change as a result of projected changes in climate. The management issues can be aligned to two categories (i) the exacerbation of existing management issues; and (ii) exposure to new management challenges.

Existing management issues likely to be exacerbated due to projected climate changes include:

- Increased risks and hazards affecting recreational beach users safety. For example, due to erosion removing sediment and exposing reef and bedrock.
- Erosion and storm impact on assets (such as club houses), access paths and equipment.
- Altered reporting processes and enhanced human and financial resources required to align to state and local government requirements.
- Impact on sporting and other recreational activities of the clubs, due to impact on both club premises and the beach foreshore on which activities would be held.

Additional management challenges may include:

- Changing dynamics of beach use, due to increased temperatures and/or change in the amenity of the foreshore reserves.

- Increased training and investment in the human resources (staff and volunteer development) to account for changes in service provision
- Changes in water quality (as a result of increased storm runoff) affecting health of SLS staff and beach users.
- Protective structures fail and relocation is not possible (due to existing planning levels).

Exposure to such issues will vary dependant upon the biophysical vulnerability of SLSCs: both coastal sensitivity and exposure to climate drivers (such as wind, wave and storm events). The ZPI provides insight into those clubs that are more susceptible to erosion (coastal sensitivity). However, broader management challenges such as change in dynamics of beach use, and health and safety issues for beach users are also of critical concern.

Importantly, not all clubs identified as situated in zones of potential instability will be exposed to significant coastal management issues. Rather, the classification indicates the potential for coastal change, rather than projected coastal change[4]. Despite this, it is clear the climate change will pose a management challenge for SLSA. Approaches to facilitate effective management are examined in the section that follows.

3.2. Managing the impacts of climate change

The impacts of climate change of SLSA will include disruption to service delivery, changing dynamics of beach use, exposure of SLS staff and recreational beach users to altered beach conditions, and higher costs of asset maintenance and repair. As demonstrated in Section 3.1, SLSA currently manages a range of climate driven impacts. However, climate change will likely worsen these impacts and result in new management challenges. The capacity of SLSA to manage such impacts is of key concern.

The ability to manage climate impacts is a function of the strengths and resources available within an organisation that can reduce the level of risk, or the impacts of a disaster. This may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management (IPCC 2007b). Capacity may be inherent in an organisation or it may have developed as a result of previous policy, planning or design decisions. Factors that influence adaptive capacity include (Box 3):

- Information
- Flexibility and resources
- Susceptibility to non-climate risks

The capacity of SLSA to manage climate change risks is reflected in the decision-making and operational processes of the organisation – the *what*, *why*, *how*, *where* and *when* of operations. A review of the decision-making architecture of SLSA is presented in Appendix 5. The outputs of the review are summarised in Figure 6. The influence of the decision-making architecture on the management of climatic and non-climate risks is discussed below.

[4] Details on the met-ocean conditions influencing coastal change would be required to enhance the understanding of projected biophysical vulnerability. Smartline is currently under development to provide this important information (pers comm.).

Box 3: Factors Influencing Adaptive Capacity

Information: Access to information can support or constrain decision-making. In respect to climate change adaptation, information requirements may include (i) awareness of climate change risks, (ii) understanding of the policy implications of climate change adaptation action, and/or (iii) awareness of the services and mechanisms available to support adaptation and respond to extreme events. Such information is vital in supporting decision making for service delivery, planning and management. An organisation that is 'information effective' from an adaptive capacity perspective would have ready access to information for both organisational staff and relevant stakeholders. For example:

- Guidelines to support adaptive response (following extreme events and long-term planning).
- Collection and storage of climate change relevant information (for example, monitoring or other programs to detect changes that are occurring and a database for easy storage and access to such information, and access to studies and reports). This may include knowledge and access to relevant legislation and regulations relating to SLSA property and services.
- A communication plan to enhance awareness of and access to the information available to support decision-making for organisational staff and relevant stakeholders.

Flexibility and resources are important attributes of adaptive capacity as they can facilitate change. If an institution is flexible, changes in governing strategies and policies can be made with limited disruption. In addition, human and financial resources are important in supporting implementation of actions that will enhance resilience to projected climate changes.

Susceptibility to Non-Climate Risks: Change in climate is only one of the many interacting stressors influencing the vulnerability. Non-climate stressors such as global economic change, political upheaval and trade liberalisation can impact an organisations service delivery and operations. Such risks are regularly managed, however, exposure to such risks will impact the ability to manage climate related stressors.

SLSAs mandate is to provide great beach experiences and a safe beach and aquatic environment throughout Australia. This is achieved through the provision of SLS services, which include:

- Coastal safety and lifesaving;
- Education and training
- Fitness and sport; and
- Member and organisational development.

SLSA delivers these services via a federated model of management, with over 300 individually incorporated SLSCs providing services nationally. The highly federated model of development has benefits and downfalls in terms of its contribution to adaptive capacity. The model ensures consistency and alignment across scales from a policy perspective flexibility. For example, state centres, branches and clubs are tied to SLSA through the adoption of policies and guidelines. Therefore, change to national strategies and plans can filter through to state centre, branch and club levels. However, operational procedures are defined at the local scale and therefore there is independence and isolation in service delivery. Interestingly, proactive management action undertaken at the local scale has been recognised as a tool to support broader uptake across the organisation. There is a history of clubs showing leadership and foresight on selected management issues. These clubs communicate the benefits of such action to other clubs who in turn follow suit. Such vertical and horizontal integration of information across the organisation increases organisational flexibility.

SLSA is a volunteer based organisation that relies on community support, its corporate partners and the Australian Government to fund the majority of its activities. Consequently, human and financial resources are finite and managing day-to-day service delivery is the highest priority, enforcing a 'here-and-now' context of decision-making. The levels of human capacity are highly differential across the clubs, with full time paid staff at some clubs, while others are run solely through the dedicated commitment of volunteers. Similarly, the financial resources available to SLSCs differ nationally. Some clubs are asset rich and income poor while others are asset and income rich. The distribution of finances across the organisation

is based on ‘equal share’. Such an approach does not take into account differential capacity of clubs to generate income, for example through membership, fundraising, donations, connections, and commercial activities. Consequently, some clubs have greater financial capacity than others.

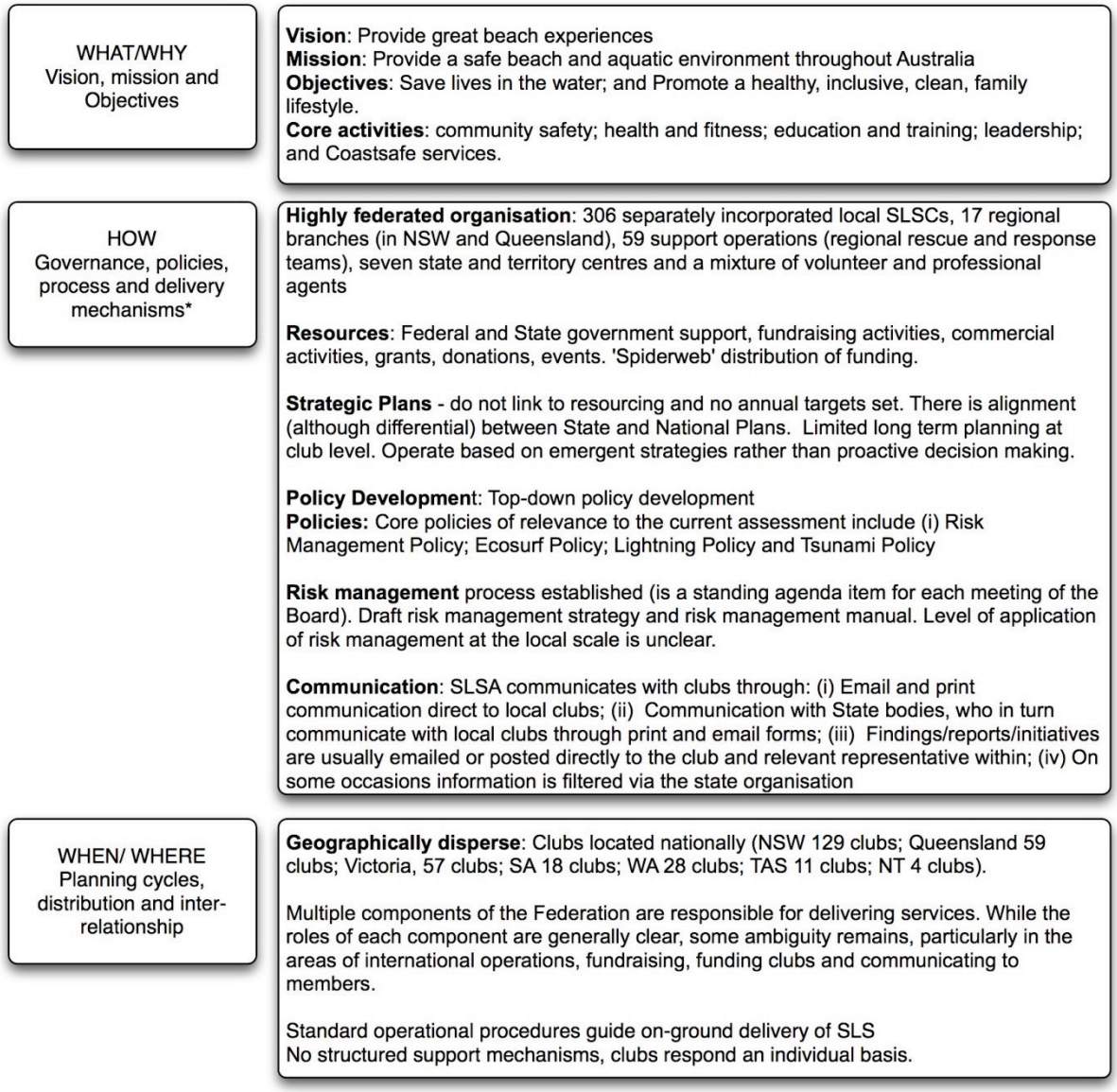


Figure 7: The What, Why, How, When and Where of Decision Making for SLSA

SLSA relies on multiple components of the Federation to deliver its services including SLSA, the state centres, clubs and individual members (Barrington Consulting Group 2009). In some states, this extends to branches Consequently, information distribution and communication is vital to support service delivery. While information delivery is advanced in some respects (for example SLSA manages and runs Australia’s most comprehensive database on coastal beach safety, the Australian Beach Safety and Management Program, and has established an Ecosurf website that provides a mechanism to share environmentally focussed news and information across the organisation), there appears to be a breakdown between provision of information at the national scale and up-take or application of information at the local scale. Nationally run and managed programs provide tools to support decision-making. However, information is commonly distributed on a project-by-project or issue-by-issue basis resulting in large levels of information distributed across

the organisation. Local scale decision makers do not have the capacity to review all information distributed and consequently, information relevant to service delivery may be overlooked.

Change in climate is only one of the many interacting stressors influencing the vulnerability of SLSA clubs. Non-climate stressors such as policy change, beach use, membership levels and economic decline are also managed across the organisation. Patterns of response to such changes are indicative of the adaptive capacity of clubs to respond to external and internal risks. Some clubs demonstrate a strong capacity to adapt to such changes and social connections are recognised as a key attribute enhancing the resilience of clubs. Risk management is performed by accessing information on an 'as-needs' basis, by individual clubs. There is no strategic guidance and/or structured mechanisms to support clubs in responding to issues that affect service delivery. As a result, some clubs effectively manage climate and non-climate risks, through utilisation of established connections and affiliations, independent of national or state centre guidance. Others have low awareness of or access to information that would support management of such risks.

3.3. Summary

It is recognised that SLSA is in the business of managing and responding to change. Since its inception, clubs have been exposed to changes in the coastal system, such as erosion, accretion and storm events and have adapted to such changes. However, it is also recognised that projected climate changes are likely to enhance current management issues and, in some cases, deliver new management challenges.

Long-term change in mean and extreme climate, as projected to occur as a result of climate change, will impact SLSAs infrastructure, assets and service delivery, both directly (through erosion and inundation) and indirectly (top down impacts of policy change at federal, state and local levels). These impacts may result in increased costs for maintenance and repair, compliance and reporting, and disruptions in service delivery.

The vulnerability of clubs to such impacts will differ nationally dependant upon their exposure, susceptibility (to climate and non-climate risks) and their adaptive capacity. The ability of SLSA to achieve its mission (i.e. provide a safe beach and aquatic environment throughout Australia) is dependant upon its ability to effectively manage the impacts and associated vulnerability to projected climate changes. In short, the issues that influence the capacity to respond to climate changes must be addressed in program development.

In subsequent sections of this report, the outcomes of the needs assessment discussed herein are applied, in conjunction with the outputs from the remaining three phases of Project delivery, to produce a Climate Change Adaptation Road Map that will support the management of the identified risks.

4. DESIRED PROGRAM RESULTS

Climate change represents a significant challenge for SLSA. The impacts of climate change will be very different along different sections of coast, long-term in nature, and effective management of the impacts will require enhancement in adaptive capacity. There is a recognised need to transition towards an adaptive model of service delivery, in which barriers to adaptation are removed and diversity and flexibility in response is promoted. In short, the goal of the program is to: *achieve proactive and coordinated management of long-term changes in mean and extreme climate across the SLSA organisation (from club to national levels).*

During consultations, the goal of the Road Map was broken down into elements that would achieve the intended vision. The output is a list of organisational qualities representative of an adaptive SLSA. These qualities represent the desired program results and include:

- An organisation with ready access to information and knowledge on climate change science, on current climate change issues and legislation, on emerging climate change issues, both locally and Australia wide.
- An organisation that is engaged at all levels with a free flow of information. For example we know which clubs are impacted and need assistance, and the Clubs who need advice or assistance know where to get it.
- An organisation with good systems, procedures and decision making mechanisms to guide the operations at all levels of members, clubs, branches, state and national.
- A responsive organisation that is able to mobilise support, advisory and information sources at all times (24 hours a day, 7 days a week).
- An organisation that has a dynamic planning process with plans that are periodically reviewed to take into account changes in social, economic, environmental and political matters.
- An organisation that has developed a 'funding pool' from which it can draw down funds for adaptation measures as well as for emergencies.
- An organisation that is well connected and in-tune with political debate, processes, grants and the decision makers.
- An organisation that respects and actively contributes to the wellbeing of its members, communities, the environment and ecology.

The outputs provide strategic direction for Road Map development. They represent the intended 'end point' or the long-term program outcomes.

5. FACTORS THAT INFLUENCE CHANGE

Adaptation to climate change is a necessary response to reduce the impacts of climate change. Even if the international community meets its commitment to reduce emission reductions, the earth is committed to a degree of change due to both historic emissions and future emissions. The adaptive need has been recognised internationally and there has been a proliferation of assessments examining strategies for adaptation (see for example UKCIP 2008). However, these practical experiences have not translated into assessments in the field of coastal beach safety. A review of international life saving federations action on climate change indicates that SLSA is a leader in this area. Consequently, examples of best practice adaptation from other surf life saving entities internationally could not be drawn. However, lessons to facilitate climate change adaptation have been drawn from other service delivery organisations, such as local government authorities and non-government organisations.

Climate change mainstreaming is promoted as a key tool to facilitate adaptation. It is a term used to describe the integration of policies and measures to address climate change into ongoing and new policies and plans (ADB 2005). The aim of mainstreaming is to increase the effectiveness, efficiency and longevity of initiatives directed at reducing climate-related risks, while also contributing to sustainable development and improved quality of life (ADB 2005). To mainstream climate change, adaptive entry points must be identified. Adaptive entry points provide opportunities for the identification, integration and implementation of measures and investments specifically designed to enable and support adaptation to climate change (OECD, 2009, Olhoff and Schaer, 2010). OECD (2009) suggest four possible entry points for climate change adaptation mainstreaming:

1. Consideration of the implications of climate change in planning processes.
2. Adjustment of regulatory and service provision frameworks, including provision of information bases on likely local impacts of climate change.
3. Adjustment of accountability mechanisms.
4. Engagement of private sector and community organisations and processes.

Whilst these entry points were developed for local and state/provincial governments, the themes provide broad guidance relevant to a range of organisations and entities.

Adaptive entry points for SLSA, at the level of plans, programs and projects, are presented in Table 3, aligned to the OCED identified entry points. By mainstreaming climate change via these adaptive entry points, SLSA can provide an operational mandate for adaptive action. In addition, climate change adaptation will become part of standard operational procedures rather than an activity undertaking in isolation. Importantly, the impacts of climate change cannot be effectively treated by one person, sector or division; rather, an integrated approach is required to support adaptation. Climate change mainstreaming is an effective tool to support such an approach.

Lessons can also be drawn internationally on approaches adopted to manage and address *barriers to adaptation*, or the *factors that inhibit change*. In an assessment of 'good practice adaptation', Travers et al (2010) noted three core barriers to adaptation: finance, capacity and information. Best practice approaches to alleviating these barriers are outlined below.

Table 3: SLSA adaptive entry points

Entry Point to Mainstream Climate Change (OCED 2009)	SLSA Adaptive Entry Point Tool
Consideration of the implications of climate change in planning processes	Strategic plans Annual plans Risk management plans
Adjustment of regulatory and service provision frameworks, including provision of information bases on likely local impacts of climate change	Standard operational procedures IT resources, such as the Ecosurf website and ABSAMP National policies
Adjustment of accountability mechanisms	Resource distribution formulas Operational mandates (club constitution) Organisational performance report card - a tool for encouraging directors and managers (at national and state levels) to focus on identified strategic priorities
Engagement of private sector and civil society organisations and processes	Research Scheme SLSA Federation

Finance: Lack of financing can be a key barrier to adaptation. Adaptation strategies often require finance to support implementation. For example, conducting research in high priority areas or hiring staff for new or amended activities. While financial assistance can be obtained through Federal and State funding sources, there are commonly more requests for support than there is financial assistance to provide support. Consequently, strategies to access limited funding and to evaluate current program expenditure are important to alleviate barriers to implementing adaptation.

Internationally, there has been a trend in establishing sustainable funding mechanisms for the specific purpose of funding climate change adaptation activities. In the Pacific, the Government of Samoa is investigating opportunities to develop sustainable financing mechanisms (Government of Australia 2009). The objective is to support national coordination of climate change adaptation and mitigation efforts to move from individual project based activities to a holistic and coordinated climate change response.

In addition, significant cost-savings can be achieved through sharing information and practical experience. Risk assessments undertaken by local governments throughout Australia are transitioning from individual (one local government) assessments to regional risk assessments. Climate projections are readily available at regional scales. Consequently cost sharing can be undertaken in regional impact assessments. In addition, ad-hoc networks are often used to share information and lessons learned in undertaking such assessments. Such activities can contribute to significant cost savings, for local governments.

Information: Access to climate information is critical to support effective climate change adaptation. In order to make informed and effective decisions about adaptive strategies, individuals, businesses, communities and governments need accurate estimates of climate change projections and their various environmental and socioeconomic effects. In addition, information on local context, i.e. historic exposure to risk and current coping strategies, is vital in supporting effective adaptation.

Information requirements can be considered under two categories (i) information collection and (ii) information dissemination. Regional monitoring networks are important tools for the collection of climate relevant data, such as coastal change and storm event/impact databases. Coordination of monitoring networks and stakeholder engagement in implementing monitoring programs are key to successful programs. Careful review of data needs and the applicability of existing monitoring networks to capture required information is a prerequisite in the design of monitoring programs. If appropriately planned, improvements in data collection and monitoring can be made with limited financial outlay. Importantly, information collection can also be enhanced through partnerships with research institutions and other agencies undertaking climate adaptation programs and projects.

Pilot projects are applied internationally as tool to support information dissemination. In addition to the practical benefits of adaptive action at the pilot site, pilot programs also provide opportunities to raise awareness and build adaptive capacity. An adaptation project funded by the Global Environment Fund (GEF) in Uruguay is focussing on implementing pilot climate change adaptation measures to address climate change risks in pilot sites, to raise awareness and information on available options and their effectiveness to treat climate risks (GEF 2007). Such demonstrations of good practice are a valuable tool in promoting adaptive action at the local scale.

Capacity: Strengthening capacity at all levels, from local to national, is a priority to provide the skills, capacity and local leadership required to manage implementation of adaptation projects/programmes and to ensure that individuals have the capability to manage climate hazards and to recover quickly from negative impacts. A long-term, systemic approach to building capacity and capability, that assists sharing of best-practice and strengthening institutions for on-ground decision making, is required.

The train-the-trainer model is widely applied as a tool to build capacity and has been applied in field of climate change risk assessment and adaptation planning (Elrick and Kay 2009). The model relies on training of key staff within an organisation; who are then responsible for the provision of training and skill transfer to others within the organisation. The approach intends to sustain training efforts and reduce the reliance on external agencies for the provision of training and capacity building.

5.1. Summary

Lessons learned from good practice climate change adaptation provide insight into strategies that will facilitate adaptation for SLSA. Key lessons drawn from the assessment include:

- Climate change mainstreaming provides the mandate for adaptive action and enables a coordinated response to the impacts of climate change.
- Mechanisms to support information collection and dissemination are vital in enabling adaptive decision making.
- Financial barriers to adaptation can be lessened via regional collaboration and the formation of financial mechanisms that enable targeted adaptive financing.
- The train-the-trainer model of capacity building has delivered proven results in climate change adaptation and risk assessments.

The outcomes informed the development of adaptive strategies for inclusion within the SLSA Climate Change Adaptation Road Map – as discussed in Section 6. The objective was to ensure that good practice lessons on enabling change and supporting adaptive action could be incorporated within the Road Map thus enhancing the effectiveness of the Road Map and facilitating implementation.

6. ADAPTIVE STRATEGIES

The outputs from the prior phases support the development of adaptive actions that will be incorporated within the SLSA Climate Change Adaptation Road Map. Adaptation is defined by the Intergovernmental Panel on Climate Change (IPCC 2007) as an "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities". There are multiple types of adaptation: anticipatory, autonomous and planned. The focus of this Project is on planned adaptation (Box 4).

The aim of the adaptation planning undertaken in this Project was to define the adaptation actions that would enable SLSA to *achieve proactive and coordinated management of long-term changes in mean and extreme climate across the SLSA organisation* (the program aim/intended vision). Consequently, the focus was on the identification of adaptive actions that would enhance the adaptive capacity of SLSA. Actions that build adaptive capacity, following UKCIP (2008) include:

- Creating information
  - Research
  - Data collection and monitoring
  - Awareness raising
- Establishing supporting social structures
  - Organisational development
  - Working in partnership
- Establishing supporting governance
  - Regulation
  - Legislation
  - Guidance

Importantly, the adaptive actions were selected in line with the principles of good risk treatment as advocated by the AGO (2006) (Box 4). The adaptive actions that address identified barriers and achieve organisational objectives are presented in Figure 8 and Table 4, along with a descriptive rationale for the each action[5].

When viewed in isolation, the adaptive actions may not present a coherent strategy for adaptive action. Therefore, to demonstrate alignment between actions and support implementation, the adaptive actions were collated under overarching adaptive strategies. The strategies align to internationally and national endorsed adaptive frameworks (such as UKCIP (2008) and AGO (2007)), and provide strategic guidance to SLSA that will support implementation through the development of four discrete programs of work. The strategies include:

1. **Strategy 1:** Build capacity to respond to the impacts of climate change by raising awareness, enhancing partnerships and mainstreaming climate change adaptation.
2. **Strategy 2:** Enhance the capacity of SLSA clubs to understand and assess their climate change risks and provide an equitable means to allocate resources to address the identified risks.

[5] Note that the ID code (shown in column 'Rationale' of Table 4) links to the overarching barriers to adaption that are being addressed through each action. Importantly, the actions outlined address a number of the identified barriers to adaptation, as demonstrated by the assignment of more than one ID code to a selected adaptation action. Such an approach is advantageous as it ensures adaptation is viewed as a holistic process rather than actions developed to meet individual problems on a case-by-case basis.

3. **Strategy 3:** Provide financial support to SLS clubs, support services and branches to adaptively manage climate change and extreme events.
4. **Strategy 4:** Provide support mechanisms to clubs to access in times of emergency and to support long-term planning, contributing to (i) a coordinated response to business continuity following extreme events; (ii) targeted guidance and direction to clubs based on their current capacity.

Box 4: Introduction of Adaptation Planning

Adaptation Definitions: *Anticipatory adaptation* that takes place before impacts of climate change are observed. *Autonomous adaptation* does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems. *Planned adaptation* that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state

The aim of adaptation planning is to define the adaptation strategies or actions that will achieve proactive and coordinated management of long-term changes in mean and extreme climate. Adaptive actions are often classified into groups based on the core target area. UKCIP (2008) classify actions into those that build adaptive capacity and those that deliver adaptive action.

When selecting adaptation actions it is important to consider the principles of good adaptation (or risk treatment). These include (adapted from AGO 2006):

- Achieve balance between climate and non-climate risks: Climate risk management should be integrated with an organisations broader risk management and with general management processes in order to limit the risk of undue emphasis being placed on any one (climate or non-climate) risk type
- Manage priority climate change risks: An organisations risk treatment process should focus on their high priority risks
- Use adaptive management: Adaptive management involves putting in place small, flexible, incremental changes based on regular monitoring and revision of plans using information available at the time. Adaptive management contrasts markedly with highly limiting alternative approaches such as relying on one-off, large scale treatments
- Look for win-win or no-regrets treatment options: Win-win treatments refer to measures that address the targeted climate change risk whilst also having other environmental, social or economic benefits. No-regrets treatments are measures that should be undertaken anyway, regardless of whether climate change is an issue
- Avoid adaptation constraining decisions: Organisations should avoid taking decisions that make it more difficult for them or others to adapt to climate change in the future
- Review your treatment strategy: An organisation should regularly review its climate change risk treatment strategy as part of a planned monitoring and review cycle.

The strategies are captured within the SLSA Climate Change Adaptation Road Map (Section 6.1). The Road Map is presented in Logframe format[6] and provides a summary of what SLSA aims to achieve in relation to management of climate change risks and sets out the activities required to achieve the identified strategies. The Road Map can be considered as discrete plan of action to enhance the resilience of SLSA to the projected impacts of climate change.

[6] A Logframe is the product of Logical Framework Analysis (LFA) that provides a summary of what SLSA aims to achieve in relation to management of climate change risks and sets out the activities required to achieve the identified strategies. Logframes are developed based on the construction of 'if/then' statements, which provide the link between action and achievement of objectives. The 'if/then' statements have been presented within the Road Map to provide transparency in the decision making process that informed Road Map development.

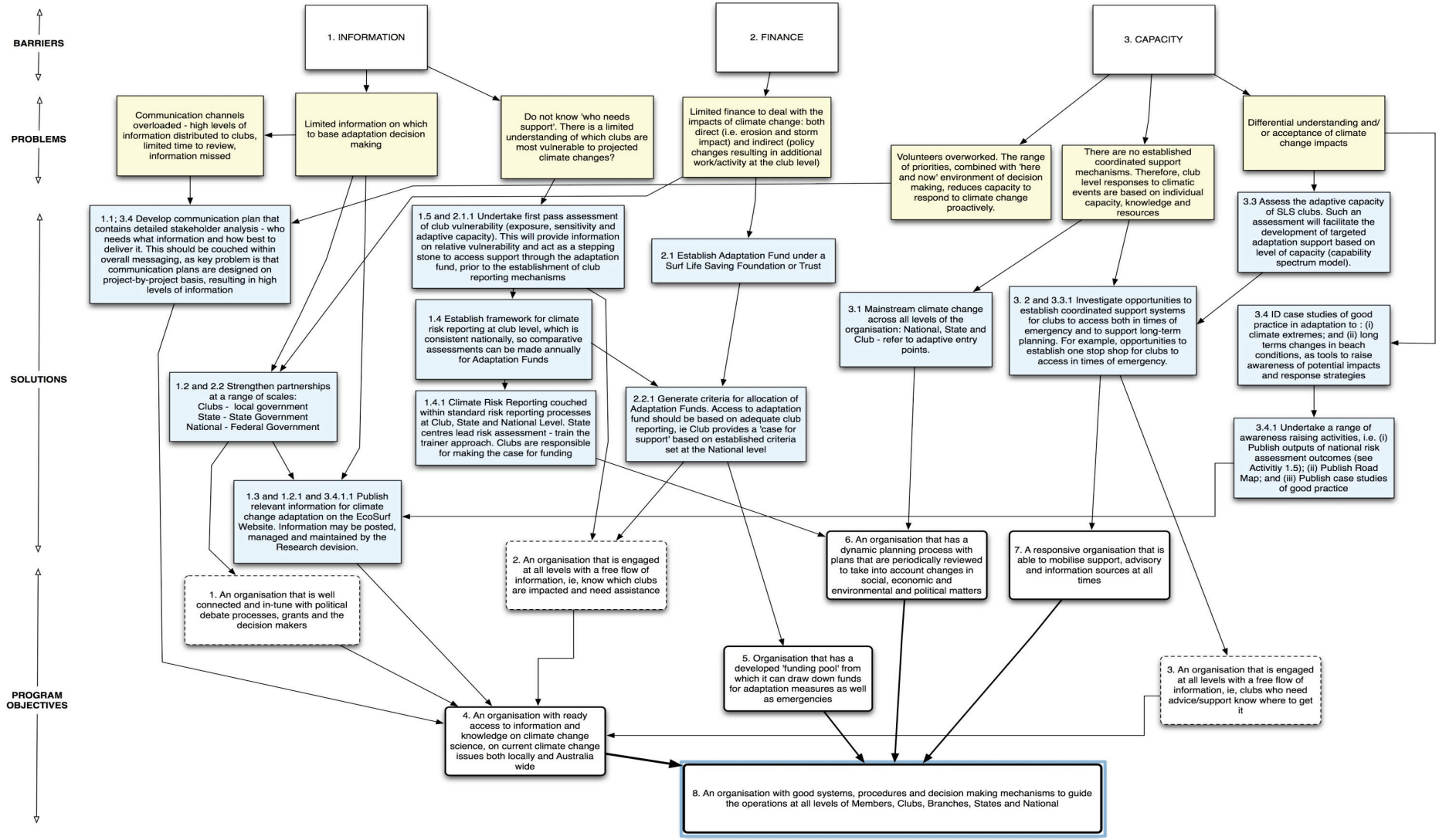


Figure 8: Problem-solution mapping, completed for SLSA

Problems aligned to core barriers to adaptation (information, capacity and finance), with recommended actions (solutions) to treat the problems and meet program objectives

Table 4: Adaptation actions for inclusion in SLSA's Climate Change Adaptation Road Map

Adaptive Action	Rationale
Strategy 1: Build capacity to respond to the impacts of climate change by raising awareness, enhancing partnerships and mainstreaming climate change adaptation.	
1. Strengthen partnerships with organisations to share and access information that supports coastal management and climate change adaptation.	*ID 1.2 and 2.1 Strengthen partnerships at a range of scales* SLSA clubs may not have the resources (technical or financial) to assess their respective climate change risks and develop adaptation strategies. Consequently, it is important to not only provide the frameworks and support for such activities (see Adaptive Action 9), but to also to link to the activities undertaken by relevant stakeholders, for example, state and local governments. There is an increasing trend for local governments and state governments to assess coastal climate change risks. While such assessments are commonly focused on organisation risk, for example, the risk that the impacts will have to the local government entity rather than the broader community, the impact assessment outcomes (physical coastal change) are valuable sources of information for SLSCs and government decision makers. SLSA clubs have a very high capacity to deliver life-saving services. Australia's technical service delivery is renowned internationally. This capacity has been built through structured processes for delivering surf life saving services. However, alignment of compliance issues and coastal management acts, policies and guidelines, is not strong. This is driven by a historic pattern of low engagement with relevant agencies and government departments. While, there is a transition towards more active engagement to facilitate a more proactive approach to planning and service delivery, there remains room for improvement. Coordination with such bodies will enable a structured approach to adaptive management. Independent action taken exclusive of an understanding of the system in which the actions are implemented can lead to mal-adaptation. Consequently, increasing awareness and partnerships with relevant stakeholders will be an important activity in enhance the adaptive capacity of SLSA.
2. Enhance communication across the organisation through development of a communication plan	*ID 1.1 and 3.4 Develop a communication plan that contains detailed stakeholder analysis - who needs what information and how best to deliver it* Information is important in enhancing the adaptive capacity of an organisation. While SLSA is at the forefront of information storage and dissemination in some respects (i.e. ABSAMP database), improvements may be made to enhance adaptive capacity. The impacts of climate change will result in management challenges, as outlined in Section 3. While some clubs may have access to information to support a proactive management approach to such impacts, others do not. There is a recognised need to provide tools to support adaptive management, enhance the information distribution, and streamline communication.

Adaptive Action	Rationale
3. Enhance clubs access to information that will raise awareness by publishing information on readily accessible locations, such as the Ecosurf website.	*ID 1.3 and 1.2.1 and 3.4.1.1 Publish relevant information for climate change adaptation on the Ecosurf Website. Information may be posted, managed and maintained by the Research division* SLSA has a strong record in information collection, storage and analysis. The Australian Beach Safety and Management System (ABSAMP) contains important information on local beach conditions, beach safety and beach use. This database is a valuable tool supporting management and service delivery. In terms of climate change adaptation, information on beach change, which is not currently captured within the tool, would be valuable in climate change risk assessments. While the tool does not currently provide this information, it is a recognised information storage system that can be readily accessed by SLSA stakeholders to support decision-making. Prospects to expand the tool to support climate change adaptation decision-making may further enhance the adaptive capacity of SLSA. Similarly, the established Ecosurf website (http://www.ecosurf.org.au/) is a central repository for environmental and climate change focused information. While the website does not currently provide information to support clubs adapt to climate change, the site provides a base for the incorporation of such information.
4. Promote on-ground adaptive action by identifying case studies of good practice, such as management actions to reduce the impacts of extreme events or long term chronic beach change	*ID 3.4 Identify case studies of good practice in adaptation to: (i) climate extremes; and (ii) long terms changes in beach conditions, as tools to raise awareness of potential impacts and response strategies* SLSA is run and managed at the local scale. While individual clubs are linked to a state centre and the national body through affiliation and adoption of policies and procedures, on-ground implementation of services is managed at the club level. Consequently, while the national body may promote change in management in response to an understanding of projected climate impacts, the value of 'change' in standard operational procedures must be clearly demonstrated to ensure broader uptake at the local level. Good practice case studies of best practice action undertaken at the local scale, which can demonstrate positive benefits to clubs, are perceived as a key tool to raise awareness of the benefits that may be gained through changes proposed at higher organisational levels. Consequently, to promote uptake of risk management and adaptive planning, it is recommended that case studies of good practice are identified and promoted through established mechanisms, including, for example, State meetings and/or the Ecosurf website.
5. Mainstream climate change into operational procedures to facilitate integrated management of climate risks.	*ID 3.1 Climate change cannot be tackled by one group of one department/sector alone. It is a cross cutting issue and requires action across all areas of an organisation.* Mainstreaming climate change is recognised as an important approach to facilitate integrated management of climate risks. The adaptive entry points (AEPs) identified in Section 5 provide a baseline for institutional assessment to support climate change mainstreaming. An assessment should be commissioned to evaluate the potential to mainstream climate change into the AEPs. This would support the transition to integrated management of climate change risks across SLSA.

Adaptive Action	Rationale
6. Undertake awareness raising activities to enhance organisational commitment to addressing the impacts of climate change.	*ID 3.4.1 Undertake a range of awareness raising activities* Awareness raising is key to enhancing organizational response. Recommended approaches to raise awareness across SLSA include: (i) Publish national risk assessment outcomes (see Adaptive Action 7); (ii) Publish Road Map; and (iii) Publish case studies of good practice (see Adaptive Action 3).
Strategy 2: Enhance the capacity of SLSA clubs to understand and assess their climate change risks and provide an equitable means to allocate resources to address the identified risks.	
7. Assess the vulnerability of SLSA clubs to climate changes (through completion of a first pass vulnerability assessment) to: (i) understand differential exposure and capacity; and (ii) provide the case for financial support to aid adaptation	*ID 1.5 and 2.1.1 Undertake first pass assessment of club vulnerability (exposure, sensitivity and adaptive capacity), as a stepping stone for accessing support through the adaptation fund, prior to the establishment of club reporting mechanisms* A key challenge in adapting to climate change is the limited understanding of the regions and clubs most at risk from projected changes. While the strategic assessment undertaken in this Project provides a solid foundation for such an assessment, it will be important to build on the work undertaken to complete a more detailed assessment of physical coastal change at the scale of individual SLS clubs. This would entail progressing from a focus on physical sensitivity (as per this Project) to incorporate exposure to metocean elements and thus define physical vulnerability. In addition, a club level assessment of adaptive capacity (See Adaptive Action 11) would provide the required information to understand the relative vulnerability of clubs to projected climate change impacts. Such information will: • Enable more focused adaptation planning at the State and national level; • Provide a first point of reference for the distribution of funds through the Adaptation Fund (see Adaptive Action 9).
8. Establish mechanisms to monitor the impacts of climate change and other risks across the organisation	*ID 1.4 Establish a framework for climate risk reporting at the club level, which is consistent nationally, so comparative assessments can be made annually for Adaptation Funds; and Climate Risk Reporting should be couched within standard risk reporting processes at Club, State and National Level. State centres will lead the risk assessment following a train the trainer approach. Clubs will be responsible for making the case for funding.* In addition to a national vulnerability assessment, it is vital that assessment of projected climate change risks is mainstreamed into standard operational risk reporting at the club level. While some clubs undertake risk assessments, these usually remain in-house documents and are not presented to state centres or the national body. Progressing from individual risk reporting to a standard risk assessment framework would deliver two primary benefits: • For those clubs not currently undertaking risk assessment and reporting activities, staff of SLSA of SLS state centers who understand the risks could work with the clubs to develop plans and strategies to mitigate those risks;

Adaptive Action	Rationale
	• By applying a nationally consistent framework, comparative assessments of risk could be made across clubs, enabling state centres and the national body to provide targeted support to clubs based on priority issues and risk levels. Note: A risk based approach to assessing climate change impacts and developing climate change adaptation strategies has been endorsed by the Australian Federal Government (AGO 2006).
Strategy 3: Provide financial support to SLS clubs, support services and branches to adaptively manage climate change and extreme events.	
9. Identify funding sources to provide dedicated financial support for adaptive action and establish criteria for equitable dispersal of funding.	*ID 2.1 Establish Adaptation Fund under a Surf Life Saving Foundation or Trust; and ID 2.2.1 Generate criteria for allocation of Adaptation Funds. Access to adaptation fund should be based on adequate club reporting, i.e. Club provides a 'case for support' based on established criteria set at the National level.* It is widely recognised that adaptation funding requirements will outstrip available finances. Consequently, there has been a move internationally to establish climate change adaptation dedicated funds. Such funding mechanisms ensure that funds can be sourced specifically for proactive and iterative adaptive action. For SLSA, such a fund will be an important source of financial support for clubs. The operational mechanics of such a fund must be explored, however it is recommended that access to funds be granted on the basis of climate change risk assessment reporting at the club level (see Adaptive Action 8). The objective is to ensure equitable access to financial support.
Strategy 4: Provide support mechanisms to clubs to access in times of emergency and to support long-term planning, contributing to (i) a coordinated response to business continuity following extreme events; (ii) targeted guidance and direction to clubs based on their current capacity.	
10. Investigate opportunities to establish coordinated support systems for clubs to access in times of emergency and to support long-term planning.	*ID 3. 2 and 3.3.1 Investigate opportunities to establish coordinated support systems for clubs to access both in times of emergency and to support long-term planning. For example, opportunities to establish one stop shop for clubs to access in times of emergency* At present, there are no structured mechanisms to support clubs respond to issues that may arise that affect service delivery, for example shoreline erosion impacting club facilities or Council planning changes. Clubs apply their own initiative, contacts and resources to address such issues. While some clubs have the necessary resources (financial and human) to respond, others do not. Neither SLSA or the state centres currently play a proactive leadership role and clubs are required to respond on an as-needs basis. Providing a structured approach to respond to such issues would enhance the capacity of clubs to respond in a proactive and coordinated manner. The outcomes of the adaptive capacity assessment (see Adaptive Action 11) would provide guidance on the types of support required for clubs to effectively manage such impacts and also an indication of the targeted support required to facilitate long-term adaptive planning. Further, opportunities to establish a one-stop shop for clubs to access in times of emergency should be investigated. Such a support mechanism would focus on ensuring business continuity and may, for example, provide detail on service providers and contact organisations to support recovery efforts.

Adaptive Action	Rationale
11. Assess the adaptive capacity of SLSA clubs to facilitate the delivery of targeted support based on individual needs	*ID 3.3 Assess the adaptive capacity of SLS clubs to facilitate the development of targeted adaptation support* Assessing the differential human and financial capacity of individual SLSA clubs would provide a context specific understanding of the ability of each club to implement adaptation strategies. Some clubs have greater capacity to implement adaptive strategies than others. This differential capacity must be understood to provide targeted support to those clubs that require it. As such, a recommendation is to establish a baseline understanding of the differential capacity of clubs across the nation. This information should be applied to generate context specific support to clubs, based on level of capacity, to undertake climate change risk assessment and adaptation planning. The outcomes should therefore be tied to Adaptive Action 10. Capability maturity models are important tools that have been previously applied to support groups progress towards 'best practice' regardless of current capacity. The application of such tools for SLSA should be investigated.

6.1. SLSA Climate Change Adaptation Road Map

Strategy 1: Build capacity to respond to the impacts of climate change by raising awareness, enhancing partnerships and mainstreaming climate change adaptation.

Strategy Logic:

If communication is more directly targeted, then it will be more readily reviewed and digested.

If information is more readily reviewed and digested, then it is more likely to be acted upon.

If all climate change related information is housed in a known location, then it can be more readily accessed by the SLSA community (established mechanisms should be used where appropriate - ie Ecosurf website and ABSAMP).

If information can be readily accessed, then there will be a more coordinated and consistent approach to climate change focused activities across the organisation.

If climate change is mainstreamed across the organisation, then there will be the mandate to undertake climate change related activities.

If partnerships are strengthened, then implementation of adaptation activities can be coordinated (internally and externally).

If awareness is raised, partnerships strengthened and climate change mainstreamed, then the capacity to respond to the potential impacts of climate change will be enhanced.

Adaptive Action	Resources	Activities	Outputs	Short (1-3 yrs) and Long Term (4-6 yrs) Outcomes	Impact (7-10 yrs)
2. Enhance communication across the organisation through development of a communication plan. 3. Enhance clubs access to information that will raise	Technical Assistance (TA) for Communications Specialist - $40,000 Staff time (research division) Staff time (IT - to update Ecosurf website)	*Raise awareness of and increase access to information on the impacts of climate change.* Communication specialist hired to develop communication plan for SLSA to undertake an in-depth assessment of communication needs across the organisation. The assessment will inform the development of a communications strategy – focused on ensuring targeted release of information across the organisation. Climate change related news and information will be housed on the Ecosurf website. The SLSA Research division will be tasked with reviewing and posting information on the site. Explore the use of social media (FaceBook, Twitter, etc) to	TA reports Communication Strategy Climate change relevant posts on the Ecosurf website Three Good Practice case studies posted	(ST) Awareness of climate change risks faced by SLSA is increased, from club to national levels. This will be achieved in part through increased consolidated communication, but also through the presentation of the results of climate change related activities, such as Road	Awareness is raised enabling heightened engagement with clubs and their members (and local stakeholders) on climate change issues leading to improved adaptive

Adaptive Action	Resources	Activities	Outputs	Short (1-3 yrs) and Long Term (4-6 yrs) Outcomes	Impact (7-10 yrs)
awareness by publishing information on readily accessible locations, such as the Ecosurf website 4. Promote on-ground adaptive action by identifying case studies of good practice, such as management actions to reduce the impacts of extreme events or long term chronic beach change.		enhance engagement on climate change issues The Ecosurf website will be the key point of information for all climate change related issues and resources, including instructions and guidelines for club climate change risk assessment reporting (once established) see Strategy 2. As a first point of call, the Climate Change Adaptation Road Map report may be published on the Ecosurf website. In addition, the final report contains a table of 'current climate change related activities and policies' that may be useful for SLSA stakeholders. Ideally this information could be uploaded as an interactive tool, either on the Ecosurf website or the ABSAMP, enabling stakeholders to add and edit information as relevant. Good practice examples of climate change adaptation and planning at the club level may also be identified and advertised through the Ecosurf website. In the first instance, clubs for inclusion and a draft case study outline will be identified in the Road Map. Subsequently, clubs can self nominate to be a case study. Other appropriate publications should be also sourced, for example reports housed or published by the: - Department of Climate Change and Energy Efficiency (DCCEE); - Australian Local Government Association (ALGA); - Coastal Councils; and/or - Climate Commission.		Map development and the National First Pass Climate Change Risk Assessment (see Strategy 2) and; Communication to SLSA stakeholders is mainstreamed, increasing engagement across the organisation. (LT) There is targeted engagement across the SLSA community; and SLSA stakeholders are aware that climate change relevant information can be accessed via the Ecosurf website and use this site as a resource; and clubs are self-nominating for inclusion as 'case studies' on the Ecosurf website	outcomes

Adaptive Action	Resources	Activities	Outputs	Short (1-3 yrs) and Long Term (4-6 yrs) Outcomes	Impact (7-10 yrs)
5. Mainstream climate change into operational procedures to facilitate integrated management of climate risks.	TA commissioned - $35,000 to examine the identified Adaptive Entry Points (AEPs) and provide recommendations for climate change mainstreaming. Internal staff time – implement outcomes of TA review and promote changes/outcomes across SLSA.	*Climate change can be mainstreamed across the SLSA by tapping into the Adaptive Entry Points identified during Road Map development.* The adaptive entry points include: Strategic Plans; Annual Plans; Risk Management Plans; National Policies; Standard Operational Procedures; Resource distribution formulas; IT resources, such as the Ecosurf website and ABSAMP; the Research Scheme; SLSA Foundation; Operational mandates (club constitution); and Organisational performance report cards. Preliminary recommendations for review by TA include: Update Strategic Plan to incorporate reference to climate change and outline the approach to climate change management adopted by SLSA – i.e. an adaptive management approach built on the principles of risk assessment. Risk management plans are broadened to incorporate climate change as a component of the risk assessment framework (achieved in part through Strategy 2, but should also be captured within the National risk assessment currently under development) National policies, standard operational procedures and operational mandates are regularly reviewed and updated to account for changes in social and environmental conditions. The review should consider the outcomes of the National and club level risk assessments (see Strategy 2). Ecosurf website updated as outlined under Action 1. ABSAMP is a key resource of the collection and storage of information on beach safety. However, it may also be a valuable resource for the collection of information on beach state, condition and	Climate change policy for SLSA Report containing review recommendations for ABSAMP Updated Strategic Plan Risk management plans incorporating climate change risks	(ST) Internal review mechanisms are established and regular review of national policies, standard operational procedures and operational mandates is undertaken at specified intervals. (LT) Climate change is mainstreamed across the SLSA organisation	SLSA has the operational mandate to adapt to the projected impacts of climate change, following an adaptive management approach.

Adaptive Action	Resources	Activities	Outputs	Short (1-3 yrs) and Long Term (4-6 yrs) Outcomes	Impact (7-10 yrs)
		change. Opportunities to incorporate such information, through, for example beach profiling and recording of extreme events, should be investigated. The Research Scheme may work to target climate change research funding and activities A SLSA Foundation or Trust could house the Adaptation Fund (see Strategy 3) Organisational performance report cards provide a mechanism to focus on climate change as a strategic priority Such amendments will require strong internal leadership, and may be best supported through the development of a Climate Change Policy for SLSA.			

Adaptive Action	Resources	Activities	Outputs	Short (1-3 yrs) and Long Term (4-6 yrs) Outcomes	Impact (7-10 yrs)
1. Strengthen partnerships with organisations to share and access information that supports coastal management and climate change adaptation.	Staff and volunteer time - to build networks and formalise relationships as appropriate.	*Activities to strengthen partnerships at a range of scales, from club, State to National levels.* Activities to establish partnerships should build on the partnerships already in place, for example, club partnerships with local governments, State partnerships with the State governments etc. The objective is to strengthen and formalise these partnerships. This may be achieved through memorandums of understanding (MOUs) between clubs and local governments in regards to emergency response during and following storm events. Such formalised agreements will ensure clarity of roles and responsibility. Establishing formalized partnerships may support the sharing of such information on: (i) coastal climate change risks as assessed by local or state governments; (ii) changes in compliance and reporting in response to climate change; and (ii) activities underway that may be leveraged by clubs. This may also include a review of lease arrangements at the club level. In building capacity to respond to the impacts of climate change, a first step for clubs is to understand their risks. Lease arrangements provide insight into the potential liability and response mechanisms following damage and/or extreme events.	Model MoUs Lease review guidelines	(ST) Formalisation of existing partnerships and establishment of new partnerships, as required.	(LT) Established partnerships provide support to SLSA in adapting to the impacts of climate change

Strategy 2: Enhance the capacity of SLSA clubs to understand and assess their climate change risks and provide an equitable means to allocate resources to address the identified risks.

Strategy Logic

If a National Vulnerability Assessment is conducted, **then** SLSA will have the required information to start implementing climate change support activities.

If SLSA knows where to focus efforts, **then** training and case study activities can commence in these locations.

If staff are trained in risk assessment, **then** they can provide support to clubs in their state to undertake such risk assessments.

If clubs are given support, **then** they can report on the identified risks they are facing and identify mitigative strategies to deal with those risks.

If clubs report in a consistent manner on their identified risks, **then** SLSA can target support for the implementation of adaptation actions.

If SLSA can provide support to clubs, **then** they can increase their resilience to the projected impacts of climate change (note that this is not to say that clubs cannot increase their resilience without financial support from SLSA. Rather, strategic adaptive actions to build capacity and enhance resilience can be undertaken immediately without financial support. Such actions will be identified through the risk assessment process. However, larger works or more detailed analyses may require financial support).

Adaptive Actions	Resources	Activities	Outputs	Short (1-3 yrs) and Long Term (4-6 yrs) Outcomes	Impact (7-10 yrs)
7. Assess the vulnerability of SLSA clubs to climate changes (through completion of a first pass vulnerability assessment) to: (i) understand differential exposure and capacity; and (ii) provide case for financial support to aid adaptation.	TA: National First Pass VA - $100,000-150,000 Internal Staff Time - Endorsement of framework for CCRA, Management of TA's	National First Pass Climate Change Risk Assessment: The completion of a National Level Climate Change Risk Assessment will enable: (i) internal prioritisation of support through the Adaptation Fund (see Strategy 3) while long term dispersal mechanisms are being established; and (ii) will demonstrate SLSAs identified need for adaptation financing support to National and State governments, which may support access to funding for inclusion in the Adaptation Fund. The assessment requires a collaborative process, to ensure the outputs are readily justifiable. This would entail, at a minimum, collaborative establishment of an evaluation framework to be applied in the assessment. Note: In the absence of the outcomes of the National First Pass Vulnerability Assessment, work may be focused in high priority locations as identified through the zero pass sensitivity assessment. Following completion of the First Pass National VA, this will be the key document informing	National First Pass Climate Change Risk Assessment, incorporating prioritisation of clubs by risk level Four 'train-the-trainer' training sessions held around Australia National Climate Change Risk Assessment Guidelines (for club level assessments) Training manual Bi-annual climate	(ST) State representatives are trained in climate change risk assessment and have begun delivering training sessions to clubs within their State. (LT) Clubs understand the risks that climate change may pose and are implementing strategies to mitigate such risks. Such strategies may include enhancing partnerships not only with local and	The impacts of climate change are actively managed at the club level. Proactive management decisions are made, based on best available science and information.

Adaptive Actions	Resources	Activities	Outputs	Short (1-3 yrs) and Long Term (4-6 yrs) Outcomes	Impact (7-10 yrs)
8. Establish mechanisms to monitor the impacts of climate change and other risks across the organisation (i.e. a climate risk reporting framework).	TA: Development of Standard Framework for club level CCRA - $40,000. Plus training to State representatives - $25,000 (excluding travel) Internal costs ($) to support dedicated State assessors and support personnel.	prioritisation of climate change focused works, while the mechanics for CCRA reporting at the club level are established. A standard framework for club level Climate Change Risk Assessments (CCRA) should be developed. The framework would ensure consistent evaluation and prioritisation of risks across clubs nationally. The objective is to raise awareness of the potential impacts of climate change at the club level and promote adaptive management of such risks. In addition, the reporting would provide an equitable process for the distribution of funds through the Adaptation Fund (as outlined in Strategy 3). Once developed, State representatives could receive training in CCRA. This would follow a 'train-the-trainer' approach. The objective is that once trained, the State representatives will be a focal point to provide support to their clubs. Clubs will be advised of the alignment between access to funding through the Adaptation Fund and the completion of regular CCRA. A bi-annual CCRA will need to be completed at the club level (as a prerequisite to access to funds through the (to be) established Adaptation Fund). Support to clubs with low adaptive capacity (see Strategy 4), will be provided as required. Club CCRA outputs compiled into the ABSAMP system. In addition, the CCRA should be couched within a broader risk management strategy/plans where available (links to Strategy 1).	change risk assessment reports produced for SLSA clubs nationally.	state government, but also with partnering clubs (as per the Regional approach to climate change management adopted by Local Governments throughout Australia).	

Strategy 3: Provide financial support to SLS clubs, support services and branches to adaptively manage climate change and extreme events.

Strategy Logic

If internal approval is given to establish a fund for climate change adaptation and disaster management, **then** such a Fund can be established under a SLS Foundation or Trust.

If such a fund is established, **then** donations and finances can be specifically targeted for such activities.

If funding is targeted, **then** it can be housed within the fund for dispersal as required.

If funding is available for dispersal as required, **then** more immediate and timely responses to disaster events and longer-term climate change issues can be delivered.

If more immediate responses can be delivered, **then** the resilience of SLSA to such events is increased.

Adaptive Action	Resources	Activities	Outputs	Short (1-3 yrs) and Long Term (4-6 yrs) Outcomes	Impact (7-10 yrs)
9. Identify funding sources to provide dedicated financial support for adaptive action and establish criteria for equitable dispersal of funding.	Internal staff time - endorsement, establishment of fund under a Foundation or Trust and seeking funding. TA - Financial Specialist - Establishment of criteria for dispersing funds - $20,000	Internal approval sought for the establishment of an Adaptation Fund (AF), which could be managed by a SLSA Foundation or Trust. Such funds are increasingly recognised as a valuable tool to enable efficient delivery of support both following disaster events and also to support management of longer-term changes in climate that will affect clubs nationally. Once approved, funding will be sought for the fund. This will commence through established funding partners. In addition, a review of potential funding opportunities will be undertaken. These will subsequently be targeted. The outcomes of the National Vulnerability Assessment may be used to support funding proposals. Criteria for dispersing funds through the Adaptation Fund will be established. The criteria will align to the clubs CCRAs – however, other mechanisms for dispersing funds will need to be established both in the interim while the club CCRA reporting frameworks are established (see Strategy 2) and also in the longer term to account for emergency response support – which may not tie to the CCRA report framework.	Agreement' to establish Adaptation Fund or Trust Funding agreements established with identified funding partners Fund dispersal mechanisms	(ST) Targeted funding mechanism established for climate change adaptation and disaster management funds (LT) Funds disseminated to clubs through the AF. The fund will provide support for both long-term management issues and emergency management funding.	Clubs have access to readily available funding sources to support implementation of proactive management strategies and provide immediate support following impacts of extreme events. Such a mechanism alleviates one of the key barriers to adaptation, thus increasing the resilience of SLSA to the impacts of climate change.

Strategy 4: Provision of coordinated support mechanisms to clubs and support services to access both in times of emergency and to support long-term planning - contributing to (i) a coordinated response to business continuity following extreme events; (ii) targeted guidance and direction to clubs and support services based on understanding of current capability.

Strategy 4 (i) Logic

If lessons can be learned from club level responses to past events, then these can be used to identify gaps, current tools and mechanisms of value, and key areas of required support.

If such issues are identified, then mechanisms to fill these gaps can be developed

If such gaps are filled, then responses to emergency events should be more effectively managed

If such events are more effectively managed, then the vulnerability of clubs to such events will be reduced.

Strategy 4 (ii) Logic

If an assessment of the financial and human capacity available at each SLS club is undertaken, then the range of capabilities across the SLS community can be mapped

If the range of adaptive capabilities can be mapped, then targeted guidance can be delivered based on recognised level of capability

If targeted support can be provide, then SLS clubs will have greater opportunity to build their adaptive capacity

If adaptive capacity is built, then resilience to the projected impacts of climate change is increased.

Adaptive Action	Resources	Activities	Outputs	Short (1-3 yrs) and Long Term (4-6 yrs) Outcomes	Impact (7-10 yrs)
10. Investigate opportunities to establish coordinated support systems for clubs to access in times of emergency and to support long-term planning.	TA - Emergency Management Specialist $30,000	Investigate opportunities to establish an Emergency Management Support Tool. The tool will provide information to clubs on the service providers and contact organisations that they will need to get them back-up and running following impact from extreme events. An important aspect of tool development will be consultation with clubs nationally on the approaches to emergency management, the resources and tools they currently access, their effectiveness and any gaps. The objective is to ensure a coordinated support response to clubs following extreme events and reduce the reliance on club level individual knowledge and connections to respond in times of need. However, it is recognised that such connections are a key to enhancing resilience - therefore, such information will be collected and reflected	TA Reports Implementation Plans for the establishment of an Emergency Response Facility and Business Continuity Support	(ST) Implementation of the Support Tool is underway - based on recommendations from the RA reports and implementation plan. (LT) Clubs apply the Support Tool following emergency events - thus supporting business continuity and associated	Clubs respond to emergency events through a coordinated response mechanism, which reduces 'outage' in service delivery and supports business

Adaptive Action	Resources	Activities	Outputs	Short (1-3 yrs) and Long Term (4-6 yrs) Outcomes	Impact (7-10 yrs)
		within the developed support tool - highlighting the value of such connections and affiliations. The objective is not to reduce diversity in practice, but rather to ensure that all clubs have knowledge and awareness of, and access to, such resources.		service delivery.	continuity following such events.
11. Assess the adaptive capacity of SLS clubs to facilitate the delivery of targeted support based on individual needs	TA – Adaptive Capacity Assessment $45,000	The objective is to understand differential adaptive capacity to enable the provision of targeted support for adaptation. An outcome of the adaptive capacity assessment should be the identification of capability levels (following the capability maturity model) for SLS clubs with recommendations to support adaptive action aligned to each capability level. The development of a self-assessment tool will enable board coverage of SLS clubs. The assessment should be conducted in a manner that will facilitate regular re-application of the assessment to monitor change in adaptive capacity over time. Apply the outcomes of the adaptive capacity assessment to (i) guide provision of support in adaptation training (see Strategy 2) and to guide (ii) the establishment of criteria for access to the adaptation fund (refer to Strategy 3); and to (iii) inform the delivery of targeted support to SLSC.	TA Report/s	(ST) Understanding of the differential adaptive capacity of SLS clubs enables the delivery of targeted support. (LT) Clubs regularly undertake self assessment of adaptive capacity and outputs are used to guide targeted support services.	Clubs have access to information and resources required to support adaptive management regardless of capacity level.

7. Next Steps - Implementation

The Road Map incorporates a number of adaptive actions that will support the transition to a coordinated and adaptive approach to manage the risks of climate change across SLSA. Importantly, the production of the Road Map is the first step in a long-term commitment by SLSA to take action on climate change. The preliminary costs assigned to the activities within the Road Map signify an investment of over $300,000. While these costs are broad estimates only, they provide a rough guide for the financial investment required to support implementation. Consequently, implementation of the Road Map will be facilitated through a prioritisation of activities and, subsequently, targeted funding for the high priority actions. Consequently, the next steps may be summarised as follows:

- Internal approval and endorsement of Climate Change Adaptation Road Map.
- Publication of Road Map outcomes.
- Internal review and prioritisation of Road Map recommendations.
- Funding sought to implement Road Map recommendations[7].
- Review and adjustment of Road Map recommendations as new information comes to the fore.

The last point makes reference to the rapidly evolving nature of climate change science that will continue to deliver new information to support adaptive decision-making. Implementation of Adaptive Strategy 1 will ensure that SLSA is acutely aware of the current knowledge and practice in the field of climate change. This information should be applied to ensure that the recommendations contained within the Road Map are reviewed and updated as new information becomes available. Such an adaptive management approach is critical to effective adaptive planning.

8. Conclusion

The impacts of climate change pose critical consequences to broader society and a significant management challenge from global to local scales. Governments, non-government organisations, the private sector and communities are increasingly aware of the impacts climate change may pose and are investigating approaches to manage the impacts. In particular, climate change presents a critical challenge for those whose operations are focused largely in the coastal zone. Surf Life Saving Australia (SLSA) is one such organisation.

SLSA has recognised the urgent need to adapt to projected climate changes and commissioned this study to understand the complexity of the problem being faced so that targeted adaptive actions could be developed. The proactive planning approach adopted in this Project facilitated (i) a review of the identified need for program development, (ii) confirmation of intended program outcomes; and (iii) the development of strategies to progress from the identified need to achievement of program outcomes. In this way, adaptive strategies address priority issues.

The outcome is a Climate Change Adaptation Road Map that will enhance SLSA resilience to the impacts of climate change through implementation of actions and strategies that build adaptive capacity. Through implementation of the strategies outlined, SLSA will increase its

[7] Two draft study briefs have been developed – See Appendix 7. The study briefs have been developed to enable SLSA to leverage investment in climate change adaptation. They provide guidance on the development of well-justified project proposals to be rapidly developed to seek funding – either from internal or external sources.

understanding of the differential vulnerability and adaptive capacity of SLSA entities, understand the support options required and put in place the governance structures that will facilitate adaptive action.

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Appendices

Appendix 1: Physical Sensitivity Methods

The physical sensitivity of the coast was determined by identifying areas of potentially unstable (erodible) shores by geomorphic type through the Smartline Geomorphic mapping tool developed by Sharples et al (2009) *for the First Pass National Assessment of Climate Change Risks to Australia's Coast* (DCCEE 2009). The physical sensitivity of the coastline in which a SLSC is present has been classed as either a zone of potential instability (potentially erodible) or a zone of potential stable coast to provide an indication of the SLSCs located on potentially erodible coasts. This classification is a first pass assessment and does not consider the exposure of the coast to regionally variable drivers of climate change. Such an assessment would form the basis of a second pass assessment (Figure 9).

SLSA supplied a Google Earth place mark file (.kml format) with the locations of SLSCs in Australia. The file was modified to correct a number of location errors and converted to Shapefile (.shp format) to allow compatibility with ArcGIS. Both the converted SLSC Shapefile and Smartline data were combined in ArcGIS. A buffer was applied to the SLSC Shapefile in order to pin the data attributes contained within the Smartline to each SLSC location following the methodology that formed the basis of the First Pass National Assessment of Climate Change Risks to Australia's Coast (DCCEE, 2009). The methodology was validated by a member of the University of Tasmania National Shoreline Geomorphic and Stability Mapping Project[8]

State and National level maps were created to illustrate the distribution of SLSCs located on zones of potentially unstable coast. A Google Earth place mark file in KML format containing the Smartline attribute data has also been created to allow visualisation of the results in Google Earth.

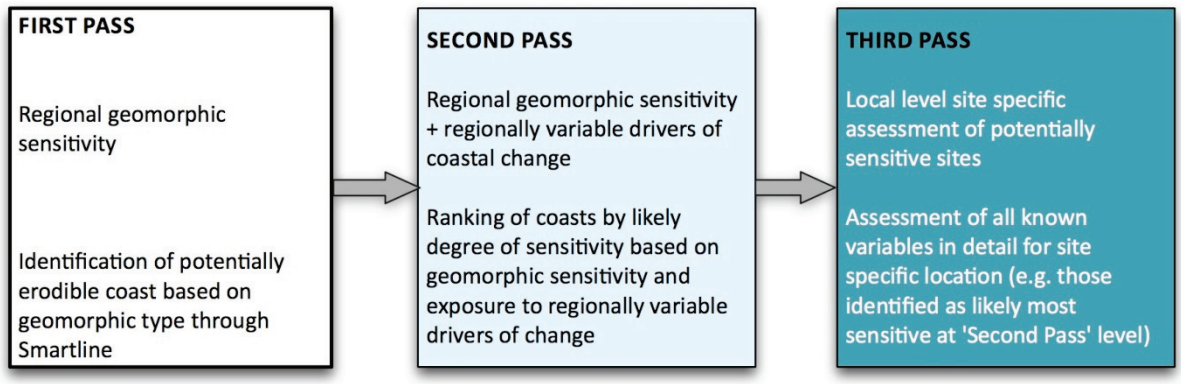

Figure 9: Different scales of assessment showing first pass physical sensitivity assessment (following DCCEE 2009)

In addition to the application of Smartline, a desktop visual assessment of the coastal characteristics in the vicinity of each SLSC was undertaken applying Google Earth imagery. Information collected included distance from vegetation line, buffer typology, buffer dimensions presence of offshore reef, beach type, presence of rock, presence of dune and presence of controlling structures. The outputs provide strategic guidance on the potential sensitivity of the clubs to coastal erosion and/or inundation.

[8] R. Mount, University of Tasmania, School of Geography and Environmental Studies. Pers. Comm. February 2011

Appendix 2: Outputs of the visual assessment of physical sensitivity of SLSA clubs

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Agnes Water	Agnes Water	qld1471	QLD	24:11:5.00 S	151:53:46.00 E	0.7	R + BR		
Albany	Middleton beach (SLSC)	wa0399	WA	35:0:34.00 S	117:55:27.00 E	1	R-LTT	Foreshore Reserve, Dune	10
Aldinga Bay	Aldinga	sa0216	SA	35:16:12.00 S	138:26:40.00 E	0.3	LTT LBT	Foreshore Reserve, Dune	40
Alexandra Headland	Alexandra Headland	qld1545B	QLD	26:39:36.00 S	153:5:57.00 E	1.3	LTT + ROCKS	Foreshore Reserve, Protection	10
Altona	ALTONA (MAIN)	vicP072	VIC	37:52:17.00 S	144:49:22.00 E	0.1	R + SF	Foreshore Reserve, Road, Protection	50
Anglesea	ANGLESEA	vic310	VIC	38:24:51.00 S	144:11:15.00 E	1.2	LTT/TBR	Cliff	30
Apollo Bay	APOLLO BAY	vic378	VIC	38:44:35.00 S	143:40:30.00 E	1.2	LTT/TBR	Foreshore Reserve, Dune	65
Arcadian								Foreshore Reserve	
Aspendale	ASPENDALE	vicP044D	VIC	38:1:26.00 S	145:5:48.00 E	0.6	LTT/TBR-RBB	Exposed	
Austinmer	AUSTINMER	nsw362	NSW	34:18:23.00 S	150:56:8.00 E	1.5	TBR		
Avalon Beach	AVALON	nsw302	NSW	33:38:8.00 S	151:19:58.00 E	1.6	TBR	Foreshore reserve, protection	10
Avoca Beach	Avoca Beach	nsw287	NSW	33:27:47.00 S	151:26:11.00 E	1.5	TBR	Foreshore reserve, protection	5
Ayr	Alva Beach	qld0891	QLD	19:27:14.00 S	147:29:1.00 E	0.6	R + RBB	Dune	80
Ballina Lighthouse and Lismore SLSC	LIGHTHOUSE	nsw028	NSW	28:52:16.00 S	153:35:26.00 E	1.6	LTT/TBR	Foreshore reserve, dune	25
Bancoora	BANCOORA	vic290	VIC	38:17:28.00 S	144:24:26.00 E	1.2	TBR	Dune	80

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
							NEW CLUBHOUSE COMPLETED IN SEP 2010. LOCATION NOT SHOWN
20			Yes	Yes			Low resolution Aerial photography
40		Yes: discontinuous	No	Yes	Yes	Road	The club is setback behind developed dunes above beach level. The beach and club are west facing. The wave climate at the beach is affected by the fetch-limited Saint Vincent Gulf. Reef flats are present offshore
	Seawall - Concrete		Yes	No	Yes	Concrete Ramp	Rock outcrops are exposed on the beach in front of the club. The club is protected by a concrete seawall
50	Seawall: Concrete		Yes	No	Yes	Concrete Ramp	The club location was taken as the physical address as per the ALSC website. The club is setback behind the coastal road and a seawall
	Retaining walls	Yes	Yes	No	Yes	Road	The Anglesea SLSC is situated on top of a 15m high cliff consisting of the demons bluff formation (limestone) the cliffs are actively eroding with winter storms undercutting and redistributing talus along the beach. A tombolo has formed in lee of the offshore reef blocking the river mouth. Previous landslips mainly rotational in nature have occurred in the past, notably the Melba parade slide in the 70's
65	Dune fencing		No	Yes	Yes	Concrete Ramp	The club is setback behind dune and foreshore reserve. The location of the club is fairly protected from SW swells as it is ENE facing
	Seawall - Rubble mound	No	No	No	Yes	Direct	The club is located in Townsville; it patrols a protected rock pool/ engineered beach. High seawalls bound the facility
	Unknown		No	Yes	No	Direct	Low-res aerial photo. Appears to be coastal protection as the club is located in line with the former veg line. Dunes flank either side of the club. The club has previously been inundated during storm events
	Seawall - Concrete	Yes: discontinuous	Yes	No		Concrete Ramp	The club appears to be buffered by rock outcrops that form the south point of the beach. Ocean pools have been built into this unit of rock.
5	Seawall - Rubble mound	Yes	Yes			Concrete Ramp	The club is relatively protected by coastal structures, however due to its close proximity to the beach would most likely be attacked during storms and high water levels
80		Yes	No	Yes	Unknown	Unknown	Low-res aerial photo. The stretch of coast is in lee of the GBR. The club is on a dynamic shoreline of the Burdekin Delta with beach and bar conditions constantly changing due to tidal currents. A large sand spit approx 250m offshore was buffering the beach and club as of 2004
25		Yes	Yes	Yes	Yes	Sand Path	The club is located in dune and foreshore reserve, which is buffered by an exposed rocky head.
80		Yes: Discontinuous	No	Yes	Yes	Compacted track	The club appears well set back behind extensive dunes. A rocky Headland with tombolo in its lee is located approx 300m south of the Club

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Barwon Heads Thirteenth Beach	POINT FLINDERS	vic285	VIC	38:17:25.00 S	144:30:1.00 E	0.3	TBR	Dune, Road	80
Batemans Bay	MALUA BAY	nsw543	NSW	35:47:34.00 S	150:13:50.00 E	1.2	TBR	Foreshore Reserve, Dune	10
Beaumaris	BEAUMARIS	vicP046	VIC	37:59:40.00 S	145:2:2.00 E	0.5	LTT/TBR + REEFS	Foreshore Reserve	10
Bellambi	BELLAMBI	nsw367B	NSW	0:0:0.00 N	0:0:0.00 E	1	TBR-LTT	Foreshore Reserve, Dune, Creek	30
Bellinger Valley-North Beach SLSC	NORTH BEACH/SOUTH BOGANGAR	nsw006	NSW	28:20:54.00 S	153:34:32.00 E	1.6	TBR	Foreshore Reserve, Dune	60
Bermagui	HORSESHOE BAY	nsw625	NSW	36:25:28.00 S	150:4:35.00 E	0.6	LTT-R	Foreshore Reserve, Dune, Road	90
Bicheno	Bicheno	tas0145	TAS	41:52:20.00 S	148:18:10.00 E	0.5			
Bilgola Beach (Lifeguards)	BILGOLA	nsw303	NSW	33:38:44.00 S	151:19:41.00 E	1.4	TBR	Foreshore Reserve, Protection	5
Bilinga	Bilinga	qld1597B	QLD	28:8:57.00 S	153:30:0.00 E	1.5	LTT	Foreshore Reserve, Dune	60
Binningup	Binningup Beach	wa0770	WA	33:12:47.00 S	115:40:59.00 E	1	R	Carpark, Dune	50
Birubi Point	BIRUBI POINT	nsw238	NSW	32:47:3.00 S	152:4:36.00 E	1.4	TBR+ROCKS	Dune, Rock	30
Black Rock	BLACK ROCK	vicP050	VIC	37:58:36.00 S	145:0:56.00 E	0.4	R + REEFS	Foreshore Reserve	15
Blackhead	BLACK HEAD	nsw192	NSW	32:3:53.00 S	152:32:37.00 E	1.4	LTT/TBR	Foreshore Reserve, Protection	10
Boat Harbour	Boat Harbour (SLSC)	tas1055	TAS	40:55:40.00 S	145:37:5.00 E	1.3	R + LTT	Foreshore Reserve, Protection	10
Bonbeach	BONBEACH	vicP044A	VIC	38:3:42.00 S	145:6:59.00 E	0.6	LTT/TBR	Exposed	10
Bondi	Bondi Beach	nsw320	NSW	33:53:29.00 S	151:16:36.00 E	1.5	TBR	Foreshore reserve, protection	35
Bowen	Queens Beach	qld0950	QLD	19:58:59.00 S	148:14:17.00 E	0.3			
Bribie Island	Woorim	qld1556	QLD	26:56:34.00 S	153:8:55.00 E	0.7		Foreshore Reserve, Dune	40
Brighton	BRIGHTON	vicP055	VIC	37:55:45.00 S	144:59:24.00 E	0.4	LTT/TBR	Protection	

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
80		Yes: Discontinuous	No	Yes	Yes	Unknown	The club is well setback behind the high foredunes and Barwon Heads-Torquay road
40		Yes	No	Yes			Low-res aerial photography, difficult to establish. Other photos show presence outcropping of igneous units. East facing exposed to gently refracting SE swells. Possible buffered to a degree by the southern headlands and reef
10		Yes: Discontinuous	Yes	No	No	Direct	The club is located on grassed area behind the beach, it is partially buffered by the Rocky outcrops of Ricketts Point
30		Yes: Discontinuous	No	Yes	Yes	Concrete Bridge	The Club is uniquely setback behind a creek/wetland area. The beach is accessed via a bridge spanning the creek. The club appears to be more at risk from potential flooding of the creek and backwater from storm surges
60			No	Yes	Yes	Sand Path	Club appears well setback behind developed dune of approx 40m width
90			No	Yes	Yes	Sand Path	This is a New Club (being painted as of Nov 2010) it is will setback behind densely vegetated dune. The Beach is approx 400m length and embayed by two Rocky headlands
	Seawall - Concrete	Yes: discontinuous	Yes	No		Concrete Ramp	The Beach appears to be largely controlled by the two large rocky headlands surrounding it
60	Dune fencing		No	Yes	Yes	Concrete Ramp	The club is located on a residential block, which is setback approx 60-70m from the veg line.
60		Yes: Discontinuous	No	Yes	Yes	Concrete Ramp	Low resolution Aerial photography
30		Yes	Yes	Yes	Yes	Concrete Ramp	The club is located on a rock outcrop, next to extensive dune systems that run approximately 1km inland
15		Yes: Discontinuous	Yes	Yes	Yes	Concrete Ramp	The club is located on reserve above the beach
10	Seawall - Rubble mound	Yes	Yes			Concrete Ramp	The club is protected from the south to the north east and is located on rocky coast
	Seawall - Concrete	No	Yes	No	Yes	Concrete Ramp	Rocky outcrops and headlands dominate the stretch of coast. The beach is exposed to the NE
10	Dune fencing		No	Yes	No	Wooden Ramp	The club flanked by dune which extends approx 20m seaward this dune has been cleared directly on front of the club for access
	Seawall - Concrete		No	No	Yes	Concrete Ramp	Highly modified coast on Australia's most frequented beach
							EXACT LOCATION UNKNOWN DUE TO INACCURATE KLM AND LOW RES AERIAL PHOTOGRAPHY: Queens beach which is the town's main northern beach has a narrow high tide beach and then a low tide bar that widens to become ridged sand flats several hundred meters in width to the more protected east
40	Unknown	No	No	Yes	Yes	Sand Path	Moreton island is located approximately 15km offshore protecting from the SE and E. A small Bar Island is located approx 150m from the veg line directly in front of the club
	Seawall - Concrete		Yes	No	Yes	Concrete Ramp	

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Brighton (SA)	Brighton	sa0230B	SA	35:1:12.00 S	138:30:34.00 E	0.8	LTT	Foreshore Reserve, Road, Protection	35
Broadbeach	Broadbeach	qld1591E	QLD	28:1:11.00 S	153:25:48.00 E	1.5	LTT/TBR	Foreshore Reserve, Dune, Road	50
Bronte	BRONTE	nsw323	NSW	33:54:12.00 S	151:16:6.00 E	1.5	TBR	Foreshore reserve, protection	20
Broome	Cable Beach	waK0019	WA	17:57:19.00 S	122:12:4.00 E	1		Foreshore Reserve, Dune	30
Broulee Surfers	BENGELLO/ SOUTH BROULEE/ SOUTH	nsw562	NSW	35:52:48.00 S	150:9:18.00 E	1.6	TBR	Dune	60
Brunswick	BRUNSWICK HEADS	nsw011	NSW	28:35:20.00 S	153:34:8.00 E	1.6	TBR	Dune	80
Bulli	BULLI	nsw366	NSW	34:20:35.00 S	150:55:23.00 E	1.5	TBR	Foreshore Reserve, Dune	25
Bundaberg	Nielsen Park	qld1501	QLD	24:48:23.00 S	152:27:24.00 E	0.7		Foreshore Reserve, Dune	10
Bungan Beach	BUNGAN	nsw305	NSW	33:40:3.00 S	151:19:10.00 E	1.5	TBR	Dune	20
Burleigh Heads Mowbray Park	Burleigh Heads	qld1592B	QLD	28:4:47.00 S	153:26:59.00 E	1.5	TBR	Foreshore Reserve, Protection	
Burnie	West Beach	tas1087	TAS	41:2:55.00 S	145:54:14.00 E	0.9		Foreshore Reserve	10
Burning Palms	BURNING PALMS	nsw348	NSW	34:11:13.00 S	151:2:38.00 E	1.6	RBB+ROCKS	Dune, Rock	60
Byron Bay	MAIN (BYRON BAY)	nsw013A	NSW	0:0:0.00 N	0:0:0.00 E	1	TBR/LTT	Carpark, Coastal Protection	30
Cabarita Beach	BOGANGAR/ CABARITA	nsw004	NSW	28:17:43.00 S	153:34:36.00 E	1.5	TBR	Dune, access path	65
Cairns	Palm Cove	qld0715	QLD	16:45:52.00 S	145:40:33.00 E	0.4	R + LTT	Foreshore Reserve	15
Camden Haven	GRANTS/ NORTH HAVEN	nsw178	NSW	31:37:9.00 S	152:50:8.00 E	1.5	TBR	Foreshore Reserve, Dune	20
Cape Hawke	ONE MILE	nsw198	NSW	32:11:21.00 S	152:32:8.00 E	1.3	TBR	Foreshore Reserve, Dune	25
Cape Paterson	CAPE PATERSON\\ FIRST SURF	vic156	VIC	38:40:36.00 S	145:36:32.00 E	1.3	LTT/TBR	Foreshore Reserve, Rock	
Carlton Park	Carlton Beach	tas0392	TAS	42:52:15.00 S	147:37:48.00 E	1.1	TBR	Dune	20

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
	Seawall - Rubble mound	No	No	Yes	Yes	Concrete Ramp	The club sits on a heavily modified beach. A large seawall fronts the dunes and club. A 250m jetty is located approximately 200m north of the club
50	Dune fencing	No	No	Yes	Yes	Concrete Ramp	The club is located south of surfers paradise and is setback behind managed foredune and a road
	Seawall - Concrete	Yes: discontinuous	No	No		Concrete Ramp	
30	Unknown		No	Yes	yes	Compacted track	The club is located approx 5-8m above the beach level setback from the veg line of the dune
60		Yes: discontinuous	No	Yes	Yes	Sand Path	The club is located in the far northern corner of the south facing beach flanked by intertidal reef and headland to the east. The area of beach in front of the club appears to be an area of longshore deposition
80		Unknown	No	Yes	Yes	Sand Path	
25		Yes	Yes	Yes	Yes	Concrete ramp	Surf club located on point of reef and rock outcrops, the SE orientation of the beach makes open to the incident swells.
10	Groyne	No	Yes	Yes	Yes	Sand Path	Two groynes have been built at either end of the beach to keep sand over the underlying rocks. The beach is fringed by extensive basalt flats
20		Yes	Yes	Yes	Yes	Concrete ramp	
	Seawall - Concrete	No	Yes	No	Yes	Concrete ramp	The club is located on a highly modified shoreline with coastal protection present. Burleigh Point is directly east of the club
	Seawall - Concrete		No	No		Concrete Ramp	SLSTAS state manager mentioned that this club is thinking about extending its current seawall
60			Yes	Yes	Yes	Cleared pathway	The club is setback behind rocky coast approximately 60-70m behind the veg line. Is located above MSL 10-20m
30	Seawall - Rubble mound, Groyne		No	No		Sand Path	The club is located behind extensive coastal protection. The shoreline is approximately 50 meters advanced on the updrift side of the saturated groyne and significant erosion has occurred on the downdrift side which has been reinforced with rubble mound seawall The club is roughly located behind the groyne
65			Yes	Yes	Yes	Sand Path	The club is located in an area of newer development, it is buffered by approx 60-70m wide dunes
15	Unknown	Yes	Unknown	No	No	Unknown	Low res aerial photography, The club is located on Palm Cove. The GBR fringes the coast approx 25km offshore
20	Training wall		No	Yes		Concrete ramp	The club is located approx 250m North of the Camden head training walls
25			Yes	Yes	Yes	Sand Path	The club is located on the southern end of one mile beach. The club is protected by a rocky headland and dune system
		Yes: Discontinuous	Yes	Yes	Yes	Compacted track	The club is located on a rocky cliff top overlooking the bay
20	Unknown	No	No	Yes	Yes	Concrete ramp	The club is located on the SE coast of TAS deep in Frederick Henry Bay, its southerly orientation means it receives most southerly swell entering the bay.

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Carrum	CARRUM	vicP043C	VIC	38:4:54.00 S	145:7:21.00 E	0.6	LTT/TBR	Exposed	
Catherine Hill Bay	MIDDLE CAMP	nsw259	NSW	33:9:6.00 S	151:37:54.00 E	1.6	TBR/RBB	Dune	15
Caves Beach	CAVES	nsw255	NSW	33:6:29.00 S	151:38:53.00 E	1.3	LTT	Foreshore Reserve, Dune	35
Chelsea Longbeach	CHELSEA	vicP044B	VIC	38:3:2.00 S	145:6:41.00 E	0.6	LTT/TBR	Exposed	
Chiton Rocks	Boomers-Chiton Rocks	sa0157	SA	35:32:12.00 S	138:39:32.00 E	1.3	TBR LTT + ROCKS	Foreshore Reserve, Dune	40
Christies Beach	Christies Beach	sa0225	SA	35:8:18.00 S	138:28:8.00 E	0.8	LTT	Foreshore Reserve, Protection	40
City of Bunbury	Bunbury Beach	wa0757	WA	33:21:25.00 S	115:37:1.00 E	1	R	Protection	
City of Perth	City Beach	wa0841	WA	31:56:11.00 S	115:45:15.00 E	1.2	LTT + Groynes	Protection	
Clifton Beach	Clifton Beach	tas0408	TAS	42:59:18.00 S	147:32:8.00 E	1.3	TBR	Dune	45
Clovelly	CLOVELLY	nsw324	NSW	33:54:49.00 S	151:15:59.00 E	0.3	R/LTT	Foreshore Reserve, protection	25
Coalcliff	COALCLIFF	nsw354	NSW	34:14:40.00 S	150:58:38.00 E	1.5	TBR	Dune	20
Coffs Harbour	PARK	nsw109	NSW	30:17:13.00 S	153:8:24.00 E	1.4	TBR	Foreshore Reserve, Dune	45
Coledale	COLEDALE	nsw358	NSW	34:17:14.00 S	150:56:56.00 E	1.5	TBR	Foreshore Reserve, Dune	20
Collaroy	COLLAROY	nsw310D	NSW	0:0:0.00 N	0:0:0.00 E	1.2	LTT	Protection	5
Coochiemudlo Island	Main Beach (Coochiemudlo Island)	qldCOOCH01	QLD	27:34:28.00 S	153:19:45.00 E				
Coogee (NSW)	COOGEE	nsw326	NSW	33:55:14.00 S	151:15:29.00 E	1	R/LTT	Cliff	
Coogee Beach (WA)	Coogee Beach	wa0825	WA	32:7:14.00 S	115:45:39.00 E	0.7	R + REEFS	Dune	70
Cooks Hill	BAR	nsw245A	NSW	0:0:0.00 N	0:0:0.00 E	1.6	TBR	Protection	
Coolangatta	Coolangatta	qld1599A	QLD	28:9:36.00 S	153:32:21.00 E	1.4	LTT/TBR	Foreshore Reserve, Dune	60

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
			No	Yes	No	Direct	Dunes flank either side of the club, the have been cleared for access. The veg line is approx 15m adjacent to the club
15		Yes: Discontinuous	No	Yes		Concrete ramp	High energy coast, relatively exposed, Old coal loading jetty runs approx 300meters from the veg line. South of the club is dominated by Rocky headlands and cliffs
35	Dune fencing	Yes: Discontinuous	Yes	Yes	Yes	Sand Path	A creek runs beside the club flowing into the ocean. Extensive caves and rock outcrops appear along the shoreline
			No	Yes	No	Direct	Dunes flank either side of the club. The veg line is in line with the front of the club, Three Bars present in front of club
40	Dune fencing	Yes: discontinuous	Yes	Yes	Yes	Sand Path	The club is located behind foredune on a foreshore reserve. Outcropping appears along the beach.
	Seawall - Rubble mound	Yes	Yes	No	Yes	Concrete ramp	The club is west facing. Rubble mound has been placed over a former dune creating a large seawall. The club is located above beach level
	Seawall - Concrete		No	No	Yes	Concrete Ramp	The club is located on the beach and is protected by a seawall,
	Seawall - Concrete		No	No	Yes	Concrete Ramp	The club is protected by a 1-2m high concrete seawall. The shoreline is heavily engineered
45			No	No	Yes	Concrete Ramp	noted to be large winter storms that removed large volumes of sand and scarped dunes this year as per conversion with SLSTAS state manager
	Seawall: Concrete	Yes: Discontinuous	Yes	No	Yes	Road	The Club is located approx 150m from the Clovelly beach which is an 80m wide deposit of sand occurring at the end of an engineered channel. The club is located on a heavily engineered headland fronting Coogee Bay
20		Yes: Discontinuous	Yes	Yes	Yes	Concrete Ramp	The club is located on top of stabilised grassed dune approx 20m behind veg line and approx 10m above MSL
45		Yes	No	Yes	Yes	Sand Path	The club is located approx 50m from the veg line behind stabilised dune. An extensive beach/tombolo is present in front of the club
20	Seawall: Concrete	Yes: Discontinuous	Yes	Yes	Yes		The club is located in lee of a rocky headland
	Boardwalk: Concrete	Yes: Discontinuous	Yes	No	No	Concrete Ramp	The Club is NE facing, it is protected by Winter southerlies but exposed to summer NE systems. A seawall/boardwalk appears to protect the club
							Very low res aerial photography, the club faces south to Redland bay which consists of intertidal flats, subtidal terraces and deltas. Fetch restricted area. Low to no wave climate
		Yes	Yes	No	Yes	Concrete Ramp	The club is located on the southern rocky headland at Coogee. Above MSL and is protected by geological controls (cliffs)
70		Yes	Yes	Yes	Yes	Concrete Ramp	The club is setback from the veg line on a foreshore reserve area. An approx 100m long jetty is located on the beach in front of the club
	Seawall: Concrete	Yes: Discontinuous	No	No	No	Concrete Ramp	The club appears to be located directly on the former veg line, the club area is heavily engineered with what looks like concrete seawalls
60	Dune fencing	No	No	Yes	Yes	Concrete Ramp	The club is well setback from the vg line. Dunes appear to be undergoing remediation works. Grassy reserve is present between the club and the dunes. The Tweed sand bypassing project has causes massive accretion on Greenmount Beach. Kirra point Big groyne is saturated. Approx 100m+ of beach from veg line

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Coolum Beach	Coolum	qld1539E	QLD	26:31:48.00 S	153:5:24.00 E	1.5	TBR	Foreshore reserve, protection	10
Copacabana	COPACABANA	nsw288A	NSW	33:29:26.00 S	151:25:54.00 E	1.5	RBB	Dune	30
Corrimal	CORRIMAL	nsw369	NSW	34:22:48.00 S	150:55:8.00 E	1.6	TBR/RBB-TBR	Foreshore Reserve, Dune	120
Cottesloe	Cottesloe Beach	wa0839	WA	31:59:28.00 S	115:45:5.00 E	1	R LTT	Foreshore Reserve, Dune, Protection	40
Cronulla	CRONULLA	nsw335	NSW	34:3:19.00 S	151:9:18.00 E	1	LTT	Protection	10
Crowdy Head	CROWDY	nsw184	NSW	31:47:7.00 S	152:45:0.00 E	1.5	LTT/TBR	Foreshore Reserve	15
Cudgen Headland	DREAMTIME/ KINGSCLIFF/ CUDGEN	nsw003	NSW	28:13:31.00 S	153:34:4.00 E	1.6	TBR/RBB	Carpark, Coastal Protection	0
Currumbin	Currumbin	qld1595	QLD	28:7:46.00 S	153:29:16.00 E	1.5	LTT/TBR	Rock	
Darwin	Casuarina Beach	nt0146	NT	12:20:46.00 S	130:52:46.00 E	0.3	R + SF	Foreshore Reserve, Rock	50
Dee Why	DEE WHY	nsw314B	NSW	0:0:0.00 N	0:0:0.00 E	1.6	RBB-TBR	Exposed	
Denmark	Ocean Beach	wa0444	WA	35:1:45.00 S	117:19:50.00 E	1.5	TBR	Foreshore Reserve, Protection	
Devonport	Bluff Beach	tas1136	TAS	41:9:44.00 S	146:21:23.00 E	0.8	R + LTT	Foreshore Reserve, Protection	20
Dixon Park	DIXON	nsw245B	NSW	0:0:0.00 N	0:0:0.00 E	1.6	TBR/RBB	Foreshore Reserve, Dune	50
Dongara-Denison	Dongara	wa1066	WA	29:14:38.00 S	114:54:59.00 E	0.6	R LTT		
Dromana Bay	DROMANA	vicP017C	VIC	38:19:54.00 S	144:57:52.00 E	0.5			
Edithvale	EDITHVALE	vicP044C	VIC	38:2:11.00 S	145:6:15.00 E	0.6	LTT/TBR	Exposed	
Eimeo	Eimeo	qld1107	QLD	21:2:2.00 S	149:10:42.00 E	0.2	SF		
Elliott Heads	Elliott Heads	qld1509	QLD	24:55:12.00 S	152:29:33.00 E	0.7	R + LTT	Foreshore Reserve, Dune	60
Ellis Beach	Ellis	qld0712	QLD	16:43:26.00 S	145:38:42.00 E	0.4	R + LTT	Exposed	

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
	Seawall - Concrete	No	Yes	No	Yes	Concrete Ramp	Rubble mound appears to have been placed in front of the seawall for additional protection
30	Dune fencing	Yes: Discontinuous	Yes	Yes	Yes		
120	Dune fencing	Yes: Discontinuous	No	Yes	Yes	Sand Path	The club is well setback from the veg line (approx 125m) a creek flows south of the club.
35	Seawall - Concrete	Yes discontinuous	Yes	Yes	Yes	Concrete Ramp	The Cottesloe groyne located directly west of the club is holding the beach to the north, while Cottesloe reef is present south of the groyne.
	Seawall: Concrete	Yes: Discontinuous	Yes	No	No	Concrete Ramp	The club appears fairly exposed, Rocky headland is present to the south east which potentially buffers from incident wave energy
15		Yes: Discontinuous	No	No	No		Poor Aerial photography, assessment based on panoramic photograph of club. The club is fronted by approx 15m of landscaped lawn, rip rap fronts the lawn. The location is well protected by Crowdy head with exposure largely influenced by northerly systems
0	Seawall - Sandbag	Yes: Discontinuous	No	No	No	Sand Path	Club is in danger of being lost. Sandbags are being used to protect the heavily eroded areas of scarping at the seaward boundary of the club
		No	Yes	No	No	Concrete Ramp	The club is located on a rock outcrop (elephant rock) roughly in line with the High water mark. The club has been inundated in storm systems
50		No	Yes	No	Yes	Compacted track	The club is setback behind dripstone cliffs. The beach is a wide high tide beach fronted by 200-300m intertidal sand flats
		Yes: discontinuous	No			Direct	Low res aerial photography, club located on former veg line. Likely inundated during storms
	Seawall - Wooden		Yes	No	No	Direct	Low res aerial photography, 3 structures present in a cluster, took the closest to the shoreline. Photography of front building shows timber seawall protecting it. Rock outcrops form the south platforms and headland
	Seawall - Concrete	No	Yes	No	Yes	Concrete Ramp	Heavily modified foreshore with coastal protection. Rock flats are exposed 100m east of the beach
50			No	Yes	Yes	Wooden ramp	Club appears well setback behind developed dunes
							NO KML PROVIDED, Club founded in 2004
							REBUILDING
			No	Yes	No	Direct	Dunes flank either side of the club house, they have been cleared in front for access. Three Bars generally present along beach
							Low res aerial photography: the beach is approx 400m long north facing low energy beach. The beach extends east of the rocks at the base of the point as a single sand spit, backed by a small mangrove filled tidal creek.
60	Groyne	No	No	Yes	Yes	Sand Path	The 400m wide E facing beach lies between two groynes
		Yes	Unknown	No	No	Direct	A small clubhouse sits in line with the veg line. A large LTT beach fronts the club and the GBR is approx 25km offshore

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Elouera	ELOUERA	nsw334C	NSW	0:0:0.00 N	0:0:0.00 E	1.6	TBR/RBB	Dune	25
Elwood	ELWOOD	vicP061	VIC	37:53:14.00 S	144:58:54.00 E	0.4	TBR-RBB	Protection	
Emu Park	Emu Park	qld1377	QLD	23:15:46.00 S	150:49:41.00 E	0.5	R + LTT	Foreshore Reserve, Protection	25
Era	NORTH ERA	nsw346	NSW	34:10:41.00 S	151:3:24.00 E	1.4	TBR	Dune	50
Esperance-Goldfields	Fourth-Twilight Beach	wa0156	WA	33:53:15.00 S	121:50:0.00 E	1.6	TBR	Dune	20
Etty Bay	Etty Bay	qld0768	QLD	17:33:34.00 S	146:5:25.00 E	0.5	R + LTT	Foreshore Reserve, Road	35
Evans Head/ Casino SLSC	EVANS HEAD	nsw029F	NSW	0:0:0.00 N	0:0:0.00 E	1.5	TBR-RBB	Foreshore Reserve, Dune	55
Fairhaven	FAIRHAVEN	vic328	VIC	38:28:8.00 S	144:4:9.00 E	1.5	TBR/RBB	Dune	10
Fairy Meadow	TOWRADGI/ FAIRY MEADOW	nsw370B	NSW	0:0:0.00 N	0:0:0.00 E	1.4	TBR/RBB	Foreshore Reserve, Dune	50
Fingal Rovers	LETITIA SPIT	nsw002	NSW	28:11:6.00 S	153:33:38.00 E	1.6	TBR-LTT	Dune	40
Floreat	Floreat-Scarborough-Trigg	wa0842	WA	0:0:0.00 N	0:0:0.00 E	1.3	RLTT	Dune	25
Forrest Beach	Forrest Beach	qld0832	QLD	18:41:10.00 S	146:18:38.00 E	0.6	R + BR	Foreshore Reserve, Dune	60
Forster	FORSTER	nsw196	NSW	32:10:36.00 S	152:30:43.00 E	1	TBR-LTT	Protection	
Frankston	FRANKSTON	vicP043A	VIC	38:8:20.00 S	145:7:12.00 E	0.6	LTT/TBR	Exposed	
Fremantle	Leighton Beach	wa0836	WA	32:1:35.00 S	115:44:56.00 E	1.2	LTT	Dune, Protection	
Freshwater	FRESHWATER	nsw316	NSW	33:46:54.00 S	151:17:27.00 E	1.5	RBB/TBR	Exposed	
Garie	GARIE	nsw344	NSW	34:10:12.00 S	151:4:8.00 E	1.6	TBR/RBB	Foreshore Reserve, Dune	15

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
25	Dune fencing		No	Yes	Yes	Concrete Ramp	There is a large concrete seawall present 150m south of the club that terminates near North Cronulla SLSC, the wall could have implications for sediment delivery and transport at Elouera
			No	No	Yes	Concrete Ramp	The club is fronted by a concrete seawall. Renourishment has occurred in the Elwood area. An inner and outer bar separated by a trough are noted
	Seawall - Rubble Mound	No	Yes	Yes	Yes	Concrete Ramp	The beach is setback on foreshore reserve behind a 1m high rubble mound seawall. Outcrops of rock are visible along the beach and appear to be holding sand
50		Yes: discontinuous	Yes	No		Direct	Era is a very small club accessible only by foot, or track. Large cliffs and rocky headlands dominant the stretch of coast.
20	Unknown	Yes: Island	Yes	Yes	Yes	Sand Path	low res photo, granite headland south of the club and granite island in front of the club provide protection
35		Yes	No	No	Yes	Sand Path	The club patrols a small section of beach where there are stinger guards. The GBR is approx 30km offshore
55			No	Yes	Yes	Sand Path	The club appears well set back behind developed dune. A training wall runs 170m out from the veg line. This training wall is located 250m south of the club and appears to provide a degree of protection
10	Dune fencing	Yes: Discontinuous	Yes	Yes	Yes	Compacted track	
50	Dune fencing		No	Yes	Yes	Concrete Ramp	
40	Dune fencing	Yes: discontinuous	No	Yes	No	Sand Path	
25	Unknown		No	Yes	Yes	Sand Path	Club is located on a generally steep, reflective beach which attached bar cut by rips
60	Unknown	Yes	No	Yes	Yes	Sand Path	The club is located on a straight exposed beach with a low tide bar and occasional rip, A stinger net is present. Offshore the coast is buffered by the GBR and Great Palm Island
	Seawall - Concrete		No	No		Direct	Exposed club that has been protected by engineering works
			No	Yes	No	Concrete Ramp	The club is flanked by managed dunes. The front of the club is in line with the adjacent vegetation line. The bars separated by troughs are visible
30	Seawall - Concrete		No	Yes	No	Direct	The club has a small concrete wall on front of it, potentially to stop aeolian sediments from entering the club. The clubs website shows plans for a new clubhouse (see consultation folder for information on new club house send from Fremantle SLSC)
		Yes discontinuous	Yes		No	Direct	A wide sandy beach is present in front of the club. The beach is approx 400m long and is embayed by two 20m high rocky headlands. The non ortho-rectified aerial photograph makes it difficult to determine if there is a protection structure in front of the club
15		Yes discontinuous	Yes	Yes		Cleared pathway	The club is located on rocky coast on an approx 750m long beach between two cliff headlands. The northern cliff is 110m high. In the aerial photograph the sandy beach extends approx 80m from veg line to water mark. Cliffs dominant the coast and wave energy is high

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Geraldton	Tarcoola-Back beach	wa1081	WA	28:48:28.00 S	114:37:9.00 E	1.5	TBR	Foreshore Reserve, Dune	60
Gerringong	WERRI	nsw397	NSW	34:44:8.00 S	150:50:3.00 E	1.6	R	Foreshore Reserve, Dune, Road	60
Glenelg	Glenelg	sa0230D	SA	34:58:47.00 S	138:30:0.00 E	0.8	LTT	Foreshore Reserve	35
Golden Beach	GOLDEN	vic078J	VIC	38:12:47.00 S	147:24:1.00 E	1.4			
Gove Peninsula	Gadalathami/ Town	nt1012	NT	12:10:22.00 S	136:47:17.00 E	1	R + LTT	Foreshore Reserve	25
Grange	Grange	sa0232B	SA	34:53:59.00 S	138:28:47.00 E	0.6	LTT	Foreshore Reserve, Dune	35
Gunnamatta	GUNNAMATTA	vic253	VIC	38:27:7.00 S	144:51:47.00 E	1.6	TBR/RBB	Dune	90
Half Moon Bay	HALF MOON BAY	vicP052	VIC	37:58:3.00 S	145:0:42.00 E	0.4	TBR	Protection	
Hampton	HAMPTON	vicP054	VIC	37:56:36.00 S	144:59:55.00 E	0.3	LTT	Foreshore Reserve, Protection	25
Hat Head	HAT HEAD	nsw144C	NSW	0:0:0.00 N	0:0:0.00 E	1.4	TBR	Foreshore Reserve, Dune	90
Helensburgh Stanwell Park	STANWELL PARK	nsw352	NSW	34:13:46.00 S	150:59:26.00 E	1.6	TBR/RBB	Dune	15
Henley	Henley	sa0232A	SA	34:55:12.00 S	138:29:24.00 E	0.6	LTT	Protection	15
Hervey Bay	Scarness-Torquay	qld1525	QLD	25:16:58.00 S	152:52:35.00 E	0.3	SF	Dune	20
Inverloch	MAIN (SURF BEACH)	vic144	VIC	38:38:53.00 S	145:41:48.00 E	0.2	R + TF	Dune	80
Jan Juc	JAN JUC	vic298	VIC	38:20:47.00 S	144:18:33.00 E	1.4	TBR/RBB	Rock	10
Kawana Waters	Buddina	qld1549B	QLD	26:41:24.00 S	153:7:45.00 E	1.5	LTT/TBR	Foreshore Reserve, Dune	60
Kempsey Crescent Head	Killick Beach	nsw150	NSW	31:7:34.00 S	153:0:15.00 E	1.6	TBR	Foreshore Reserve, Protection	30
Kennett River	KENNETT RIVER	vic359	VIC	38:40:5.00 S	143:51:47.00 E	1.3	TBR+ROCKS +REEF	Dune, Rock	10
Kiama Downs	JONES/BOYDS	nsw390	NSW	34:38:21.00 S	150:51:19.00 E	1.5	TBR	Foreshore Reserve, Dune	40

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
60	Dune fencing	Unknown	No	Yes	Yes	Sand Path	The club is located on a paved area adjacent to a large carpark setback behind the dunes
60		Yes: discontinuous	No	Yes	Yes	Cleared pathway	
	Seawall - Concrete		No	No		Concrete Ramp	Heavily modified stretch of metropolitan coast, large concrete seawall, club is set back approx 35-40meters from the wall
25		No	Yes	No	Yes	Compacted track	The club is located on grassy reserve on top of a grassy bluff. The beach fronting the club is steep with course sediment. Rock flats are present east of the club
75	Dune fencing	No	No	Yes	Yes	Concrete Ramp	The club is located Behind a carpark. A 300m jetty is located 50m south of the club
90		Yes: discontinuous	No	Yes	Yes	Compact track	The club is well setback behind extensive dunes
	Seawall - Stone		No	No	Yes	Concrete Ramp	There is no beach in front of the club, the beach is located approx 50m north of the club and accessed by a ramp
	Seawall - Concrete, Groyne		No	No	Yes	Concrete Ramp	Heavily modified beach with 3 groynes (1 large approx 120m long rubble mound, and 2 approx 50m timber groynes. Concrete seawall along the whole coast
90			No	Yes		Sand Path	The club appears well setback behind the dunes, and is protected from SE and E swells by Hat head
15		Yes: discontinuous	No	Yes		Sand Path	
	Seawall - Rubble mound		No	No	Yes	Concrete Ramp	Highly modified and structurally controlled area of coast. The surf club is fronted by a wide 120m sandy beach (in photo looks like summer) a rubble mound seawall is protecting the surf club and adjacent carpark
20	Unknown		No	Yes	Unknown	Direct	Low res aerial photography. The surf club is located on Scarness-Torquay beach which is characterised by low energy locally generated wind waves as Fraser island protects the coast from swell
80			Yes	Yes	Yes	Unknown	The club is being rebuilt. A vulnerability assessment was undertaken by Water Technology PL. The club was deemed to be setback behind a 2100 high scenario considering SLR, long term dune erosion (Brunn rule) and short term Storm erosion (SBEACH)
		Yes: discontinuous	Yes		Yes	Concrete Ramp	The Club is located on top of the limestone cliff top and is accessible via a concrete ramp. Rock debris is at the toe of the cliff indicating undercutting and overtopping
60	Dune fencing	No	No	Yes	Yes	Concrete Ramp	The club is located on a straight East facing 9km long sandy beach. The clubhouse is setback in the dunes
15	Seawall - Rubble mound	Yes: discontinuous	Yes	No	Yes	Boat ramp	The club is located on a protected point next to the mouth of the creek. The club is protected to the East and South East by Cresent Head
10		Yes: discontinuous	Yes	Yes	Yes	Sand Path	The club is located between the beach and the Great Ocean Rd Behind the rock (limestone) Kennet point which provides some protection. The river mouth also supplies sediment to the beach
40		Unknown	No	Yes	Yes	Concrete Ramp	Club located behind dune

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Killcare	PUTTY/ KILLCARE	nsw292	NSW	33:31:48.00 S	151:21:56.00 E	1.4	R/LTT-LTT/TBR	Foreshore Reserve, Dune, Protection	30
Kingston Beach SLSC	Kingston Beach	tas0466	TAS	42:58:51.00 S	147:19:34.00 E	0.5	R/LTT		
Kirra	Kirra	qld1598	QLD	28:10:0.00 S	153:31:55.00 E	1.2	R + LTT	Foreshore Reserve, Protection	20
Lakes Entrance	EASTERN	vic077	VIC	37:52:36.00 S	148:1:11.00 E	1.5	RBB/LBT	Dune	40
Lennox Head Alstonville	SEVEN MILE/ LENNOX HEAD	nsw021	NSW	28:45:30.00 S	153:36:4.00 E	1.6	TBR	Foreshore Reserve, Dune	45
Long Reef	LONG REEF	nsw314A	NSW	0:0:0.00 N	0:0:0.00 E	1.6	TBR-RBB	Dune	50
Lorne	LORNE	vic336	VIC	38:32:15.00 S	143:58:40.00 E	1	LTT	Foreshore Reserve, Protection	10
Mackay	Mackay	qld1118	QLD	21:7:50.00 S	149:13:15.00 E	0.6	R + LTT	Foreshore Reserve, Dune	40
Macksville-Scotts Head	FORSTER (SOUTH)/ SCOTTS HEAD	nsw129	NSW	30:41:42.00 S	152:59:30.00 E	1.6	TBR LTT	Rock	
MacMasters	MACMASTERS	nsw288B	NSW	33:29:56.00 S	151:25:30.00 E	1.4	TBR/LTT	Protection	10
Mallacoota	MAIN - BASTION POINT	vic005	VIC	37:34:9.00 S	149:45:43.00 E	0.5	LT+REEF	Dune	25
Mandurah	San Remo	wa0793A	WA	32:28:9.00 S	115:44:44.00 E		r + sf	Dune	50
Manly	MANLY	nsw317C	NSW	0:0:0.00 N	0:0:0.00 E	1.4	TBR	Foreshore reserve, protection	5
Maroubra	MAROUBRA	nsw327A	NSW	0:0:0.00 N	0:0:0.00 E	1.5	TBR-LTT	Foreshore reserve, protection	20
Mentone	MENTONE	vicP045C	VIC	37:59:21.00 S	145:3:33.00 E	0.4	LTT/TBR	Foreshore reserve	10

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
30	Unknown		Yes	Yes	Yes	Concrete Ramp	The club is situated on the southern end of Putty Beach, Scarped headland backs the club while small cliffs generally extend to larger cliffs with significant boulders and tallus at their toe at the southern headland
							PROBATIONARY CLUB AT PRESENT. OUTPOST OF CLIFTON BEACH SLSC
30	Seawall - Rubble mound	No	Yes	No	Yes	Concrete ramp	Kirra Beach has seen significant change since commencement of the tweed sand by passing project. Massive accretion has occurred on the beach which is now some 150-250m from the veg line. 'Little groyne' located approx 50m west of the clubhouse is now completely buried by sediment. Some of the sandy beach in front of the club is now being reclaimed as dune.
40	Unknown		No	Yes	Yes	Concrete ramp	The club is located on a barrier system and is potentially exposed to surge and high water level events from the estuary and the ocean
45	Club built on skids		No	Yes			The Lennox Head Surf Club is located adjacent to Lakes Ainsworth, north of the old peat, where the beach widens and the surf increases. The surf club itself is built on skids, so it can be towed inland, if and when the beach erodes.
50	Dune fencing	Yes: discontinuous	No	Yes	Yes	Concrete Ramp	
	Seawall - Stone		Yes	No	Yes	Concrete ramp	The club is located at the southern end of the beach, it is protected by a 1m high stone seawall. The beach is low energy with SW storm systems producing the only significant waves and erosion. Rock outcrops are in front of the club forming Lorne Point
40	Dune fencing		No	Yes	Yes	Concrete ramp	The beach has one of the largest tides on the Australian East Coast (up to 8m)
			Yes	Yes		Concrete Ramp	The club is located on the tombolo in lee of Scotts head and is protected to the west and more exposed to the east. Considerable outcropping occurs along the clubhouse
	Seawall - Rubble mound	Yes: discontinuous	Yes	No		Concrete Ramp	MacMasters Beach partially fills a drowned valley, with Cockrone Lake occupying the centre. The beach and low dunes block the lake, and the valley's sides form 100m-high sandstone headlands at each end of the 1.5km-long beach which includes Copacabana SLSC to the north. MacMasters is a relatively safer and more popular beach, however rips become stronger further up the beach
25		Yes: discontinuous	Yes	Yes	Yes	Compacted track	There is no permanent club at Mallacoota at the moment, there is a temporary facility. There are Patrols from Xmas to Australia Day. The MSLSC is working with the east Gippsland shire council to find a permanent home.
50	Groyne		No	Yes	yes	Wooden ramp	the club is located on the updrift side of the groyne and is setback approx 40m from the veg line
	Seawall - Stone		No			Concrete Ramp	The club is fronted by an approximate 2m stone armour sea wall
20	Seawall - Concrete		No	No	Yes	Concrete Ramp	the club is located at the north end of Maroubra beach, the shoreline has been highly modified with an extensive reserve and coastal protection structures present
10			No	No	Yes	Sand Path	Grass bluffs back the club. It is difficult to determine the height of the club relative to the beach level, a small vegetated foredune fronts the club. Shallow bars and troughs can be seen.

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Merewether	MEREWETHER	nsw245C	NSW	0:0:0.00 N	0:0:0.00 E	1.6	TBR/RBB	Foreshore reserve, Dune, Protection	15
Mermaid Beach	Mermaid Beach	qld1591G	QLD	28:3:0.00 S	153:26:23.00 E	1.5	LTT/TBR	Foreshore reserve, Dune, Road	100
Metropolitan Caloundra	Kings (Caloundra)	qld1554	QLD	26:48:16.00 S	153:8:26.00 E	1	LTT/TBR	Rock, Protection	50
Miami Beach	Miami Beach	qld1591I	QLD	28:4:12.00 S	153:26:21.00 E	1.5	LTT/TBR	Foreshore Reserve, Dune, Road	30
Mindil Beach	Mindil Beach	nt0137	NT	12:26:44.00 S	130:49:49.00 E	0.3	R + SF	Foreshore Reserve	50
Minnie Water Wooli	MINNIE WATER	nsw063	NSW	29:46:11.00 S	153:17:50.00 E	1.3	TBR-LTT		
Mission Beach	Mission Beach	qld0784	QLD	17:54:32.00 S	146:5:51.00 E	0.4	R + LTT	Unknown	
Moana	Moana	sa0221	SA	35:11:59.00 S	138:28:11.00 E	1	LTT TBR	Foreshore Reserve, Protection	
Mollymook	MOLLYMOOK	nsw468	NSW	35:19:56.00 S	150:28:32.00 E	1.5	TBR-LTT	Foreshore Reserve, Protection	15
Mona Vale	MONA VALE	nsw307	NSW	33:40:54.00 S	151:18:42.00 E	1.5	TBR	Dune	30
Moore Park	Moore Park	qld1492	QLD	24:41:30.00 S	152:14:43.00 E	0.4	R + LTT		
Mordialloc	MORDIALLOC	vicP045A	VIC	38:0:20.00 S	145:4:50.00 E	0.5	LTT/TBR	Dune, Protection	30
Mornington	MILLS	vicP030	VIC	38:12:42.00 S	145:2:48.00 E	0.5	LTT	Exposed	
Moruya	MORUYA (HEADS)	nsw566	NSW	35:55:16.00 S	150:9:25.00 E	1.5	TBR-LTT	Foreshore Reserve, Dune	65
Mt Martha	MOUNT MARTHA POINT	vicP018	VIC	38:18:3.00 S	144:59:24.00 E	0.5	R	Exposed	
Mudjimba	Mudjimba	qld1543D	QLD	26:36:0.00 S	153:5:24.00 E	1.5	TBR	Foreshore Reserve, Dune	70
Mullaloo	Mullaloo Beach	wa0863	WA	31:47:21.00 S	115:43:59.00 E	1.3	LTT TBR	Protection	

	DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
	15	Seawall - Concrete	Yes	Yes	Yes	Yes	Concrete Ramp	Rock platforms and cliff
	100	Dune fencing	No	No	Yes	Yes	Concrete Ramp	The club is well setback behind dune, foreshore reserve and road
		Seawall - Concrete	Yes	Yes	No	Yes	Concrete Ramp	The club is built into a bluff. An extensive rock platform and concrete seawalls front the club, A seawall also boarders the shoreline of the sandy beach that the club patrols
	70		No	No	Yes	Yes	Sand Path	The club is located behind a foreshore reserve and a road. An access path has been cleared through the dunes.
	50			No	No			
								The club could not be located on Google earth. A new clubhouse was built in late 2009. The old clubhouse consisted of portable units and shipping containers
	60	Unknown	No	Unknown	Unknown	Unknown	Unknown	LOW RES AERIAL PHOTOGRAPHY. The beach is in lee of Dunk island and the Great Barrier Reef
		Seawall - Concrete	No	No	No	Yes	Concrete Ramp	The club is located behind a concrete seawall on a heavily modified beach
	15	Seawall - Concrete	Yes: discontinuous	Yes	No	Yes	Concrete Ramp	The club is located at the south end of Mollymook Beach, it is protected by the southern headland and rock platforms.
	30	Dune fencing		No	Yes		Sand Path	The club is partially exposed by the access cut through the dune in front of the club. A tombolo has formed in lee of the Rocky outcrop north of the club
								The club was severely damage by cyclones in early 2010. The retaining structure of the club was eroded. In June 2010 it was decided that the club would be demolished. A new clubhouse would be setback 30m from the current one. http://www.news-mail.com.au/story/2010/06/30/-moore-park-bundaberg-erosion-council/
	25	Dune fencing, Concrete path		No	Yes	Yes	Concrete ramp	Inner bar and outer bar separated by trough
		Seawall - Concrete		No	No	No	Direct	Low res aerial photo difficult to establish features. The club appears relatively exposed with no fronting dune, rock or visible protection
	65		Yes: discontinuous	No	Yes	Yes	Sand Path	The club appears well setback behind developed foredune. Rock outcrops can be seen along the beach approx 100m north of the club
				No	No	No	Direct	The club is located on the beach and is exposed.
	70		No	Yes	Yes	Yes	Compacted track	The club is setback behind extensive dune and foreshore reserve. Rock outcrops are observed on the beach directly in front of the club
		Seawall - Concrete	Yes discontinuous	No	Yes	Yes	Concrete Ramp	

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Nambucca Heads	MAIN	nsw125	NSW	30:38:11.00 S	153:0:52.00 E	1	TBR-LTT	Foreshore Reserve, Dune	15
Narooma	NAROOMA	nsw599	NSW	36:13:25.00 S	150:8:27.00 E	1.5	TBR	Foreshore Reserve, Carpark, Dune	20
Narrabeen	NARRABEEN	nsw310B	NSW	0:0:0.00 N	0:0:0.00 E	1.4	TBR	Foreshore Reserve, Dune	45
Newcastle	NEWCASTLE	nsw243	NSW	32:55:49.00 S	151:47:8.00 E	1.6	TBR+ROCKS	Foreshore Reserve, Protection	
Newport	NEWPORT	nsw304	NSW	33:39:15.00 S	151:19:22.00 E	1.3	TBR-LTT	Exposed	
Nobbys (NSW)	NOBBYS	nsw165	NSW	31:26:47.00 S	152:55:46.00 E	1	TBR	Foreshore Reserve, Protection	15
Nobbys Beach	Nobby's Beach	qld1591H	QLD	28:3:33.00 S	153:26:21.00 E	1.5	LTT/TBR	Foreshore reserve, Dune	20
Noosa Heads	Noosa	qld1532	QLD	26:22:45.00 S	153:4:48.00 E	1	LTT/TBR	Foreshore reserve	20
Normanville	Normanville	sa0207	SA	35:26:17.00 S	138:18:23.00 E	0.6	LTT	Foreshore Reserve, Dune, Protection	15
North Avoca	NORTH AVOCA	nsw287A	NSW	0:0:0.00 N	0:0:0.00 E	1.5	RBB	Foreshore Reserve, Dune	40
North Bondi	NORTH BONDI	nsw320A	NSW	0:0:0.00 N	0:0:0.00 E	1.3	LTT/TBR	Foreshore Reserve, Protection	15
North Burleigh	North Burleigh	qld1592A	QLD	28:4:12.00 S	153:26:21.00 E	1.5	LTT	Foreshore Reserve, Dune	30
North Cottesloe	Cottesloe Beach	wa0839	WA				R LTT	Dune, Rock	15
North Cronulla	NORTH CRONULLA	nsw334D	NSW	0:0:0.00 N	0:0:0.00 E	1.5	TBR/RBB	Foreshore reserve, Protection	15
North Curl Curl	NORTH CURL CURL	nsw315A	NSW	0:0:0.00 N	0:0:0.00 E	1.6	RBB/TBR	Rock, Protection	
North Entrance	TUGGERAH/ NORTH ENTRANCE	nsw275	NSW	33:18:42.00 S	151:31:45.00 E	1.6	LBT (OUTER)	Foreshore Reserve, Dune	40

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
15			Yes	Yes		Concrete Ramp	Nambucca Heads Surf Club is located at the base on one of the many bluffs that dominate this section of coast. Car parking is provided both above and below the bluffs, with shops and amenities on top of the bluffs. The bluffs form headlands, rocks and reefs where they protrude into the surf, resulting in an irregular beach alternating with rocks and waves averaging one metre in height. The result is a 600m-long beach characterised by a continuous attached bar under normal waves, with rips forming during higher wave events, particularly amongst the rocks
30			Yes	Yes	Yes	Unknown	The beach lies on the south side of Wagonga Heads, and runs south for 750m to a low rocky headland, which is home to Narooma Cemetery. Rocks also occur in the surf in front of the clubhouse and dominate the northern end of the beach. Access is provided by a road to the centre of the beach where the surf club is located. Little Lake backs the southern half of the beach and runs out next to the club
45	Dune fencing		No	Yes		Sand Path	The club is setback approx 40-50m from the veg line on Narrabeen Beach. Soft coastal management ie dune fencing has been used in the area
	Seawall - Concrete		Yes	No	Yes	Concrete Ramp	The back of the beach is highly modified with a seawall, road and parking along the beach; a large rock and a wading pool on the northern rocks; and the surf club in the centre
		Yes: discontinuous	No	No		Direct	The Club is located on a concrete slab in line with the former veg line, beach width in photo approx 35 meters
15	Seawall - Concrete	Yes: discontinuous	No	No	Yes	Concrete Ramp	The club is located on a heavily engineered area with a concrete seawall present. The cargo ship Pasha Bulka ran aground on this beach in a winter storm and was stranded for several weeks
20	Dune fencing	No	No	Yes		Sand Path	The club is partially exposed to the beach from the access path cleared between the dunes.
			No	No			Low res aerial photography from 2010 shows works being carried out on the front section of the club, A rubble mound sea wall is located on the beach immediately to the west of the club
25	Seawall - Concrete	No	No	Yes	Yes	Concrete Ramp	The club is located on modified foredune. A concrete wall protects the front of the club. Extensive seagrass beds are close to shore. A blocked river mouth is south of the club forming a lagoon
40	Dune fencing	Yes: discontinuous	Yes	Yes	Yes	Sand Path	The club is located at the north end of Avoca beach, outcropping occurs in close proximity to the club
15	Seawall - Concrete		No	No	Yes	Concrete Ramp	The club is located on a heavily engineered stretch of coast on Australia's most frequented beach.
30	Dune fencing	No	No	Yes	Yes	Sand Path	The club is fronted by remediated dune. Rock outcrops (Nobby Heads) are present 100m north of the club
15			Yes	Yes	Yes	Concrete ramp	The club has a 2m high stone seawall boarding it. Dunes flank either side of the club
35	Seawall - Concrete		No	Yes	Yes	Concrete ramp	The club is located on a heavily engineered beach, the dune fronting the club appears to be in poor condition
		Yes discontinuous	Yes	No	Yes	Concrete Ramp	The club is built on Rock forming the Northern headland of the beach
40	Dune fencing	Yes: discontinuous	No	Yes	Yes	Concrete Ramp	The club is setback from the vegetation line by approx 45m. On top on the dune

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
North Haven	North Haven	sa0233	SA	34:47:15.00 S	138:28:51.00 E	0.3	LTT	Dune	100
North Kirra	North Kirra	qld1597C	QLD	28:9:36.00 S	153:30:33.00 E	1	LTT	Foreshore Reserve, Dune	40
North Narrabeen	NORTH NARRABEEN	nsw310A	NSW	0:0:0.00 N	0:0:0.00 E	1.5	TBR	Foreshore Reserve, Dune	35
North Palm Beach	NORTH PALM	nsw300A	NSW	0:0:0.00 N	0:0:0.00 E	1.6	TBR		
North Steyne	NORTH STEYNE	nsw317B	NSW	0:0:0.00 N	0:0:0.00 E	1.5	TBR	Exposed	
North Wollongong	NORTH WOLLONGONG	nsw371	NSW	34:24:47.00 S	150:54:6.00 E	1	TBR-LTT	Foreshore reserve, protection	10
Northcliffe								Foreshore Reserve, Dune	30
Nowra Culburra	WARRAIN	nsw403	NSW	34:56:53.00 S	150:46:35.00 E	1.5	LTT/TBR	Foreshore Reserve, Dune	30
Ocean Beach	OCEAN	nsw297A	NSW	0:0:0.00 N	0:0:0.00 E	0.5	R/LTT+TIDAL SHOAL	Foreshore Reserve, Dune	40
Ocean Grove	OCEAN GROVE	vic283B	VIC	38:16:12.00 S	144:31:12.00 E	1	TBR	Protection	25
Pacific	Pacific	qld1593B	QLD	28:6:0.00 S	153:27:36.00 E	1.5	LTT/TBR	Dune, Reserve	30
Pacific Palms	ELIZABETH	nsw206	NSW	32:19:46.00 S	152:32:13.00 E	1	LTT	Dune	40
Palm Beach (NSW)	Palm Beach	nsw300	NSW	33:35:29.00 S	151:19:31.00 E	1.5	TBR	Foreshore Reserve, Dune	40
Palm Beach (Qld)	Palm Beach	qld1593C	QLD	28:7:12.00 S	153:28:11.00 E	1.5	LTT/TBR	Dune, Protection	5
Pambula	PAMBULA	nsw671B	NSW	0:0:0.00 N	0:0:0.00 E	1.5	TBR/RBB	Dune	20
Penguin	Preservation Bay	tas1103	TAS	41:6:7.00 S	146:2:51.00 E	1	R + LTT	Foreshore Reserve, Rock	40
Picnic Bay	Picnic Bay	qldMT09	QLD	19:10:45.00 S	146:50:21.00 E	0.2	R+LTT+REEF	Protection	

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
100	Breakwaters	No	No	Yes	Yes	Sand Path	The club is located behind foreshore, the beach has been heavily modified and is prograding. The 1.2km long beach is bound by 2 breakwaters
40	Dune fencing	No	No	Yes	Yes	Sand Path	The beach at Nth Kirra has also been influenced heavily by the tweed sand bypassing project.
35	Dune fencing	Yes: discontinuous	No	Yes	Yes	Sand Path	The club is setback on developed reserve behind a 20-25m wide foredune. A rocky headland is present approx 200m north of the club
			No	No		Direct	The club is located in Manly and is one of the oldest in Sydney, The club is located on the beach on a concrete slab and is fully exposed. Seawalls are present either side of the club protecting the carparks and foreshore reserve
	Seawall - Concrete	Yes	No	No		Concrete Ramp	Highly developed stretch of metro coast, surf club has protection structures in place. Outcropping occurs along the beach and offshore reefs and bombies are present
30	Dune fencing	No	No	Yes		Sand Path	The club is partially exposed via a cleared access path cut thru the dunes
30		Yes: discontinuous	No	Yes	Yes	Sand Path	Low res aerial photography, only able to identify presence of dune and distance to veg line. Club appears well setback on top of the dune
40	Dune fencing		No	Yes	Yes	Concrete Ramp	The beach starts at Wagstaff Point a sandy spit that separates it from the estuarine Ettalong Beach. It runs initially from the point as Ocean Beach, a misnomer, as here it is essentially part of the Brisbane Water ebb tide delta, hence largely tide dominated. The delta forms tidal shoals that extend off the centre of the beach for nearly 2km to Little Box Head. Immediately west of the shoals in the vicinity of the Ocean Beach Surf Club wave height increases, particularly during south east swell conditions. The waves break over shallow bars and troughs, which none the less generate rips and tidal currents.
	Seawall - Concrete	Yes: discontinuous	No	Yes	Yes	Road	The club is setback behind a large concrete seawall on top of dunes and foreshore reserve
30	Dune fencing	No	No	Yes	Yes	Concrete Ramp	The club is located on a residential block of land on the coast.
40			No	Yes	Yes	Sand Path	The Club is setback approx 40m behind low foredune in the centre of the 600m long Elizabeth Beach. The beach is embayed by two Rocky headlands
40	Dune fencing		No	Yes		Sand Path	The club is exposed to high wave energy from the south east. The club is located on a barrier complex
	Seawall - Rubble mound	No	No	Yes	Yes	Sand Path	Low foredune fronts the club. A groyne is located approx 330m downdrift of the club which is holding sand.
20		Yes: discontinuous	No	No		Sand Path	Outcrops and headlands occur within 150m of the club. The resolution of the photo was quite low.
	Unknown	No	Yes	No	Yes	Concrete Ramp	The club is setback behind rock flats, a road and foreshore reserve. The Bay and 700m long sandy beach is located between two rocky bluffs. Waves average 0.5-1.0m
	Seawall - Rubble mound		No	No	Yes	Unknown	Low res aerial photography. The second Townsville club is located on a landscaped area built on top of the existing beach. A rock seawall circles the area providing protection

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Picnic Bay		qldMT9		0:0:0.00 N	0:0:0.00 E				
Point Leo	POINT LEO SURF	vic236	VIC	38:25:31.00 S	145:4:5.00 E	0.5	R/LTT	Dune	70
Point Lonsdale	POINT LONSDALE (BACK) SURF	vic282	VIC	38:17:17.00 S	144:36:6.00 E	1.4	TBR+ REEF FLATS	Dune	30
Point Lookout	Cylinder Beach	qld1583	QLD	27:25:32.00 S	153:31:55.00 E	0.7	TBR	Rock	80
Port Bouvard	Pyraminds	wa0777	WA	32:36:34.00 S	115:37:38.00 E	1.3	R LTT	Exposed	
Port Campbell	PORT CAMPBELL	vic451	VIC	38:37:9.00 S	142:59:33.00 E	0.5	R+LTT	Foreshore Reserve, Protection	10
Port Douglas	Port Douglas (Four Mile)	qld0697	QLD	16:30:6.00 S	145:28:0.00 E	0.5	R+LTT	Foreshore reserve	40
Port Elliot	Horseshoe Bay	sa1077	SA	33:8:39.00 S	134:26:58.00 E	1.5	R	Foreshore Reserve	10
Port Fairy	PORT FAIRY	vic511	VIC	38:22:5.00 S	142:15:17.00 E	1.5	LTT/TBR	Foreshore Reserve	25
Port Kembla (NSW)	PORT KEMBLA HARBOUR	nsw375	NSW	34:28:23.00 S	150:54:14.00 E	0.2	TBR/RBB	Foreshore Reserve, Dune	100
Port Macquarie	FLYNNS	nsw164	NSW	31:26:34.00 S	152:55:36.00 E	1.4	LTT	Foreshore Reserve	15
Port Melbourne	PORT MELBOURNE	vicP064D	VIC	37:50:39.00 S	144:56:18.00 E	0.3	TBR/LTT	Foreshore Reserve, Protection	10
Port Noarlunga	Port Noarlunga	sa0224	SA	35:9:8.00 S	138:28:7.00 E	0.4	R	Protection	10
Port Sorell	Port Sorell	tas1163	TAS	41:9:52.00 S	146:33:31.00 E	0.1	R + SF	Foreshore reserve, Dune	50
Portland	BRIDGEWATER BAY SURF	vic554	VIC	38:21:47.00 S	141:25:10.00 E	1.6	LTT/TBR	Dune, Foreshore Reserve	15
Portsea	PORTSEA (BACK)	vic269	VIC	38:20:13.00 S	144:42:27.00 E	1.7	TBR+REEF	Dune	10
Queenscliff	QUEENSCLIFF	nsw317A	NSW	0:0:0.00 N	0:0:0.00 E	1.5	TBR	Foreshore Reserve, Protection	5
Quinns Mindarie	Quinns Rocks Beach	wa0888	WA	31:40:41.00 S	115:41:36.00 E	0.9	R LTT	Foreshore Reserve, Dune	45
Rainbow Bay	Rainbow Bay	qld1600	QLD	28:9:51.00 S	153:32:48.00 E	1.3	TBR	Road	20

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
70		Yes: discontinuous	No	Yes	Yes	Sand Path	The club appears well setback.
30		Yes: discontinuous	Unknown	Yes	Yes	Unknown	
		No	Yes	No	Yes	Concrete Ramp	The club is located above beach level on Rock outcrop just south of the northern headland of the beach
	Groyne		No	Yes		Direct	The club was completed in early 2010. It is south of the Dawesville channel in an accretion zone
	Seawall - Wooden	Yes: discontinuous	Yes	No	Yes	Concrete ramp	Club located behind beach on semi-protected inlet. Setback behind seawall
40	Unknown	Yes	No	No	Yes	Unknown	The club Is located behind the tree line in tropical Port Douglas, A stinger net is present in front of the club. The coast is buffered by the GBR
10		Yes: discontinuous	No	No			Low res aerial photography difficult to draw details, Rocky headland present to the south of the club. The club appears to be in a relatively protected area of the bay
	Seawall - Rubble mound	No	No	No	Yes	Concrete ramp	Coast is heavily controlled by the seawall, sandy beach generally not present in winter. The club is located in a semi-protected bay.
100		Yes: discontinuous	No	Yes	Yes	Sand Path	The club is well setback by a developed dune system. Directly west of the club is a rocky headland, The club is located in a area of potential longshore deposition
15		Yes: discontinuous	No	Yes	Unknown	Unknown	Low res aerial photography: nearby panoramic photos show Rock outcrops North and South of the club forming headlands. The foreshore reserve looks heavily modified
	Seawall - Concrete		No	No	Yes	Concrete Ramp	The club is located on highly developed foreshore reserve in a largely protected area of Port Phillip Bay
	Seawall - Concrete	Yes	No	No	Yes	Concrete Ramp	The club is located behind a large concrete seawall. The beach is fringed by calcarenite reef approx 300m from the club creating a low energy beach
50	Unknown	No	Yes	Yes	Yes	Concrete Ramp	The club is located at the northern end of Freers Beach. Large tidal flats are present. Rocky headlands are present immediately north of the club
15			Yes	Yes	Yes	Concrete Ramp	The club is located on Bridgewater bay
10		Yes: discontinuous	Yes	Yes	Yes	Wooden ramp	The club is located half way up the dunes approx 10m above beach level
	Seawall - Stone	Yes: discontinuous	No	No	Yes	Concrete Ramp	The club fronts an area of choked creek/river mouth. A small channel runs through this flowing into the bay. A rocky headland is located approx 150m East
60	Dune fencing	Yes: discontinuous	No	Yes	Yes	Concrete Ramp	
20			Yes	No		Bitumen Ramp	Unable to accurately identify if there is a seawall fronting the road however it is likely due to the exposure of the area to storms. This area has been heavily modified by the Tweed sand bypassing project

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Rainbow Beach	Rainbow Beach	qld1529	QLD	25:51:41.00 S	153:4:41.00 E	1.5	TBR	Dune	35
Red Rock Corindi	RED ROCK (NORTH)	nsw080	NSW	29:58:52.00 S	153:13:58.00 E	1.6	TBR		
Redcliffe Peninsula	Suttons-Margate	qld1570	QLD	27:14:35.00 S	153:6:42.00 E	0.3	R+LTT	Foreshore Reserve, Protection	10
Redhead	REDHEAD	nsw250A	NSW	0:0:0.00 N	0:0:0.00 E	1.6	RBB	Rock	
Rosebud	ROSEBUD	vicP017B	VIC	38:21:7.00 S	144:54:29.00 E	0.4	R + SF	Foreshore Reserve, Dune	60
Salt	SALTWATER	nsw188	NSW	32:0:5.00 S	152:34:2.00 E	1.5	TBR	Foreshore Reserve, Dune	100
Sandon Point	SANDON POINT	nsw365	NSW	34:20:3.00 S	150:55:31.00 E	1	TBR-LTT	Rock, Foreshore Reserve	5
Sandridge	SANDRIDGE	vicP066	VIC	37:50:23.00 S	144:55:9.00 E	0.2	R + SF	Foreshore Reserve	10
Sandringham	SANDRINGHAM	vicP053	VIC	37:57:19.00 S	145:0:20.00 E	0.5	TBR/RBB	Protection	
Sarina	Sarina	qld1141	QLD	21:22:54.00 S	149:18:56.00 E	0.6	R + LTT	Foreshore Reserve	10
Sawtell	SAWTELL	nsw114	NSW	30:21:55.00 S	153:6:12.00 E	1.5	TBR-LTT	Foreshore Reserve	50
Scarboro SLSC	Scarborough Beach	wa0842	WA			1.2	LTT TBR	Foreshore Reserve, Protection	30
Scarborough Wombarra	SCARBOROUGH	nsw356	NSW	34:16:29.00 S	150:57:29.00 E	1.5	TBR	Rock, Foreshore Reserve	25
Seacliff	Seacliff	sa0230A	SA	35:1:48.00 S	138:30:35.00 E	0.8	LTT	Foreshore Reserve, Dune	15
Seaford	SEAFORD	vicP043B	VIC	38:6:23.00 S	145:7:27.00 E	0.6	LTT/TBR	Dune, protection	15
Seaspray	SEASPRAY	vic078P	VIC	38:22:32.00 S	147:11:38.00 E	1.4	LTT/TBR	Exposed	0
Secret Harbour	Secret Harbour	wa0793E	WA	32:23:13.00 S	115:43:52.00 E		TBR	Dune	60
Semaphore	Semaphore	sa0232E	SA	34:50:24.00 S	138:28:11.00 E	0.6	LTT	Foreshore Reserve, Dune	110

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
35		No	No	Yes	Yes	Concrete Ramp	The club is located approx 10m+ high on a grassy bluff
							UNABLE TO LOCATE
	Seawall - Rubble mound	No	Yes	No	Yes	Concrete Ramp	The club is located behind large rubble mound seawall and rocky shore platform to the east and a concrete seawall to the south
		Yes: discontinuous	Yes	Yes	Yes	Concrete Ramp	The Redhead Surf Club is located on a rock outcrop 100m south of Redhead Point. The stretch of sand between the club and the point is known as Little Redhead and under most conditions has a strong, permanent rip against the point
60	Groyne		No	Yes	Yes	Concrete Ramp	Several timber groynes have been built along the beach to the inner bar to stem erosion. A low seawall also fronts the car park and club house. A broad sand flat extend up to 1km from the shoreline
100			No	Yes	Yes	Concrete Ramp	New club established in 2004 setback almost 100m from veg line. Located underneath commercial development. Straight Beach with wide surf zone and bars cut by rips every 200-300m
		Yes: discontinuous	Yes	Yes	Yes	Wooden ramp	Club is located on a rock outcrop adjacent to Sandon Point, Visual evidence of some rubble from potential erosion of the cliff
	Raised Path - Concrete		No	No	No	Concrete Ramp	The approx 400m beach in front of the club is bounded by two large breakwaters/piers that have modified and controlled the shoreline
	Seawall - Concrete		Yes	No	Yes	Concrete Ramp	
			Yes	No	Yes	Unknown	Low res aerial photography, The club is fronted by Rock platform and is protected by swell. The GBR is offshore of the coast
50		Yes: discontinuous	No	Yes		Sand Path	Low res aerial photography, the club appears well setback from the veg line
30	Seawall - Concrete		No	Yes	Yes	Concrete Ramp	The club sits above the beach and is protected by terraced concrete and stone walls, these works were undertaken as part of the Scarborough beach foreshore development
25		Yes: discontinuous	Yes	No	Yes	Concrete Ramp	The Club is located on the beginning of the coastal escarpment
15	Unknown	No	Yes	Yes	Yes	Concrete Ramp	The club is located on a sandy beach which overlies extensive rockflats that appear south of the club
15	Dune fencing		No	Yes	Yes	Sand Path	The club was recently rebuilt and is setback behind low foredune. The 150m long Seaford pier is directly south of the club, a trough separates the inner and outer bars
0	Renourish-ment		No	No	Yes	Wooden ramp	The Seaspray SLSC had been heavily eroded in July 2007. The Front of the club was rebuilt with rip rap, sand bags, and renourishment. A new timber access ramp fronts the club now. The SLSC is located on 90mile beach a high wave energy stretch of coast with pronounced longshore drift
60			No	Yes	Yes	Sand Path	The boundary club is setback behind approx 60m of foredune. The club building is built on a large concrete slab. The building Is setback by 5m from the seaward end of the slab
110	Unknown	No	No	Yes	Yes	Sand Path	The club is fronted by a foreshore reserve, wide beach and wide surf zone with three shallow shore parallel bars

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Shellharbour	SHELLHARBOUR NORTH/NUNS	nsw381	NSW	34:34:9.00 S	150:52:4.00 E	1.4	LTT	Foreshore Reserve, Dune	35
Shelly Beach	SHELLY	nsw027	NSW	28:51:46.00 S	153:35:42.00 E	1.6	TBR/RBB	Foreshore Reserve, Dune	40
Shoalhaven Heads	SHOALHAVEN HEADS	nsw400C	NSW	0:0:0.00 N	0:0:0.00 E	1.6		Foreshore Reserve, Dune	10
Soldiers Beach	SOLDIERS	nsw274	NSW	33:17:30.00 S	151:33:53.00 E	1.6	TBR/RBB	Dune, Protection	25
Somerset	Somerset Beach	tas1080	TAS	41:2:12.00 S	145:49:59.00 E	0.7	R + LTT	Foreshore Reserve, Dune	30
Somerton	Somerton	sa0230C	SA	35:0:0.00 S	138:30:33.00 E	0.8	LTT	Foreshore reserve, Dune, Protection	25
Sorrento (VIC)	SORRENTO OCEAN (BACK)	vic268	VIC	38:20:46.00 S	144:43:38.00 E	1	LTT	Foreshore Reserve, Dune	25
Sorrento (WA)	Sorrento Beach	wa0858	WA	31:49:50.00 S	115:44:42.00 E	1.3	LTT	Foreshore Reserve, Protection	
South Curl Curl	CURL CURL	nsw315B	NSW	0:0:0.00 N	0:0:0.00 E	1.6	RBB/TBR	Foreshore Reserve, Protection	
South Maroubra	SOUTH MAROUBRA	nsw327B	NSW	0:0:0.00 N	0:0:0.00 E	1.3	TBR-LTT	Foreshore Reserve, Dune	55
South Melbourne	SOUTH MELBOURNE	vicP064C	VIC	37:50:50.00 S	144:56:44.00 E	0.4	TBR	Protection	
South Narrabeen	SOUTH NARRABEEN	nsw310C	NSW	0:0:0.00 N	0:0:0.00 E	1.3	TBR-LTT	Dune	25
South Port (SA)	Southport	sa0223	SA	35:9:37.00 S	138:28:8.00 E	1	LTT TBR	Dune	35
South West Rocks	FRONT	nsw137	NSW	30:53:12.00 S	153:3:31.00 E	0.5	LTT-R	Foreshore Reserve	20
St Kilda	ST KILDA	vicP063	VIC	37:52:3.00 S	144:58:23.00 E	0.4	LTT/TBR	Foreshore Reserve, Protection	15
Stockton	STOCKTON	nsw239B	NSW	32:49:18.00 S	151:55:50.00 E	1.5	TBR	Carpark, Dune	10
Surfers Paradise	Surfers Paradise	qld1591C	QLD	28:0:0.00 S	153:25:48.00 E	1.5	LTT/TBR	Foreshore Reserve, Protection	35
Sussex Inlet	CUDMIRRAH	nsw451	NSW	35:11:35.00 S	150:34:21.00 E	1.6	LTT+INLET	Dune	130
Swanbourne Nedlands	Swanbourne Beach	wa0840	WA	31:57:36.00 S	115:45:15.00 E	1.1	RLTT	Foreshore Reserve, Dune	30

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
35			Yes	Yes	Unknown	Concrete Ramp	The club is setback approx 35m from the veg line. Developed dune runs North from the club to Barrack Point, Rock outcrops occur within 10 meters of the club
40	Carpark/ Path	Yes: discontinuous	No	Yes	Yes	Concrete Ramp	The club is setback behind paved carpark and walking track situated on the back dune above the beach. Setback from veg line is approx 40m
20			No	No		Sand Path	Low res aerial photography
25	Dune fencing	Yes: discontinuous	Yes	Yes	Yes	Concrete Ramp	The club is located on top of the dune, the area consists of largely paved areas. The beach is embayed by two tombolos in lee of the rocky headlands, the beach is approx 1.2km in length
30		No	Yes	Yes	Yes	Sand Path	The club is located west if a river mouth that provides sediment that spreads out over the rock flats fronting the club
	Seawall - Rubble mound	No	Yes	Yes	Yes	Concrete Ramp	The club is fronted by a rock seawall and beachfront road that extends to Glenelg
25		Yes	Yes	Yes	Yes	Wooden ramp	The club appears well setback with Rock controlling shoreline movement of the approx 500m long beach
	Seawall - Stone	Yes discontinuous	No	No	Yes	Concrete ramp	The shoreline has been heavily modified by coastal protection works, a seawall fronts the clubhouse and there is a groyne 70m north of the club and another 150m m south of the club
	Seawall - Concrete	Yes: discontinuous	No	No	Yes	Concrete Ramp	Heavily engineered beach. Surf club located behind concrete seawall. Rock platforms approx 150m SE of club
55	Dune fencing		No	Yes		Sand Path	The club is located on at the more protected southern end of Maroubra beach, Outcrops can be seen SE of the club towards the southern headland
	Seawall - Stone		No	No	No	Direct	The club is located directly on the beach and is protected by a seawall around its perimeter
25	Dune fencing		No	Yes		Sand Path	Club setback approx 25m from developed dunes
35	Dune fencing	No	No	Yes	Yes	Sand Path	The club is located on a sand spit that crosses the mouth of the Onkaparinga River
20	Seawall - Rubble mound		Yes	No		Unknown	Low res aerial photography: The club is located on a foreshore reserve in lee of a rocky headland extending 170m seaward from the club. The club is closer a lagoon formed by a blocked creek mouth than to the water mark
15	Seawall - Concrete		No	No	Yes	Concrete Ramp	Inner city Melbourne club, heavily modified shoreline forming at St Kilda esplanade
20			No	Yes		Sand Path	The club is located on the carpark behind narrow dunes. The beach that the club is located on is afforded some protection by the training walls entering the Port of Newcastle
	Seawall - Concrete	No	No	No	Yes	Concrete Ramp	The club is located on the entrance of Cavil Ave. A road and concrete seawall front the club. The parcel of coast is highly modified
130			No	Yes	Yes	Wooden ramp	The club sits high in the back dune and has a setback of approx 130m
60			No	Yes			

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Swansea Belmont	BLACKSMITHS	nsw250C	NSW	0:0:0.00 N	0:0:0.00 E	1.5	TBR	Foreshore Reserve, Dune	40
Tacking Point	TACKING POINT/ LIGHTHOUSE	nsw171	NSW	31:28:36.00 S	152:55:50.00 E	1.6	TBR	Foreshore Reserve, Dune	50
Tallebudgera	Tallebudgera	qld1593A	QLD	28:6:0.00 S	153:27:36.00 E	1.5	LTT/TBR	Foreshore reserve, Dune, Protection	100
Tamarama	TAMARAMA	nsw322	NSW	33:54:2.00 S	151:16:14.00 E	1.5	TBR+ROCKS	Rock	
Tannum Sands	Tannum Sands	qld1433	QLD	23:56:48.00 S	151:22:32.00 E	0.4	R+LT+SF	Foreshore Reserve, Dune	40
Taree Old Bar	OLD BAR	nsw187	NSW	31:58:16.00 S	152:35:33.00 E	1.5	TBR	Dune	60
Tathra	TATHRA	nsw659	NSW	36:42:54.00 S	149:58:44.00 E	1.6	RBB-TBR	Exposed	
Terrigal	Wamberal-Terrigal	nsw285	NSW	33:26:11.00 S	151:26:35.00 E	1.5			
Terrigal	TERRIGAL	nsw285B	NSW	33:26:44.00 S	151:26:39.00 E	1.2	TBR-LTT	Foreshore Reserve, protection	
The Entrance	THE ENTRANCE	nsw276	NSW	33:20:52.00 S	151:30:14.00 E	1.3	LTT	Protection	
The Lakes	LAKES	nsw268B	NSW	0:0:0.00 N	0:0:0.00 E	1.5	TBR/RBB	Dune	30
Thirroul	THIRROUL	nsw363	NSW	34:18:59.00 S	150:55:42.00 E	1.6	TBR/RBB	Exposed	
Toowoon Bay	TOOWOON BAY	nsw278	NSW	33:21:33.00 S	151:30:1.00 E	1	TBR-LTT	Foreshore Reserve, Protection	10
Torquay	TORQUAY	vic297	VIC	38:20:29.00 S	144:19:17.00 E	1.2	TBR	Foreshore Reserve, Protection	
Towradgi	TOWRADGI	nsw370A	NSW	0:0:0.00 N	0:0:0.00 E	1.6	TBR/RBB	Foreshore Reserve, Dune	80
Trigg Island	Trigg Island	wa0843	WA	31:52:29.00 S	115:45:5.00 E	1.2	LTT-TBR-REEF	Foreshore Reserve, Dune	15
Tugun	Tugun	qld1597A	QLD	28:8:24.00 S	153:29:24.00 E	1.5	LTT+TBR	Foreshore Reserve, Dune	35
Tweed Heads Coolangatta	Coolangatta-Greenmount	qld1599	QLD	28:9:59.00 S	153:32:24.00 E	1.4	TBR	Foreshore reserve	30

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
40	Dune fencing		No	Yes	Yes	Concrete ramp	A training wall extends approx 350m seaward from the veg line at the southern extent of the beach which is approx 500m from the club. This likely influences local wave climate and sediment transport the beach in front of the club
50		Yes: discontinuous	No	Yes	Yes	Sand Path	Pockets of rock outcropping along the beach
100	Seawall - Rubble mound	No	No	Yes	Yes	Concrete Ramp	The club is located next to the mouth of the Tallebudgera creek, a seawall is present on the shoreline of the creek. The club appears well setback from the veg line of the dune. The Sth breakwater of the Talle creek acts as a control point trapping sediment
			Yes	No	Yes	Concrete ramp	The club is located on a rock outcrop at approx 10m above the beach
40	Unknown	No	No	Yes	Yes	Compacted track	Low res aerial photography
60			No	Yes	Yes	Concrete Ramp	The club is setback from the vegetation line by approx 65m and located on top of the dune. The beach has a wide surf zone cut by frequent rips
		Yes: discontinuous	Yes	No		Direct	The club is flanked by dunes at both sides. The club is located directly on the veg line fronting onto a wide sandy beach protected by an eastern rocky headland
	Seawall - Concrete	Yes: discontinuous	No	No	Yes	Concrete Ramp	The club is located on a heavily modified shoreline with concrete paths and seawalls
	Seawall - Rubble mound	Yes: discontinuous	No	No	Yes	Concrete Ramp	The club is perched above the beach and protected by a rubble mound seawall at its base
30	Dune fencing	Yes: discontinuous	No	Yes	Yes	Sand Path	The club is located on a more isolated stretch of coast. The club appears well setback and sits in the back dune above the beach level
			No	No	No	Direct	The club sits on a concrete slab in line with the former veg line. The slab extends approx 1ft high above the sand level in the photo
10	Seawall - Stone	Yes	Yes	No	Yes	Concrete Ramp	The club sits on the shoreline fronted by a tombolo that has formed in lee of the eastward rocky outcrops
	Seawall - Concrete	Yes: discontinuous	Yes	Yes	Yes	Concrete Ramp	The club is fronted by a concrete area and seawall, vegetated reserve is adjacent to the club a creek runs south of the club, the creek is usually blocked forming a lagoon, limestone cliffs are south of the blocked creek mouth
80		Yes	Yes	Yes	Yes		The club is well set back behind a well developed dune system
40	Dune fencing		Yes	Yes	Yes	Concrete ramp	The club is fronted by paved reserved and remediated dunes.
35	Dune fencing	No	No	Yes	Yes	Concrete Ramp	
30	Dune fencing	No	Yes	Yes	Yes	Concrete Ramp	The club lies just south of Greenmount head, a rocky headland. This end of Greenmount beach has been heavily influenced by the Tweed sand bypassing project. Massive accretion has occurs in the past decade

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Ulverstone	Buttons Beach	tas1116	TAS	41:9:10.00 S	146:11:6.00 E	0.9	R + LTT	Protection	15
Umina	UMINA	nsw297B	NSW	33:31:39.00 S	151:18:57.00 E	1	TBR	Dune	35
Urunga SLSC	HUNGRY HEAD	nsw118	NSW	30:31:46.00 S	153:1:32.00 E	1.3	TBR-LTT	Dune, Road	35
Venus Bay	VENUS BAY	vic141	VIC	38:44:30.00 S	145:50:25.00 E	1.7	TBR/RBB	Dune	130
Wamberal	WAMBERAL	nsw285A	NSW	33:25:50.00 S	151:26:50.00 E	1.6	TBR/RBB	Dune	30
Wanda	WANDA	nsw334B	NSW	0:0:0.00 N	0:0:0.00 E	1.6	TBR/RBB	Dune	30
Waratah Beach	SANDY POINT (WARATAH BAY)	vic119A	VIC	38:50:24.00 S	146:7:45.00 E	1.6	TBR/RBB	Dune	60
Warilla Barrack Point	WARILLA-BARRACK PT	nsw380	NSW	34:33:7.00 S	150:52:10.00 E	1.5	TBR/RBB-TBR	Foreshore reserve, dune	75
Warriewood	WARRIEWOOD	nsw308	NSW	33:41:25.00 S	151:18:32.00 E	1.4	TBR	Dune	15
Warrnambool	WARRNAMBOOL	vic500	VIC	38:23:39.00 S	142:29:35.00 E	1.3	LTT/TBR	Dune	40
Wauchope Bonny Hills	RAINBOW/ BONNY HILLS	nsw174	NSW	31:34:32.00 S	152:50:35.00 E	1.5	TBR	Carpark, Dune	30
West Beach	West Beach	sa0231C	SA	34:56:23.00 S	138:29:24.00 E	0.6	LTT LBT	Protection	15
Whale Beach (Lifeguards)	WHALE	nsw301	NSW	33:36:38.00 S	151:19:53.00 E	1.5	TBR		
Whyalla	Whyalla	sa0596	SA	33:2:34.00 S	137:34:51.00 E	0.2	R + SF	Protection	
Williamstown	WILLIAMSTOWN	vicP069	VIC	37:52:0.00 S	144:53:30.00 E	0.1		Foreshore Reserve, Protection	20
Windang	WINDANG	nsw379B	NSW	0:0:0.00 N	0:0:0.00 E	1.6	TBR/RBB	Dune	30
Wollongong City	WOLLONGONG CITY	nsw373	NSW	34:26:1.00 S	150:54:8.00 E	1.5	TBR	Dune	40
Woodside Beach	WOODSIDE	vic078T	VIC	38:33:16.00 S	146:58:33.00 E	1.3	LTT	Dune	40
Woolamai Beach	WOOLAMAI	vic190	VIC	38:32:17.00 S	145:19:57.00 E	1.6	TBR/RBB	Dune	40
Woolgoolga SLSC	WOOLGOOLGA	nsw090	NSW	30:6:12.00 S	153:11:58.00 E	1.2	TBR-LTT		
Woonona	WOONONA	nsw367A	NSW	0:0:0.00 N	0:0:0.00 E	1.6	TBR/RBB-TBR	Foreshore Reserve, Dune	50

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
		Yes	No	No		Concrete Ramp	
35	Dune fencing	Yes: discontinuous	No	Yes	Yes	Concrete Ramp	A new club was finished in 2008, the club is set back behind the dunes
35		Yes: discontinuous	Yes	Yes	Yes	Unknown	The club is setback above the beach on top of vegetated reserve. A carpark and road fronts the club. A creek with a closed mouth is present 50m south of the club
130		Unknown	Unknown	yes	Yes	Path	The club is well setback into the high dunes
30	Dune fencing	Yes: Discontinuous	No	Yes	Yes	Concrete Ramp	The club is setback behind dunes, Terrigal lagoon is present North of the club
30	Dune fencing		No	Yes	Yes	Concrete Ramp	The club is located at the northern end of Cronulla beach and exposed to higher wave energy than the 3 clubs south on the same beach
60		Unknown	No	Yes	yes	Path	The club is well setback into the dunes
75	Dune fencing		No	Yes	Yes	Concrete Ramp	
15	Seawall - Rubble mound	Yes: Discontinuous	Yes	Yes	Yes	Sand Path	The club is located at the southern extent of the beach at the top of a modified dune with a small seawall at its toe. The club is buffered to the S and E by a Rocky headland
40			No	Yes	Yes	Sand Path	The club is setback behind foredunes. Car bodies and other bulk waste lies beneath the foredunes
30		Yes: discontinuous	Yes	Yes		Under construction	The new club was completed in September 2010. Swell direction is from the east. The club is located behind a carpark and narrow band of dunes on a rocky/sandy beach
	Seawall - Rubble mound	No	No	No	Yes	Concrete Ramp	The club is located above the beach behind a large rubble mound seawall
	Seawall - Concrete	No	No	No	Yes	Concrete Ramp	The Club is fronted by seawall and road. It is located in a protected area of the Spencer gulf and receives low wave energy, a large harbour and breakwaters are located to the NW which would likely be providing a control to local sediment transport
	Seawall - Concrete, Groyne		No	No	Yes	Concrete Ramp	Highly modified beach with continuous concrete seawall, a approx 100m groyne south of the club
40	Dune fencing		No	Yes	Yes	Sand Path	
40			No	Yes	Yes	Concrete Ramp	The club is fronted by a concrete walking path and other sealed surfaces, The club sits above beach height approx 40m setback from the veg line of the coastal dune
40			Unknown	Yes	Yes	Unknown	Low res aerial photo. Photos of clubhouse not available. Club appears setback in high dune
40	Dune fencing		Yes	Yes	Yes	Compacted track	The club is setback behind dunes, granite outcrops occur along the coast
50		Yes: discontinuous	No	Yes	Yes	Concrete Ramp	Club appears well setback behind developed dunes

SURF CLUB	BEACH NAME	BEACH ID	STATE	LAT	LON	Hs	BEACH TYPE	BUFFER TYPOLOGY	BUFFER DISTANCE (m)
Wye River	WYE RIVER	vic351	VIC	38:38:3.00 S	143:53:34.00 E	1.4	TBR+ROCKS +REEF	Dune	25
Yamba	YAMBA	nsw042	NSW	29:26:3.00 S	153:21:51.00 E	1.3	TBR	Protection	
Yanchep	Yanchep Beach	wa0896	WA	31:32:42.00 S	115:37:14.00 E	1.2	LTT TBR	Carpark, Dune	45
Yeppoon	Yeppoon	qld1363	QLD	23:7:54.00 S	150:44:59.00 E	0.4		Foreshore Reserve, Protection	20

DIST FROM VEG LINE (m)	STRUCTURES	OFFSHORE REEF	VISIBLE ROCK	VISIBLE DUNE	ABOVE BEACH	ACCESS	NOTES
25			Yes	Yes	Yes	Compacted track	The club is setback from the dunes. The beach is approx 250m wide and bounded by two rock platforms, Wye river flows south of the club, and its mouth is usually blocked.
	Seawall - Concrete/ Rubble		No	No	No	Direct	From inspection of photos the club is protected by a concrete/ rubble seawall that is in poor condition. The bay looked particularly eroded
45		Yes	Yes	Yes	Yes	Sand Path	The club is located behind a carpark setback behind the dunes. The beach is buffered by the rock platform and reef approx 70-100m offshore. A calm lagoon is in its lee.
	Seawall - Rubble mound	No	No	No	Yes	Concrete Ramp	Shoreline stabilised with coastal armour and protection. Large tidal difference

Appendix 3: Climate change projections

Climate projections are established based on emission scenarios and socio-economic scenarios, applied to model the future evolution of the greenhouse effect at the global scale. The IPCC uses "standard" scenarios to simplify the comparison of results from different climate models (defined in Nakicenovic and Swart 2000), known as the "SRES scenarios" (Special Report on Emissions Scenarios). Four families of socio-economic scenarios (A1, A2, B1 and B2) represent different world futures in two distinct dimensions: economic versus environmental, and global versus regional development patterns. Selected global non-climatic environmental and socio-economic trends relevant to coastal areas for each of these families are outlined in Table 5. The projections are **not** predictions, but rather a set of assumptions applied to forecast potential futures.

Table 5: IPCC Special Report on Emission Scenarios (SRES) (IPCC 2000)

Scenario	Description
A1	The A1 storyline describes a future world of very rapid economic growth, a global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 storyline develops into three scenario groups that describe alternative directions of technological change in the energy system. They are distinguished by their technological emphasis: fossil intensive (A1FI), non-fossil energy sources and technologies (A1T), or a balance across all sources (A1B)
A2	The A2 storyline describes a very heterogeneous world. The underlying theme is self reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing population. Economic development is primarily regionally oriented and per capita economic growth and technological change more fragmented and slower than other storylines.
B1	The B1 storyline describes a convergent world with the same global population as in the A1 storyline (one that peaks in mid-century and declines thereafter) but with rapid change in economic structures toward a service and information economy, with reductions in material intensity and the introduction of clean and resource efficient technologies. The emphasis is on global solutions to economic, social and environmental sustainability, including improved equity, but without additional climate initiatives.
B2	The B2 storyline describes a world in which the emphasis is on local solutions to economic, social and environmental sustainability. It is a world with continuously increasing global population, at a rate lower than A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the B1 and A1 storylines. While the scenario is also oriented towards environmental protection and social equity, it focuses on local and regional levels. An illustrative scenario was chosen for each of the six scenario groups – A1B, A1FI, A1T, A2, B1 and B2. All were considered equally sound by the IPCC.

Six "marker" scenarios have been developed out of these four families: one each for the A2, B1 and B2 worlds, and three scenarios for the A1 world: A1T (non-fossil fuel sources); A1B (balanced fuel sources); and A1FI (fossil-intensive fuel sources). Each of these scenarios result in a differing range of climate change impacts summarised in Table 6. B1 produces the lowest emissions and A1FI produces the highest emissions.

The major climate change factors relevant to the coastal zone include storms, waves, sea level, temperature, CO_2 concentration and runoff. Global mean projections for sea level rise (SLR), sea surface temperature (SST) and pH for the six SRES scenarios are presented in

Table 7. Globally CO_2, SST, sea level and storm intensity are set to increase, however there is likely to be significant regional variability for all except CO_2. Global trends in storm frequency, storm track and wave climate are uncertain, with all experiencing significant regional variability. Thus, it is useful to focus on regional predictions for climate change in relation to coastal areas.

Table 6: Selected global non-climate environmental and socio-economic trends relevant to coastal areas for the SRES storylines (Nicholls et al., 2007).

Environmental and socio-economic factors	Non-climatic changes and trends for coastal and low-lying areas (by SRES Future)			
	'A1 World'	'A2 World'	'B1 World'	'B2 World'
Population (2080s) (billions)	1.8 to 2.4	3.2 to 5.2	1.8 to 2.4	2.3 to 3.4
Coastward migration	Most likely	Less likely	More likely	Least likely
Human-induced subsidence	More likely		Less likely	
Terrestrial freshwater/sediment supply (due to catchment management)	Greatest reduction	Large reduction	Smallest reduction	Smaller reduction
Aquaculture growth	Large increase		Smaller increase	
Infrastructure growth	Largest	Large	Smaller	Smallest
Extractive industries	Larger		Smaller	
Adaptation response	More reactive		More proactive	
Hazard risk management	Lower priority		High priority	
Habitat conservation	Low priority		High priority	
Tourism growth	Highest	High	High	Lowest

Table 7: Projected global mean climate parameters relevant to coastal areas at the end of the 21st century for the six SRES scenarios (Nicholls et al. 2007)

Climate Driver			B1	B2	A1B	A1T	A2	A1FI
Surface ocean pH (baseline today: 8.1)			8.0	7.9	7.9	7.9	7.8	7.7
SST rise (°C) (relative to 1980-1999)			1.5	-	2.2	-	2.6	-
Sea-level rise (relative to 1980-1999)	Best estimate	(m)	0.28	0.32	0.35	0.33	0.37	0.43
	Range (m)	5%	0.19	0.21	0.23	0.22	0.25	0.28
		95%	0.37	0.42	0.47	0.44	0.50	0.58

National Projections

Globally, projections indicate a rise in sea surface temperature, sea level and storm intensity, however, there is likely to be significant regional variability in the degree of change. The Australian Greenhouse Office, through the Australian Climate Change Science Programme, engaged CSIRO and the Bureau of Meteorology to develop climate change projections for Australia. The latest projections are documented in the report, *Climate Change in Australia* (CSIRO 2007). Australia-wide changes in climate may be summarised as follows:

- An increase in land temperatures ranging from 1°C by 2030 to 5°C by 2070;
- A tendency for increase in coastal wind speed;

- Global sea level rise by 18 – 59 cm by 2100;
- An increase in sea surface temperature;
- A likely increase in the proportion of tropical cyclones;
- An increase in the frequency of hot days and warm nights; and
- A decrease in precipitation of between 2% and 5% by 2030 and approximately 10% by 2070 in the southwest.

The projections are expected to vary at an Australia-wide scale. For example, rainfall is predicted to increase in northern Western Australia, but decrease in the southwest of Western Australia (Figure 10). Due to the nature of climate variability, projections have been further focused to reflect potential conditions for major Australian Cities Table 8. The projections suggest an increase in seasonal and annual temperature across all states, with variable changes in rainfall, humidity and in solar radiation that will have associated significant impacts for ecosystems, economic growth and human settlements across the region (CSIRO 2007).

It is important to note that the projections in Table 4 are not presented for all climate variables. For example, there are no projections for change in mean sea level or wind direction). Further, they are based on the results of multiple climate models and do not account for local topographical effects. However, in the absence of more detailed climate modelling, these projections are considered the best available information from which to draw inferences on potential changes in climate.

Climate and oceanic drivers are the primary forcing factors of coastal change. In the coastal region, climate change affects ocean water levels, winds, wave conditions, coastal currents, sediment transport patterns and ocean nutrients (NCCOE 2004). It is important to recognise that these coastal specific parameters are the main drivers of coastal changes.

NCCOE (2004) provides a framework for assessing risk of climate change in the coastal zone. This framework defines the primary climate variables as outlined in Table 9. Climate change projections for each of the primary variables are drawn primarily from CSIRO (2007) and supplemented with information drawn from the IPCC Fourth Assessment Report (IPCC 2007).

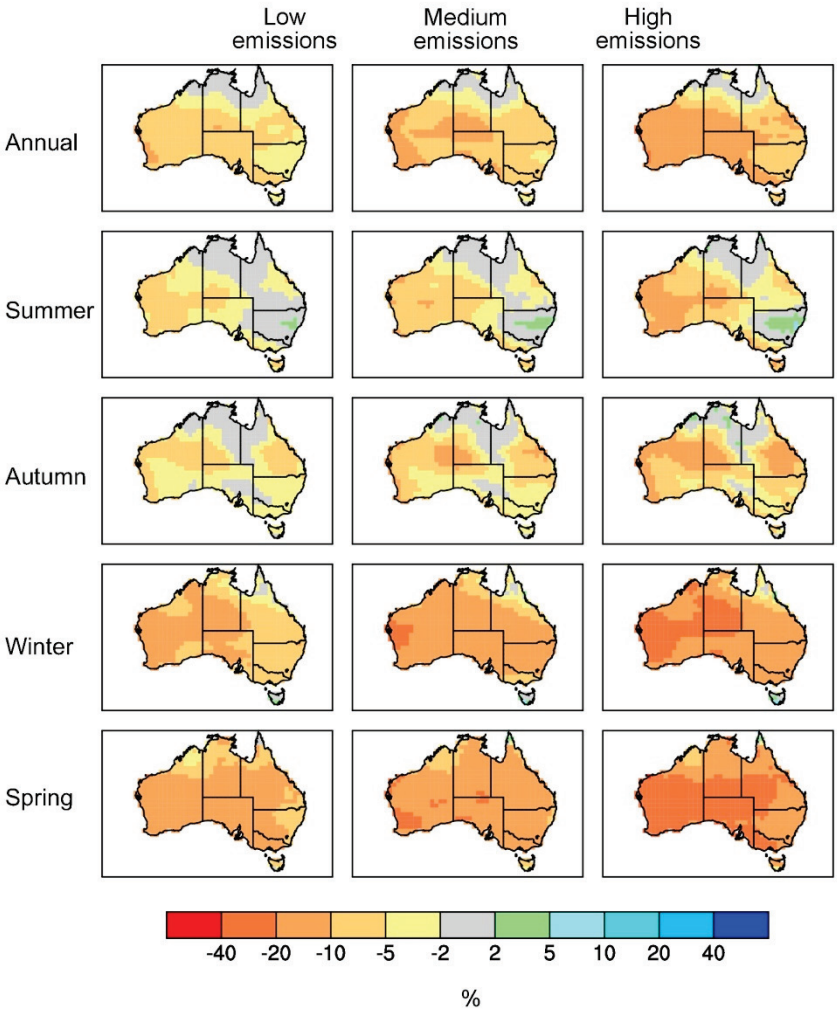

Figure 10: Average National Change in Rainfall in 2070, 50th percentile. (CSIRO, 2007)

Table 8: Climate projections for Australian capital cities, 2070 A1FI 50th percentile

Variable	Season	Adelaide	Brisbane	Canberra	Darwin	Hobart	Melbourne	Perth	Sydney
Temperature (°C)	Annual	2.8	3.1	3.0	3.2	2.1	2.8	2.7	3.0
	Summer	3.0	3.0	3.2	3.2	2.2	3.1	2.9	3.1
	Autumn	2.8	3.0	3.0	3.3	2.2	2.7	2.7	3.0
	Winter	2.4	3.1	2.5	3.2	1.9	2.2	2.3	2.6
	Spring	3.0	3.2	3.3	3.3	1.9	2.9	2.9	3.3
Rainfall %	Annual	-13	-9	-9	-1	-6	-11	-19	-8
	Summer	-5	-3	1	1	10	-4	-12	2
	Autumn	-4	-9	-6	0	-4	-5	-12	-6
	Winter	-19	-18	-16	-13	0	-12	-22	-16
	Spring	-23	-18	-19	-15	-12	-21	-27	-17
Wind-speed (%)	Annual	0	6	-2	2	4	-1	-1	-1

Variable	Season	Adelaide	Brisbane	Canberra	Darwin	Hobart	Melbourne	Perth	Sydney
	Summer	7	7	4	3	-6	-1	8	8
	Autumn	-1	3	-8	-2	-2	-8	6	-5
	Winter	-6	-1	-1	0	15	2	-14	-3
	Spring	-1	17	-3	7	7	-1	-3	-1

Table 9: Key climate drivers and their significance on the Australian coast (following NCCOE 2004, p. 21)

Key Variable	Australian Scenario	Comment
Mean Sea Level	Projected range of sea level rise (m): Scenario Percentile 2030 2070 B1 95 0.13 0.33m A1B 95 0.14 0.41m A1F1 95 0.15 0.47m	Projected range of sea level rise (m) relative to 1990 baseline: The IPCC AR4 provides maximum and minimum projections for the decade 2090-2099 and for the potential dynamic response of the Greenland and Antarctic Ice Sheets but does not provide time series for projections of sea level rise throughout the 21st Century. Therefore, Hunter (in press) analysed the AR4 outputs in combination with the TAR outputs to establish time series data[9]. This information has been applied to establish SLR predictions for inclusion in the current assessment.
Ocean Currents and Temperature	No quantitative or qualitative models are available for coastal regions of the continent. Important to differentiate between currents driven by major circulation e.g. East Australian or Leeuwin Current and atmospherically forced currents such as storm surge or coastally trapped waves. Tidal currents will vary in shallow waters with sea level rise. SST increase similar to air temperature increase.	Natural spatial and temporal variability still masks the underlying behaviour of the oceans and hinders climate change assessment. Global data gathering is advancing knowledge on many fronts.

[9] See http://www.cmar.csiro.au/sealevel/sl_proj_21st.html#21C_ts

Key Variable	Australian Scenario	Comment
Wind Climate	Largely qualitatively: - Trade winds may be weaker - Westerly wind stream may move further south More quantitatively: - Maximum potential intensity of tropical cyclones may increase by 10% to 20% - Regions of cyclogenesis and the regions affected by tropical cyclones are not expected to change significantly.	Climate models do not at this stage provide firm predictions for any key meteorological features such as the timing, intensity or location of the tropical monsoon, mid-latitude systems, the subtropical anti-cyclone belt or ENSO related effects. Localised effects remain possible.
Wave Climate	Regional wave climate will alter if regional wind patterns change. Seasonal wave direction would be affected if the mean latitudinal position of major weather systems alone were changed. Other factors will be site specific and determined by the local sea level rise and bottom topography.	Not possible to formulate a general scenario as effects could vary. Intensity changes are subject to qualifications in regard to the wind climate.
Rainfall / Runoff	Rainfall changes: By 2030: - Summer -10% to +10% overall - Winter -10% to + 5% overall By 2070: - Summer -35% to +35% overall - Winter -35% to +10% overall	Increases are possible in the frequency of occurrence of high intensity precipitation events.
Air Temperature	Rise in land surface air temperature: By 2030: - 0.4 - 2.0 °C most areas By 2070: - 1.0 - 6.0 °C most areas	Increases are possible in the frequency of occurrence of extremely high temperatures with reductions in the frequency of very low temperatures.

The severity of change in key climate drivers differs per climate scenario. Importantly, since the IPCC projections were published in 2007, the growth of greenhouse gas has been slightly greater than the most pessimistic IPCC emissions scenarios (A1FI) (IDDRI 2009). Consequently, strategic risk assessments undertaken in Australia commonly apply the A1FI scenario as a baseline for change. This approach was adopted in consideration of the potential impacts of climate change on SLSA (as discussed in Section 3 of this report).

Appendix 4: Impacts of Climate Change on the Australian Coastal Zone

Australia has a diverse coast stretching approximately 35,000 km (Geoscience Australian, 2010). The dynamic interactions between coastal and terrestrial processes over time have shaped the Australian coastline. It is estimated that more than 10,000 sandy beaches make up about half of mainland Australia's coast; much of the remainder is rocky coast. The coast of Australia can be classified into four broad geomorphic regions (Figure 11, DCCEE 2009). These regions have been delineated based on their respective geomorphology, sediment characteristics and metocean characteristics (tides, waves, currents) and include:

- Region 1: Cape York to Exmouth
- Region 2: Exmouth to Wilsons Promontory
- Region 3: Wilsons Promontory to Fraser Island
- Region 4: Fraser Island to Cape York

Tasmania and the Bass Strait islands share characteristics of both Regions 2 and 3. The characteristics of each region and the projected impacts of climate change based on biophysical environment are summarised here.

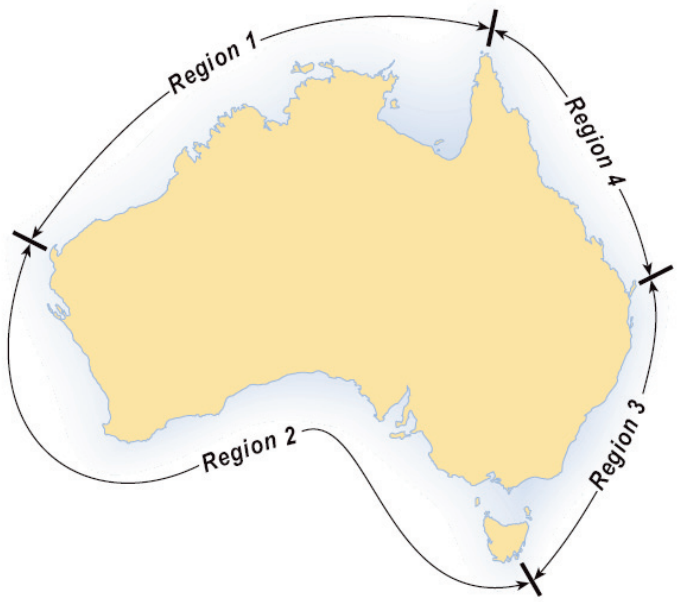

Figure 11: Broad Regions of Australian Geomorphology (DCCEE, 2009)

Region 1: Cape York to Exmouth

The muddy coasts of northern Australia are subject to macro-tidal conditions, high rates of annual rainfall and are particularly prone to cyclones. The cyclonicity of the region has shaped the low level cheniers (sand and shell ridges) on the muddy shorelines with fringing mangroves. Large tidal flats with sparse vegetation cover generally extend into many estuarine environments where mangroves have adjusted and established to tidal levels and sediment conditions. Run off from rainfall in the wet season greatly increases the sediment output of catchments and complex hydrologic processes and interactions between tidal flows, stream discharge and sediments occur in the estuaries, bays, and gulfs.

The macro-tidal conditions of this region drive coastal processes and evolution. The impacts of coastal climate change will be largely felt through the associated effects of cyclone activity. Tropical cyclones are the major climatic driver within this region. Tropical cyclones cause substantial erosion of the coast when inundation occurs overtopping unconsolidated coastal dune systems resulting in erosion and deposition as sand sheets extending inland (Nott, 2006). High intensity precipitation associated with cyclone activity has the potential to increase coastal flooding; furthermore the impacts of cyclones may be amplified by degradation of mangrove forests by anthropogenic activity.

Region 2 – Exmouth to South East Tasmania

The carbonate coasts are subject to mainly micro-tidal conditions and exposed to high wind and wave energy generated in the Indian and Southern Oceans. Sediments in the region are mostly derived from marine carbonates. Aeolian (wind driven) processes mobilise calcareous sands into generally west to east aligned dune ridges. There is high prevalence of limestone cliff as seen in areas of coast in Shark Bay, the Great Australian Bight and areas surrounding Port Campbell in western Victoria reflecting their exposure to high wave energy conditions. The southernmost tracks of tropical cyclones occurring in Region 1 also influence the coastal conditions in Region 2.

The impacts of coastal climate change will be varied in this region due to the combination of stretches of limestone and calcarenite cliffs and the presence of bays, estuaries and gulfs where tidal processes and flats are more significant. The added impact of sea level rise on storm surges will impact beach stability due to potential inundation of low-lying coastal regions (Eliot and Pattiaratchi, 2005). The severity of cliff erosion under climate change in this region is unknown (DCCEE 2009), however changes in wave climate under climate change may have the potential to increase wave attack of soft coastal cliffs resulting in recession.

Region 3 – South East Tasmania to Fraser Island

The bayed coasts with micro-tidal conditions and quartz sediments are exposed to moderate wind and wave energy from the Tasman Sea and Southern Ocean. The region can at times be influenced by tropical periodic high-energy cyclonic activity, including tropical cyclones to the north and extra-tropical cyclones. The Region is characterised by the presence of rocky headlands that separate beach and dune stretches of varying lengths. In the northern part of the region, sediments in the littoral system can bypass the headlands moving northwards. Drowned river valleys cut into ancient uplands forming intricate estuaries and low-lying delta systems where settlements and agriculture are clustered as seen on the central coast of New South Wales.

Storm systems may result in a range of impacts on the coast dependent upon their interactions with sediment supplies, bay and shelf geometry. There is uncertainty in regards to the frequency and intensity of tropical cyclones tracking further south. However, they have the potential to cause widespread inundation, coastal erosion and saltwater intrusion of coastal aquifer systems. Projected changes in wind speed (Table 8) have the potential to mobilise unconsolidated sediments causing erosion of unvegetated coastal dunes reducing buffer capacity to storm events. In some estuarine systems of this region the seaward bar could become permanent which could potentially result in more saline conditions (Haines and Thom 2007).

Region 4 – Fraser Island to Cape York

The Great Barrier Reef and its islands provide a buffer to incident wave energy on the low-lying rocky mainland coasts of this Region, which experience a mixture of tidal conditions.

The Great Barrier Reef consists of more than 3,600 individual reefs and islands extending for approximately 2,300 km (DCCEE 2009). Low-lying deltas occupy the areas along the mainland coast that are periodically inundated during cyclonic floods.

Rises in sea level and sea surface temperature will have large scale impacts on sensitive ecosystems such as the Great Barrier Reef. A rise in sea level could potentially reduce the capacity of the reef to buffer against incident wave conditions. Increased sea surface temperatures may accelerate coral bleaching reducing the overall structural capacity of the reef system. As seen in Region 1, tropical cyclones are one of the major climatic drivers in the tropical north that cause extensive inundation and erosion of low lying coastal erosions. More pronounced impacts of cyclones may be felt along the sandy coastline in lee of the Great Barrier Reef as they are generally more deprived of sediments than southern beaches (DCCEE 2009).

Appendix 5: Assessment of Decision Making Architecture

The capacity of SLSA to manage climate change risks is reflected in the decision-making and operational processes of the organisation – the *what*, *why*, *how*, *where* and *where* of operations. This appendix presents the outcomes of the assessment of the decision-making architecture of SLSA. In particular, it examines:

- The *what* and *why* of the organisation: organisation vision, mission and objectives.
- The *how* of the organisation: organisational governance, decision process and delivery mechanisms.
- The *when* and *where* of the organisation: delivery, distribution and interrelationships.

The What and Why

The core activities of SLSA Surf Life Saving Australia (SLSA) are (Table 10):

- Coastal safety and lifesaving;
- Education and training
- Fitness and sport; and
- Member and organisational development.

The organisation aims to 'provide great beach experiences', and 'a safe beach and aquatic environment throughout Australia'. The overriding objectives of SLSA are to:

- Save lives in the water; and
- Promote a healthy, inclusive, clean, family lifestyle.

Table 10: SLSA core activities (SLSA 2007)

Service Category	Activities
Community Safety	Surf lifesavers: 37,000 trained volunteers providing 1.4 million hours of beach patrol per season Australian Lifeguard Services Support operations – helicopters, jet rescue boats and wave-runners
Health and Fitness	Surf sports participation – from nippers to international competition Surf carnivals The Australian Surf Life Saving Championships Coaching and officiating
Education and Training	Australian Lifesaving Academy – surf rescue, workplace training and leadership development Nippers School programs – teaching surf survival skills to kids in coastal and regional communities
Leadership	Peak body advocacy Social capital – through leadership and member development programs which value and promote volunteering Environmental responsibility – advancing protection and sustainability of the coastal environment
Australian Coast safe Services	The Australian Coastal Public Safety Guidelines Australian Beach Safety and Management Program (ABSAMP) Coastal safety and risk management services

The How

SLSA was built from the ground up - originating from the club level. The growth of SLSA has seen the development of branches, state centres and the national body, following a federate model of governance and management. Today, the peak policy and decision body for the surf lifesaving movement is the SLSA Board (the Board). The Board is supported by a number of committees, which play a role in the organisation's corporate governance and risk management.

The various entities (i.e. state centres, branches, clubs) of SLSA are not subsidiaries of SLSA Ltd and have a variety of different legal and reporting structures. Each entity has its own identify but is part of the SLSA family through adoption of standardised procedures and policies. Relationships between the multiple levels of the Federation are represented in Figure 12.

There is a flow of information, reporting and/or resources internally within the Federation (Barrington Consulting Group 2009). The roles of SLSA and the state centres are outlined in Table 11 and Table 12. While the roles are generally clear, the federated model of governance can result in some ambiguity, particularly in the areas of international operations, fundraising, funding clubs and communicating to members. Some management responsibilities cross scales (from club, to state, to national) and in some cases there is multiple responsibility, making logistical and financial responsibility unclear.

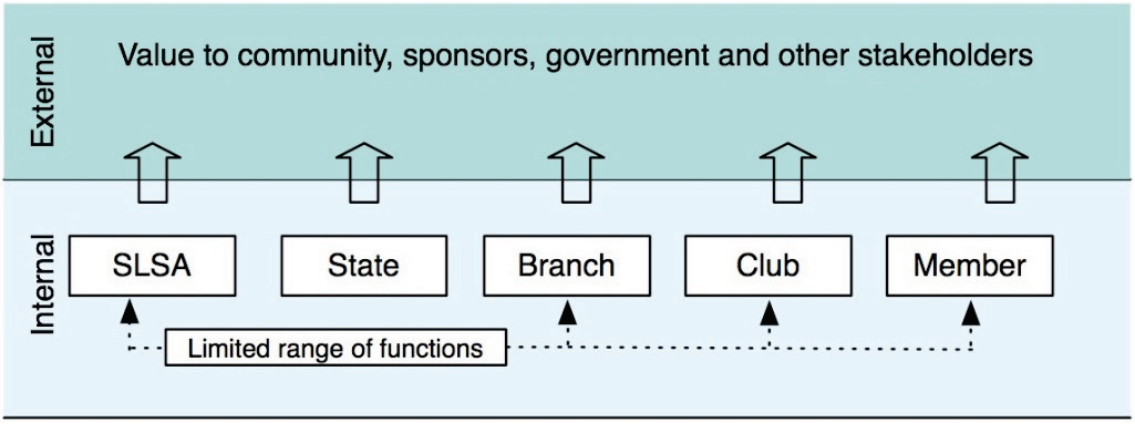

Figure 12: Delivery within SLS Federation (source: Barrington Consulting Group 2009)

Table 11: Roles of SLSA and State Centres (source: Barrington Consulting Group 2009)

Component	Role
SLSA	Provide leadership and direction for the SLS movement Provide input to leadership by state centres and assist the growth of SLS within their designated scope of activity Facilitate and share between State Provide resources Protect intellectual property Engage with national government and sponsors Coordinate national events Coordinate national branding and marketing Coordinate national sponsorship Coordinate national fundraising Drive standardizations and consistency

	Leverage State capability Manage the link between paid staff and volunteers Balance the requirements of individual States
State Centres	Provide input to leadership by Clubs and assist the growth of SLS within their designated scope of activity Deliver/implement within the designated scope of activity Engage with local levels of government and sponsors Provide feedback and input to SLSA Inform and report back to SLSA Facilitate/communicate to members Innovate in relation to programs, marketing and events Adapt resources, strategy and priorities as appropriate Apply standards/policies and customize to suit local conditions

Table 12: Delivery of Specific Roles within the Surf Life Saving (source: Barrington Consulting Group 2009)

Function	SLSA	State Centre	Club	Member
International operations	X	X	X	X
Fundraising	X	X	X	X
Funding Clubs	X	X		
Communicating to members	X	X	X	

SLSA relies on community support, its corporate partners and the Australian Government to fund the majority of its activities. This income is supplemented with royalties derived from trademark licensing. A small amount of funding is also received from fees for activities such as competitions and conferences. To support their activities, State centres are engaged in commercial activities such as education, training and the provision of contract lifeguard services to local government and other land managers.

SLSA is a charity and the Surf Life Saving Foundation actively conducts fundraising on behalf of SLSA and its state centres. In 2007 the Surf Life Saving Rescue Trust Fund (SRTF) was established for perpetuity funding to 'provide a more assured and ongoing source of income to the organisation for future program and resourcing needs. The Foundation is the trustee of the SRTF. Additionally, SLSA occasionally benefits from unsolicited bequests and donations. SLS clubs also conduct their own fundraising activities.

An overview of the financing mechanisms of the organisation is shown in Figure 13. In most cases, the National level receives support through the Federal Government, state centres receive support through State Governments and clubs receive support from top-down (Federal and state centre support) and through their own fundraising activities.

The distribution of financial support from Federal to state agencies is based on an established formula[10]. Subsequently, the distribution of funding from state centres to clubs is commonly based on 'equal share', i.e. equal levels of funding are distributed to all clubs in each State regardless of the clubs existing financial status. While some clubs are asset rich, they may not be financially rich. Others are both asset and income rich as a result of high membership, commercial activities and established connections and affiliations.

[10] The formula considers internal measures rather than external measures. External measures may include club value, use level, financial status.

Clubs pay annual fees of affiliation to the state centre, as does the state centre to the National body. In some cases, fees are based on club membership fees paid, where a proportion goes to the affiliation (i.e. state connection) to cover expenses such as insurance, while the national body also receives a proportion.

Lease arrangements differ significantly between clubs. Two clubs situated only 500 m apart may have very different arrangements. For example, one club may own the land and the premises in which they operate, while others have a 'peppercorn' lease with local councils. If there is, for example, damage to SLSA facilities, the 'responsibility' for this issue differs on a club-by-club basis depending upon the lease arrangements in place.

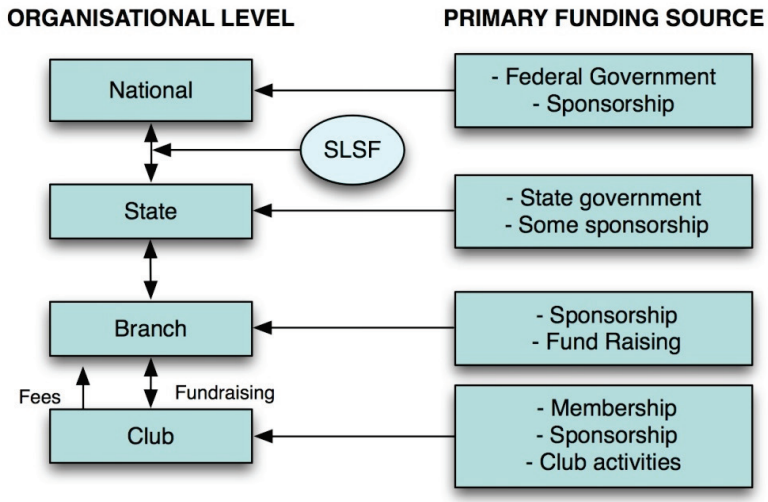

Figure 13: Financial mechanisms of SLSA

Plans and policies are set at the national scale. The focus of SLSAs strategic management plan is to develop the capacity and capability of the surf lifesaving movement to deliver quality services to meet the growing needs of beach visitors and SLSA members. The Barrington Consulting Group (2009) note that the Strategic Plan 2007-11, whilst generally understood and comprehensive, is: broad in nature; does not link to resourcing; and contains no annual targets. However, the Strategic Plan contains a number of activities (strategies) to implement its vision, including: delivering its peak body responsibilities; preventing deaths and injuries in the water, leading a strong viable national organisation, building frontline capacity and supporting SLSAs core objectives. There is general alignment between the national plan and the strategic plans of the state centres (Barrington Consulting Group 2009). However, due to the lack of annual targets with allocated resourcing, close alignment is difficult to achieve. Further, while not formally required, a majority of the clubs have annual plans that link, in part, to state centre strategic plans.

A model top-down policy development is adopted, where policy is developed based on a perceived need. SLSA has a number of policies in place in that guide operations and activities of SLSA. Those of relevance to the current Project include:

- Risk management policy: Outlines the two areas in which risks are likely to occur: strategic and operational risks. Policy aims to ensure that major risks are identified and effectively managed.
- Ecosurf policy: The Ecosurf policy includes policy statements and 'practice' to ensure ecologically sustainable use of the coastal environment. While water and energy saving initiatives are captured within this policy (as economic saving activities) this could be broadened to explicitly incorporate recognition of the impacts of climate

change and to outline practices to reduce/mediate these impacts – through provision of funding, promotion of activities that can be undertaken at home, etc.

- Governance Policy: Developed prior to the Organisational Effectiveness Review this policy provides guidance to the Board and outlines the role of the President, Directors and CEO.
- Lightning Policy: Sets out the guidelines for opening and closing beaches during lightning storms.
- Tsunami Policy: SLSA has developed a response guideline for a tsunami event. This guideline explains the processes that are to be considered by Surf Life Saving (SLS) State/Territory centres, and associated bodies, when developing a Tsunami Response Plan (the plans may differ at State levels). While this policy does not relate to climate driven risks, it provides an important framework that can be tailored to climate driven risk management – i.e. response during extreme weather events.

SLSA communicates with clubs through:

- Email and print communication direct to clubs.
- Communication with state bodies, who in turn communicate with local clubs through print and email.
- Findings/reports/initiatives are commonly emailed or posted directly to the club and relevant representative. On some occasions information is filtered via the state organisation.

Clubs receive a large amount of correspondence. Consequently, if it is not tied to their operational programs (i.e. saving lives) than it can be overlooked.

The When and Where

SLS relies on multiple components of the Federation to deliver its services including SLSA, the state centres, clubs and individual members. In some states, this extends to branches. Clubs are situated around the nation, particularly in highly urbanised coastal zones. The number and distribution of clubs is not the result of top-down planning and management. Rather, clubs originated in areas of identified need and on the basis of volunteer support for the establishment of such centres. The operational hours differ between clubs and are dependent upon the level of coastal use and the availability of staff or volunteers to provide SLS services. Importantly, the majority of SLSA services are provided by surf lifesavers who complete surf patrols in their own time (i.e. volunteers). SLSA operates the country's largest lifeguard service, contracting to local government and other coastal land managers.

The on-ground-delivery (club level) of SLS is guided by standard operational procedures, which are tailored to the geographic context of the clubs operations. Club operators determine the physical location for delivery of SLS. Whilst a defined service delivery area may be outlined in some clubs constitution (for example, from location X to location Y), in many cases delivery areas are not clearly defined and refer to a beach rather than defined geographic area.

SLSA is a foundation member of the International Life Saving Federation (ILS). Through this Federation SLSA maintains contact with other "lifesaving nations" and plays a leadership role in developing lifesaving expertise around the world.

Appendix 6: Climate Change Risk Assessment and Adaptation Programs/Projects Log

National Level Assessments

Project Name	Organisation	Status	Year	Link	Notes	Type
Climate Change Risks to Australia's Coasts: A First Pass National Assessment	Department of Climate Change and Energy Efficiency (DCCEE)	Completed	2009	http://www.climatechange.gov.au/publications/coastline/climate-change-risks-to-australias-coasts.aspx	This Report presents the findings of the first national assessment of the risks of climate change for the whole of Australia's coastal zone. The objectives of the first pass national coastal risk assessment are to: Initial assessment of the Climate Change (CC) implications for Australia's coastal regions. - Identify high risk areas to CC impacts. Identify impediments to developing effective coastal adaptation responses. - Help identify national priorities for adaptation to reduce CC risk in the coastal zone.	2.3
Smartline Landform and Stability Maps	Chris Sharples (University of Tasmania) Geoscience Australia	Ongoing		http://www.ozcoasts.org.au/coastal/introduction.jsp – data	A nationwide classification of coastal landforms and their associated vulnerability. Creation of a coastal geomorphic map at a national scale (whole of Australia) for use in assessing the vulnerability of Australia's coast to sea-level rise. More recently work is being done on combining the maps with coastal process data	1
Coastal Digital Elevation Model (DEM)	Department of Climate Change and Energy Efficiency (DCCEE)			http://www.climatechange.gov.au/publications/coastline/climate-change- risks-to-australias-coasts.aspx	The creation of a national Digital Elevation Model (DEM) was the highest priority task identified for the national risk assessment. DEMs provide a three dimensional model of the ground surface topography and are critical to assessing risk from inundation in low-lying areas. The mid resolution DEM covers the entire coast derived from SPOT High Resolution Stereoscopic Reference3D (SPOT) satellite imagery.	1
National Framework for Climate Change Science	Department of Climate Change and Energy Efficiency (DCCEE)	Completed	2009	http://www.climatechange.gov.au/government/initiatives/~/media/publications/science/national-framework-cc-science.ashx	The Framework identifies national climate change science priorities for the coming decade and sets out ways to harness our full science capacity to address them.	1.2

Project Name	Organisation	Status	Year	Link	Notes	Type
Australian Climate Change Adaptation Research Network for Settlements and Infrastructure	National Climate Change Adaptation Research Facility (NCCARF)	Completed	2010	http://www.nccarf.edu.au/national-adaptation-research-plan-settlements-and-infrastructure.pdf	Sets out the priority research agenda for the next 5-7 years to inform a better understanding of climate change risks and impacts on settlements and infrastructure and how these risks can be managed and impacts reduced through planned adaptation interventions.	1.2.3
House of Representatives inquiry into climate change and environmental impacts on coastal communities	Parliament of Australia	Completed	2009	http://www.aph.gov.au/house/committee/ccwea/coastalzone/report.htm	Inquiry into climate change and environmental pressures experienced by Australian coastal areas, with particular regard to: existing policies and programs related to coastal zone management, taking in the catchment-coast-ocean continuum - the environmental impacts of coastal population growth and mechanisms to promote sustainable use of coastal resources - the impact of climate change on coastal areas and strategies to deal with climate change adaptation, particularly in response to projected sea level rise - mechanisms to promote sustainable coastal communities - governance and institutional arrangements for the coastal zone.	1.2.3
Estimating Sea Level Extremes	Antarctic Climate & Ecosystems Cooperative Research Centre	Completed	2009	http://www.sealevelrise.info/	Web tool specifically designed for designers, planners and policymakers to assist in understanding how to: assess the risk to existing assets from sea level rise and plan appropriate adaptation -set appropriate design codes and planning strategies for future developments.	1.2.3.4
NCCOE 2004: Guidelines for responding to the effects of Climate Change in Coastal and Ocean Engineering	Institution of Engineers Australia	Ongoing	2012	http://www.climatechange.gov.au/about/grants/2010-40.aspx	Updating Engineers Australia's guidelines for responding to the effects of climate change in coastal and ocean engineering and sustainability guidelines.	

Key
1.Data Collection/Interpretation (i.e. the project involves investigation of Metocean Processes, Biological Drivers, Understanding Processes, Data Acquisition)
2.Vulnerability Assessment / Risk Assessment (identification and evaluation of the consequences for infrastructure, communities and natural assets
3. Adaptation Plan (following risk/impact/vulnerability assessments, identification of actions or responses to address risk / impacts / vulnerability
4. Strategy
5.Policy

State Level Assessments

Project Name	State	Organisation	Status	Year	Link	Scope	Notes	Type
NSW Coastline Management Manual	NSW	Dept. Environment, Water, Heritage and Arts	Completed		Http://www.environment.gov.au/coasts/publications/nswmanual/index.html		Guidelines for local councils, CMA and communities to develop coast zone management plans.	5
South East Queensland Climate Adaptation Research Initiative	QLD	CSIRO, Griffith University, the University of the Sunshine Coast (USC) and The University of Queensland (UQ).	Ongoing	2013			The SEQ-CARI three-year, $14 million research project is being conducted by CSIRO, Griffith University, the University of the Sunshine Coast (USC) and The University of Queensland (UQ). The group will examine how climate change is likely to impact on people living and working in urban and rural areas, agriculture, energy demands and energy supply, forestry and marine industries, and coastal and inland ecosystems.	
Improve models for coastal and riverine environments to incorporate climate change	QLD	Dept. Environment and Resource Management	Completed		http://www.climatechange.qld.gov.au/whatsbeingdone/queensland/strategies.html - progress_on_climate_change_actions		Refer to Office of Climate Change Progress Report on Actions & Initiatives	3
Improve understanding of the risks and impacts of climate change on coastal Queensland	QLD	Dept. Environment and Resource Management	Completed		http://www.climatechange.qld.gov.au/whatsbeingdone/queensland/strategies.html - progress_on_climate_change_actions		Refer to Office of Climate Change Progress Report on Actions & Initiatives	3
Tackling Climate Change - South Australia's Greenhouse Strategy 2007-2020	SA		Completed		http://www.climatechange.sa.gov.au/uploads/pdf/TACKLING_CLIMATE_CHANGE_STRATEGY.pdf		Framework for SA, climate and greenhouse reduction plan.	4
Australian Center for Climate Change Adaptation Program	TAS	University of Tasmania DCCEE	Ongoing	2011	http://www.climatechange.gov.au/about/grants/2010-37.aspx		In relation to coastal landform stability and climate change research – developing a methodology for erosion risk analysis under climate change integrating geomorphic and wave climate data sets.	1

Project Name	State	Organisation	Status	Year	Link	Scope	Notes	Type
Climate Change and Coastal Risk Management Project	TAS	Department of Primary Industries and Water (DPIW)	Completed		http://www.dpiw.tas.gov.au/inter.nsf/WebPages/HBAW-7HNVLZ?open		In mid 2006, DPIW initiated the Climate Change and Coastal Risk Management Project. The aim of the Project was to provide principles and practical tools to assist planning authorities plan and manage assets and values vulnerable to sea-level rise, inundation and erosion in the coastal zone.	1.2
Climate Change Risk Assessment: a practical tool to assist local government priority setting	TAS	Australian Maritime College	Completed				This project aims to develop a user-friendly guide to assist local government staff and councillors to address climate risk and impacts in their area. It will enable staff and institutions to conduct basic risk assessments on an ongoing basis, allowing flexibility to adapt or make new decisions as new information comes to light. The tool will draw on the model developed by the Australian Government and it has been piloted at Kingborough Council. The Draft Report was completed February 2009. Contact Dr Melissa Nursey-Bray on m.nursey-bray@amc.edu.au for more information.	2
Coastal vulnerability mapping, Chris Sharples 2006 (spatial maps)	TAS	Department of Primary Industries and Water (DPIW)	Completed	2006	file://localhost/Indicative Mapping of Tasmanian Coastal Vulnerability to Climate Change and Sea Level Rise, which can be found at http/::www.coastalvulnerability.info: Indicative mapping is available on the LIST website http/::www.thelist.tas.gov.au:		In 2004-2006, the Strategic Policy Division of DPIW commissioned Chris Sharples to prepare an indicative assessment of areas of the Tasmanian coast that are potentially vulnerable to erosion and slumping, sea cliff instability and storm surge flooding. Data is available at both present day climate and sea level predictions and under predicted future sea level rise conditions.	1

Project Name	State	Organisation	Status	Year	Link	Scope	Notes	Type
Vulnerability assessment of northern Tasmanian and southern Victorian ports to climate change	TAS/ VIC	Australian Maritime College	Ongoing				The Australian Maritime College is conducting a preliminary vulnerability assessment of the impacts of climate change on Australian orts. Anticipated effects include increased risk of inundation from sea level rise, encroachment of invasive species due to warmer waters and enhanced corrosion due to changes in sea chemistry. It takes a case-study approach and will focus on northern Tasmania and southern Victoria. For more information, please contact Dr Melissa Nursey-Bray email: m.nursey-bray@amc.edu.au	2
Future Coasts Program	VIC	Spatial Information Systems Research Limited	Ongoing	2012	http://www.climatechange.gov.au/about/grants/2010-41.aspx		In relation to funding for Phase 2, Urban Digital Elevation Modelling in high priority regions.	1
Future Coasts Program	VIC	Victorian Department of Sustainability and Environment in partnership with the Department of Planning and Community Development.	Ongoing		http://www.climatechange.vic.gov.au/adapting-to-climate-change/future-coasts		The $13.5 million investment by the Victorian Government in the Program will help Victoria better understand and plan for the risks associated with climate change, by producing information about the impacts of sea level rise along the Victorian coast, with a focus on coastal erosion and flooding.	1
Victorian Centre for Climate Change Adaptation Research	VIC	University of Melbourne	Ongoing		http://www.vcccar.org.au/ - VCCAR website		VCCCAR aims to improve understanding in government and the community about the potential impacts of climate change and adaptation options. Researchers will work closely with all levels of government and the community to ensure that research results make a difference to policy and practice.	Various
Victorian Coastal Strategy	VIC	Dept. Sustainability and Environment	Completed		http://www.vcc.vic.gov.au/2008vcs/part2.1climatechange.htm	Statewide	Sets overall strategic direction for planning and management of the coast.	4

Project Name	State	Organisation	Status	Year	Link	Scope	Notes	Type
WA Coast Project - Sediments cell and Coastal Compartment Delineation	WA	Geological Survey of Western Australia Bob Gozzard (DMP)	Ongoing			Naturaliste to Lancelin - Lancelin to Kalbarri	The Geological Survey of Western Australia has recently completed a survey of the coast between Lancelin and Cape Naturaliste. The survey has characterised the geomorphology and geology of the nearshore, foreshore and backshore at a high level of detail using the 'Smartline' mapping concept. The results of the study are aimed at coastal engineers, planners, managers and organisations that are involved in developing and implementing coastal management plans.	1.2
Coastal Compartments and Sediment Cells	WA	Department of Planning Department of Environment and Conservation	?	?		Statewide – Strategic, regional and local scales	The aims include identifying the principal landforms and processes of the coast and nearshore waters as well as for comparative purposes to establish areas of relative susceptibility to environmental change.	1.2
LiDAR survey and bathymetric mapping (2009)	WA	Department of Transport, Coastal Infrastructure	Completed	2009		Two Rocks to Cape Naturaliste	This high resolution baseline data set has been acquired for use in the study of coastal processes and assessments of coastal vulnerability and the potential impacts of sea level rise. The project outputs include complete and seamless data files of water depths and broad seabed imagery from pseudo-reflectance, and a high resolution coastal 3D model of the land and seabed between Two Rocks and Cape Naturaliste.	1
Terrestrial LiDAR (2008)	WA	Dept. Water	Completed	2008		Swan Coastal Plain	In 2008 the Department of Water undertook a land based LiDAR survey the Swan Coastal Plain. The digital terrain model that resulted is being used to determine the patterns of flooding, groundwater/surface water interaction and ecological systems.	1
State Coastal Planning Policy SPP2.6 Review	WA	Dept. Planning, Coastal Planning Dept. Transport	Ongoing	2010		Statewide	The policy is currently being reviewed, and as a part of the review process a position statement has been adopted by WAPC to allow for a vertical sea level rise of 0.9m in relation to setback distances from coastal processes over a 100 year timeframe (to 2110).	5

Project Name	State	Organisation	Status	Year	Link	Scope	Notes	Type
Climate Change Scenarios for Initial Assessment of Risk in Accordance with Risk Management Guidance	WA	Canberra, A.C.T. Australian Greenhouse Office.	Completed	2006	http://pandora.nla.gov.au/pan/102841/20090728-0000/www.climatechange.gov.au/impacts/publications/risk-scenarios.html	South West Region	This report provides regional climate change scenarios for South Western Australia for use in the initial assessment of risks as recommended by the Australian Government. These scenarios have been prepared by CSIRO for the Australian Greenhouse Office.	1
School of Environmental Systems Engineering (SESE – UWA)	WA	UWA	?	?	http://www2.sese.uwa.edu.au	Statewide	Research activities undertaken by the School of Environmental Systems Engineering include; Coastal Physical Oceanography (including circulation and mixing on the continental shelf, nearshore processes, beach cusps, dynamics of seasonally open tidal inlets, swash sediment transport processes including beach groundwater interaction, sediment transport processes on continental shelves and submarine canyons).	1.2

Key
1.Data Collection/Interpretation(i.e. the project involves investigation of Metocean Processes, Biological Drivers, Understanding Processes, Data Acquisition)
2.Vulnerability Assessment / Risk Assessment (identification and evaluation of the consequences for infrastructure, communities and natural assets
3. Adaptation Plan (following risk/impact/vulnerability assessments, identification of actions or responses to address risk / impacts / vulnerability
4. Strategy
5.Policy

Local Level Assessments

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
Assessing Climate Change Risks and Adaptation Strategy Development in the NSW Northern Rivers Region - Byron and Tweed Shire Councils	NSW	Byron, Tweed Shire Councils (LAPP1)			http://www.byron.nsw.gov.au/climate-change		The Climate Change Strategic Planning Policy provides climate change flood planning scenarios for the years 2050 and 2100. The 2100 flood planning scenario is to be applied to both public and private works and land use planning where an adopted flood study or Floodplain Management Plan does not exist	2.3
Preparing for Climate Change – A Regional Approach by Kempsey, Nambucca and Bellingen Shires	NSW	Nambucca, Bellingen and Kempsey Shire Council	Completed	2010	http://www.kempsey.nsw.gov.au/environment/climatechange/lapp.html	LAPP2	Assist Local Government adapt to climate change by undertaking a risk assessment and developing an adaptation plan.	2.3
Planning within a climate for change in Port Stephens	NSW	Port Stevens Council	Completed		http://www.portstephens.nsw.gov.au/environment/1271/159872.html	LAPP1	Risk assessments and priorities of climate change and climate change adaptation.	2.3
Climate Change Vulnerability Assessment: Hunter & Central Coasts	NSW	Hunter and Central Coast, Lower North Coast	Completed			NCVA	This study, one of six case studies to support a 'First Pass' National Climate Change Coastal Vulnerability Assessment (NCVA), examined the sea level rise and flood vulnerabilities for the local government areas of Newcastle, Lake Macquarie and Wyong in New South Wales.	2
Systems approach to regional climate change adaptation strategies in metropolises project	NSW	Sydney Coastal Councils Group, Inc	Completed	2008	http://www.sydneycoastalcouncils.com.au/system-approach-to-regional-climate-change-adaptation-strategies-in-metropolises/index.php	IAHS - LAPP1	The Sydney Coastal Councils Group (SCCG) is comprised of 15 Local Governments located on the coast of adjacent to the Parramatta River. The SCCG Systems Approach to Regional Climate Change Adaptation Strategies in Metropolises project has taken a systems approach to assessing local government vulnerability to climate change and the barriers and opportunities associated with adaptation at the Local Government scale. The project aims to demonstrate the merit of coordinated regional scale responses to climate vulnerability through local government cooperation..	2.3

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
Illawarra Climate Change Risk Planning – Wollongong component	NSW	Wollongong City Council	Completed			LAPP1		2.3
Illawarra Climate Change Risk Planning – Kiama component	NSW	Kiama Council	Completed		http://www.kiama.nsw.gov.au/environmental-services/pdf/Kiama-LEP-2010-Documents/Local-Environmental-Plan-2010/Draft-Kiama-LEP-DoP-s.65-version.pdf	LAPP1	New draft environmental action plan for Kiama Region.	2.3
Illawarra Climate Change Risk Planning – Shellharbour component	NSW	Shellharbour Council	Completed		http://www.shellharbour.nsw.gov.au/default.aspx?WebPage=1554	LAPP1	New environmental action plan for Shellharbour, 2011.	2.3
Climate Change Impact Risk Management and Adaptation Action	NSW	Manly City Council	Completed	2008	http://www.manly.nsw.gov.au/content.aspx... www.lgsa-plus.net.au/www/htm	LAPP1	The Manly Council Coastline Management Plan will provide a blueprint for the future management of the Manly Beach area, ensuring that the impact from coastal processes is incorporated into future development and planning.	2.3.4

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
Assessing the risks from sea level rise in the Sutherland Shire	NSW	Sutherland Shire Council/ GHD	Ongoing		http://www.sutherland.nsw.gov.au/			2
Newcastle flood planning	NSW	Newcastle City Council	Completed	2007	http://www.climatechange.gov.au/publications/coastline/~/media/publications/coastline/5bsection513NSW.ashx		A concept flood planning approach for all the types of flooding has been developed which accepts some risks, and promotes shelter in place for flash flooding where feasible.	1.2
Regional Climate Change Risk Assessment & Adaptation Planning Initiative	NSW	Hunter and Central Coast, Lower North Coast	Completed		http://www.hccrems.com.au/Programs/Climate-Change/Current-Activities.aspx	Australian Government Department of Climate Change and Energy Efficiency and the NSW Environmental Trust	The initiative includes two sub projects: Rural Councils Project Development of climate change risk assessment and adaptation planning processes for 8 councils (Maitland, Cessnock, Gloucester, Singleton, Muswellbrook, Upper Hunter, Dungog & Greater Taree). In particular it: Identified the risks arising from climate change for each council Developed individual adaptation plans for each council Identified areas of common risk across councils Identified actions for collaborative, cross border adaptation planning & implementation. 2. Coastal Councils Project Delivered a regional scale risk assessment and adaptation plan across the region's 7 coastal councils (Greater Taree, Great Lakes, Port Stephens, Newcastle, Lake Macquarie, Wyong and Gosford).	2.3
Kakadu NCVA	NT					NCVA		2
Gold Coast City Climate Change Strategy development - Council Adaptation	QLD	Sunshine Coast Regional Council	Completed			LAPP1		2.3.4

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
Brisbane's Plan for Action on Climate Change and Energy 2007	QLD	Brisbane City Council		2007-ongoing	http://www.brisbane.qld.gov.au/about-council/council-vision-strategies/climate-change-energy-taskforce/brisbanes-plan-for-action/index.htm	ICLEI ARC	This project, looks to prepare Brisbane for changing climates. Through both carbon reduction and offsetting and preparedness for any changes. It is proposing a reduction for all council works, as well as working with business to establish a voluntary reduction scheme. There is also a large focus on the transport systems and preparing them for both different climates and reducing their emissions and oil consumption. Finally, they are preparing Brisbane for the possibility of disasters such as flooding and droughts.	n/a
Climate Change Strategy 2009-2014	QLD	Gold Coast City Council		2009-2014	http://www.goldcoast.qld.gov.au/attachment/environment/climate_strategy.pdf	ICLEI ARC	Gold Coast strategy, to climate change, mostly in regards to carbon reduction and mitigation. Through both reduction from council operations and then to the community. Then to adaptation in both sectors, to reduce climate change risks.	2.3
Pimpama Case Study: National Coastal Vulnerability Assessment to Climate Change	QLD	Department of Climate Change (RPS Consultants)	Completed		http://www.rpsgroup.com.au/project/pimpama-case-study-national-coastal-vulnerability-assessment-climate-change	NCVA	This project was part of the National Coastal Vulnerability Assessment, which will assist governments in planning for climate change in Australia's coastal zone. The Pimpama area is already prone to flooding and storm surge that affects mainly agricultural areas. New urban areas are progressively increasing the value of built assets in the area. South Stradbroke Island and Southern Moreton Bay create an area of high landscape and ecological value.	1.2
	QLD	Douglas Shire Council	Completed			LAPP1	Douglas Shire amalgamated with City of Cairns.	n/a
Positive Change - FNQ Climate Risks and Opportunities	QLD	Cairns Regional Council	Completed		http://www.cairns.qld.gov.au/__data/assets/pdf_file/0003/7860/ClimateChangePlan.pdf	LAPP1	Action plan presents possible climate changes, risk assessment and guidelines and recommendations for adaptation for the Cairns region.	2.3

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
Risk Identification and Prioritisation for Climate Change Adaptation in Townsville City Council's Operation Activities (Planning, Engineering, Community)	QLD	Townsville City Council	Completed			LAPP1		2.3
	SA	Yorke Peninsula				NCVA		n/a
Accelerating Adaptation Action in the City of Burnside	SA	Burnside City Council	Completed			LAPP1		n/a
City of Marion Climate Change Adaptation Project	SA	Marion City Council	Completed			LAPP1		n/a
Corporate Adaptation Project - Understanding Climate Change Risks and Managing uncertainty	SA	Onkaparinga City Council	Completed		http://www.onkaparingacity.com/custom/files/docs/climate_change_strategy_20082013.pdf	LAPP1	Onkaparinga. Climate Change Strategy 2008-2013	4
There's a change on the way - An initial integrated assessment of projected climate change impacts and adaptation options for Natural Resource Management in the Adelaide and Mt Lofty Ranges Region	SA	Adelaide Mt Lofty NRM		2006	http://www.amlrnrm.sa.gov.au/Portals/1/Issues&Problems/climate/climate-report_2006.pdf			2.3
	SA	Eyre Peninsula NRM						n/a

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
	SA	Northern and Yorke NRM						n/a
Cradle Coast Regional Climate Change Risk Assessment and Action Plan	TAS	Cradle Coast Authority	Completed			LAPP1		2.3
Creating a Pathway to a Sustainable Future - Risk Management for Climate Change	TAS	Launceston City Council	Completed			LAPP1		2.3
Tasmanian East Coast NCVA	TAS					NCVA		2
Climate Change Impacts on Clarence Coastal Areas	TAS	City of Clarence	Completed	2009	http://www.ccc.tas.gov.au/site/page.cfm?u=807		The purpose of the Climate Change Impacts Study is to provide an integrated assessment of climate change risks on coastal areas. The study assessed 17 localities within the City of Clarence that are potentially vulnerable to coastal hazards in the present day, and by 2050 and 2100.	2.3
Western Port Human Settlements Impacts and Adaptation Project	VIC	Western Port GA	Completed	2006	http://www.seccca.org.au/project_summary.asp?data_id=13	IAHS	The Western Port Greenhouse Alliance (WPGA) is a regional partnership of five Western Port Councils to address climate change mitigation and adaptation. The councils involved include the Bass Coast, Frankston, Cardinia, Mornington Peninsula and Casey Councils, located in the region to the immediate south-east of the Melbourne metropolitan area. The project focuses on the impacts of climate change on built environment and communities, and local adaptation responses to impacts. The project aims to build Local Government knowledge and capacity to adapt to climate change as well as develop and approach to climate change assessment and adaptation.	2.3
Climate Change Adaptation Strategy	VIC	Melbourne City Council	Completed		http://www.melbourne.vic.gov.au/AboutCouncil/PlansandPublications/strategies/Documents/climate_change_adaptation_strategy.PDF	LAPP1	The Climate Change Adaptation Strategy is a comprehensive assessment of Melbourne's climate change risks for 2010, 2030 and 2070. The strategy outlines a risk analysis of the potential climate change impacts and possible implications for Melbourne.	3

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
Preparing for Climate Change in the Borough of Queenscliff	VIC	Borough of Queenscliff	Completed		http://www.queenscliffe.vic.gov.au/Downloads/OM-minutes/OM_2010_08_18_apx2.pdf	LAPP1	Risk assessment and adaptation plan.	2.3
Greenhouse Action Plan	VIC	Port Philip City Council RA	Emerging, announced Dec 2010		http://www.portphillip.vic.gov.au/Dec_2010_Media_4021.htm	RA	Completed in conjunction with the Climate Action Plan for Port Phillip.	3
City of Greater Geelong Draft Climate Change Change Adaptation Strategy	VIC	Greater Geelong City Council	In Progress		http://www.geelongaustralia.com.au/council/yoursay/consult/item/8cd335ac6e42864.aspx	ICLEI ARC	The development of a Climate Change Adaptation Strategy will allow Council to better utilise current resources and will provide Council with a better understanding in relation to future resource planning and therefore better able to adjust to climate change impacts.	3
	VIC	Lakes Entrance/East Gippsland Shire	Emerging					n/a
Port Fairy regional flood study	VIC	Western Coastal Board	Completed	2009	http://ptfairy.com.au/show_news.asp?NewsID=46&SMDate=1/1/2010			n/a
Western Suburbs Regional Organisation of Councils Climate Change Risk Assessment and Adaptation Plan	WA	Western Suburbs Regional Organisation of Councils (WESROC)	Completed	2010	http://www.subiaco.wa.gov.au/template.asp?navSelect=12&mainNavID=12&pageRecID=65	Self funded		2.3
Mid West Regional Councils Climate Change Risk Assessment and Adaptation Action Plan	WA	Mid West Regional Council (MWRC)	Completed	2010	http://www.mwrc.wa.gov.au/publications/folder.2010-11-17.9935615748/	LAPP2		2.3

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
Mandurah Coastal Zone Climate Change Risk Assessment and Adaptation Plan	WA	City of Mandurah	Completed	2009	http://www.mandurah.wa.gov.au/climatechange.htm	LAPP1		2.3
Climate Change Risk Management and Adaptation Action plan for the Southern Metropolitan Councils	WA	South Metropolitan Regional Council (SMRC)	Completed	2009	http://www.rockingham.wa.gov.au/City-and-community/Environment-Planning/Climate-Change.aspx			2.3
Scarborough Beach Climate Change Vulnerability and Risk Assessment for the Review of the Scarborough Beach Urban Design Master plan	WA	Hassel City of Stirling	Completed	2009	Not publically available			1.2
Vulnerability of the Cottesloe Foreshore to the Potential Impacts of Climate Change	WA	Town of Cottesloe	Completed	2007	http://www.cottesloe.wa.gov.au/?p=942		The main aim of the Cottesloe Climate Change Vulnerability Assessment Project was to establish potential risk to existing key coastal infrastructure under a range of future climate scenarios.	2.3.4
Eastern Metropolitan Region Councils Future Proofing Perth's Eastern Region	WA	Eastern Metropolitan Regional Council (EMRC)	In Progress	2009 – Ongoing	http://www.emrc.org.au/future-proofing-perth-s-eastern-region-climate-change-adaptation.html	Self funded		2.3
Busselton Adaptation Planning – Interim Coastal Erosion Modelling	WA	Shire of Busselton	In Progress	2010 – Ongoing	http://www.busselton.wa.gov.au/node/3857		In early 2008, the Shire commissioned modelling consistent with direction provided at the time by the then Department of Planning and Infrastructure, and which assumed a 0.5 metre increase in mean sea level over a 100 year period. Two different adaptation scenarios were modelled: an 'undefended scenario', where existing coastal defence structures are not maintained and are lost over time; and an 'unmanaged scenario', where existing structures are maintained, but no new structures are developed.	1.2.3
The Northern Agricultural Community Climate Adaptation program (NACCAP)	WA	Northern Agricultural Catchment Councils (NACC)	Framework	Ongoing	http://www.nacc.com.au/Programs/Current-programs/Clima			2.3

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
					te-Change/NACCAP.aspx			
Integrated coastal precinct climate change risk assessment	WA	City of Cockburn City of Fremantle Town of Kwinana City of Rockingham Royal Australian Navy	Emerging	Ongoing	http://www.kwinana.wa.gov.au/whats_new.asp?NI D=208		Brief currently in finalisation. Currently looking to firstly produce a detailed coastal vulnerability risk assessment and adaptation plan study brief.	2.3
Rockingham Climate Change Assessment	WA	City of Rockingham	Emerging	Ongoing	http://www.rockingham.wa.gov.au/Business-and-development-(1)/Documents/FINAL-env_Climate-Change-Risk-Management-and-Adapt.aspx		Adaptation plan for the Southern Metropolitan Regional Councils post LAPP.	2.3
The Peron-Naturaliste Initiative	WA	City of Rockingham City of Mandurah Shire of Harvey City of Bunbury Shire of Capel Shire of Busselton Shire of Waroona	Emerging	2010 – Ongoing	http://www.seachangetaskforce.org.au/…/Session12AndrewHammond.pdf			2.3
Pilbara Coast NCVA	WA					NCVA		2

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
	WA	Batavia ROC: City of Geraldton-Greenough, Shire of Chapman Valley, Shire of Northampton, Shire of Irwin				LAPP2	The Batavia Regional Organisation of Councils (BROC), made up of the City of Geraldton-Greenough and the Shires of Irwin, Northampton and Chapman Valley, developed an action plan to combat climate change.	2.3
Integration of climate change into Shire of Broome's Risk Management Strategy	WA	Shire of Broome	Not completed.			LAPP1		2.3
Northern Perth Metropolitan Coast Coastal Setback Study (2005) & Southern Perth Metropolitan Coast Coastal Setback Policy (2005)	WA	Department of Planning	Completed	2005			In 2005 the Department for Planning and Infrastructure (DPI) commissioned two studies of coastal process along the Perth metropolitan coastline. While this policy cannot be applied retrospectively to development, in this instance it was used to provide a framework for assessment and to highlight areas of the coast where current development may be in need of additional study, due to possible erosion trends in the future. The studies were limited in that they used only data readily available in the strategy's timeframe, so outputs must be viewed in this context. Data was obtained from existing DPI monitoring programs, supplemented with locally specific reports ie Port Beach, Quinns Rocks, Kwinana and Two Rocks. The studies will help determine where future management focus may be required and identify where any proposed development may need more detailed coastal engineering studies. The process is not exhaustive and does not determine a final coastal setback.	1.2
Climate Change impact modelling, and quantifying coastal development	WA	Geoscience Australia (GA) Dept. Climate Change and Energy Efficiency	Ongoing	2011			The overarching objective of this project is to provide additional spatial information products to inform the National Coastal Vulnerability Assessment (NCVA), which complement existing NCVA projects and support a more comprehensive and credible assessment of climate change risks in the coastal zone. This study will undertake detailed modelling of coastal impacts under current climate and future climate change scenarios for the area south of Perth, from Rockingham to	1.2

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
							Bunbury. Delivery of Final Report and outputs, following comment from DCE, will be by 31 December 2011.	
Bunbury storm surge modelling	WA	Joint project between the State Government through DoP, and the Federal Government through Geoscience Australia	Ongoing	2010			This project, expected to be completed in late 2010, engages the services of Geoscience Australia and other specialist modellers, to provide a computer model for studying the impacts of storm surge events on the settlement of Bunbury, under various potential future climate change scenarios. For model validation and for building a hypothetical 'worst case scenario' the work will look at the historic data collected during Tropical Cyclone Alby. Crucially, the model will also attempt to take into account shoreline movement arising from erosion driven by sea level rise.	1.2
Climate Change: Whole of Landscape Analysis of the Impacts and Options for the South Coast Region (2009)	WA	South Coast Natural Resource Management	Completed	2009	http://www.southcoastnrm.com.au/pages/516/reports		The aim of the project is to identify the potential risks and impacts of climate change and seasonal variability on the natural resource assets, land and seascapes, industries and communities of the South Coast region of Western Australia, to allow the South Coast community to develop actions and set priorities to minimise the impacts of climate change on the environment and the community.	2.3
Dongara to Cape Burney Coastal Strategy	WA	Dept. Coastal Planning and Climate Change - DoP	Ongoing				The Department of Planning, City of Geraldton-Greenough and the Shire of Irwin have initiated a coastal planning project in the Dongara to Cape Burney coastal area. This project will provide strategic planning guidance for future sustainable development, subdivision and land use along the Dongara to Cape Burney coastal strip underpinned by sound environmental principles. It will result in the development of a strategic coastal management plan that will be used by planners, developers and the community.	2.3.4
Coastal processes and coastal management options for Greys to Sunset Beach (2010)	WA	City of Geraldton-Greenough, Geraldton Port Authority & Department of Transport	Emerging		http://www.cgg.wa.gov.au/node/1522		Currently being prepared - Aims are to understand coastal processes in the region, and use that knowledge to inform the coastal management priorities and practices of the City of Geraldton-Greenough.	2.3

Project Name	State	Organisation	Status	Year	Link	Funding	Notes	Type
Port Adelaide seawater stormwater flooding study		Port Adelaide Enfield	Completed	2005	http://www.climatechange.gov.au/~/media/publications/coastline/cc-risks-full-report.ashx		The study involved analysis of the 100 year storm tide level and simulation of inundation from three future scenarios of sea-level rise and land subsidence (Table 5.2). Upper and lower estimates were modelled for each scenario with the difference being the extent of water storage capacity in the non-tidal areas. For instance, if a non-tidal area has been exposed to rainfall before the storm tide event, there is a reduced capacity to store incoming inundation waters and so could lead to greater inundation (upper case).	1

Key
1.Data Collection/Interpretation(i.e. the project involves investigation of Metocean Processes, Biological Drivers, Understanding Processes, Data Acquisition)
2.Vulnerability Assessment / Risk Assessment (identification and evaluation of the consequences for infrastructure, communities and natural assets
3. Adaptation Plan (following risk/impact/vulnerability assessments, identification of actions or responses to address risk / impacts / vulnerability
4. Strategy
5.Policy

Appendix 7: Example Study Briefs

Profile 1: Vulnerability Assessment

Title: Evaluating the vulnerability of the SLS Clubs to the projected impacts of climate change.

Background: The coastal zone of Australia is likely to experience significant impacts as a result of climate change in the course of this century, even if the efforts expected from the international community to stabilise atmospheric greenhouse gas concentrations eventuate. Mean sea levels are expected to rise, wave climates are likely to alter and the frequency and intensity of storms are projected to change. In addition, algal blooms and the incidence of jellyfish may further multiply as a consequence of higher temperatures. These impacts of climate change are now widely acknowledged and accepted by a range of public, private and not-for-profit organisations within Australia. In particular, climate change presents a critical challenge for organisations whose operations are focused largely in the coastal zone. Surf Life Saving Australia (SLSA) is one such organisation, whose focus is on patrolling Australia's beaches and providing rescue services to beach users.

Surf Life Saving Australia (SLSA) is Australia's major water safety, drowning prevention and rescue authority. The highly federated and geographically dispersed organisation is made up of 309 separately incorporated local surf life saving clubs delivering services across Australia's seven state and territory centres. The coastal zone in which SLSA operates is highly dynamic and extremely vast containing a range of diverse coastal types such as sandy shores, wetlands, estuaries, lagoons, deltas, reefs and rocky cliffs. Many of the SLSA clubs are located on sandy beaches making them susceptible to change into the future. The impacts of climate change may include a heightening of weather event intensity and sea level rise, which in combination could have far reaching effects for coastal recreation, beach safety service provision and surf lifesaving facilities and services. In this respect, the potential impacts of climate change represent a significant challenge for SLSA.

A recent assessment of the vulnerability of SLSA to projected climate change noted that vulnerability is variable across the organisation due to the differential exposure and also the differential capacity of Surf Life Saving Clubs (SLSC) to respond to projected impacts. The report noted that a key challenge for SLSA was to understand this differential vulnerability to ensure targeted support could be provided as required.

Club assets and infrastructure are situated close to the active beach zone and can be impacted by contemporary changes in coastal conditions, such as long-term erosion or accretion and short-term events, such as storms. Beach scarping, damage to assets and infrastructure, interruption of sporting events and chronic erosion are just some of the issues currently faced. While many clubs have established mechanisms to respond to such events, it is recognised that projected climate changes are likely to enhance current management issues and, in some cases, deliver new management challenges.

Long-term change in climate, through projected climate changes, will impact clubs infrastructure, assets and service delivery directly through long-term changes to the configuration of beaches and coasts. These impacts may result in increased costs for maintenance and repair, compliance and reporting, and disruptions in service delivery. At present, SLSA does not have a detailed understanding of how projected climate changes may impact its services. Consequently, there is an identified need to fill this knowledge gap and develop a proactive and coordinated approach to the management of such impacts.

This project brief is focussed on developing a comprehensive vulnerability assessment programme that can be rolled out across Australia to support individual clubs assess their levels of vulnerability, while ensuring a nationally consistent and best-practice approach.

Objectives: The objectives are to:

- Assist SLS clubs assess their vulnerability to climate change.
- Develop a nationally consistent profile of SLS club vulnerability.
- Create a mechanism for ongoing support of clubs to assess, and respond effectively to climate change.

Outputs

- A guidebook for undertaking climate change vulnerability assessments at the club level that will guide clubs in their efforts to understand their exposure and to develop appropriate adaptive actions
- A national database of vulnerability assessments undertaken by clubs
- A support mechanism (to be defined).

Delivery timeframe

The program should be delivered over a 9-month period, allowing 2 months for initial data collection, 5 months for consultative guideline development, and 2 month for report writing, dissemination and engagement with clubs.

Budget

Consulting fees $100 – 150,000

Resourcing:

Coastal impact assessment consultants with climate change adaptation expertise

Profile 2: Adaptive Capacity Assessment[11]

Title: Evaluating the adaptive capacity of the SLSA to manage the projected impacts of climate change.

Background: The coastal zone of Australia is likely to experience significant impacts as a result of climate change in the course of this century, even if the efforts expected from the international community to stabilise atmospheric greenhouse gas concentrations eventuate. Mean sea levels are expected to rise, wave climates are likely to alter and the frequency and intensity of storms are projected to change. In addition, algal blooms and the incidence of jellyfish may further multiply as a consequence of higher temperatures. These impacts of climate change are now widely acknowledged and accepted by a range of public, private and not-for-profit organisations within Australia. In particular, climate change presents a critical challenge for organisations whose operations are focused largely in the coastal zone. Surf Life Saving Australia (SLSA) is one such organisation, whose focus is on patrolling Australia's beaches and providing rescue services to beach users.

Surf Life Saving Australia (SLSA) is Australia's major water safety, drowning prevention and rescue authority. The highly federated and geographically dispersed organisation is made up of 309 separately incorporated local surf life saving clubs delivering services across Australia's seven state and territory centres. The coastal zone in which SLSA operates is highly dynamic and extremely vast containing a range of diverse coastal types such as sandy shores, wetlands, estuaries, lagoons, deltas, reefs and rocky cliffs. Many of the SLSA clubs are located on sandy beaches making them susceptible to change into the future. The impacts of climate change may include a heightening of weather event intensity and sea level rise, which in combination could have far reaching effects for coastal recreation, beach safety service provision and surf lifesaving facilities and services. In this respect, the potential impacts of climate change represent a significant challenge for SLSA.

A recent assessment of the vulnerability of SLSA to projected climate change noted that vulnerability is variable across the organisation due to the differential exposure and also the differential capacity of Surf Life Saving Clubs (SLSC) to respond to projected impacts. The report noted that a key challenge for SLSA was to understand this differential vulnerability to ensure targeted support could be provided as required.

This project brief is focussed on understanding the adaptive capacity of SLSCs to enable the provision of targeted support to enhance their resilience to the projected impacts of climate change.

Objectives: The objectives are to:

- Identify the elements that contribute to adaptive capacity of SLSA clubs.
- Develop a self-assessment survey for SLSC to evaluate their adaptive capacity.
- Review assessment outcomes and define profiles/typologies of adaptive capacity of SLSCs.
- Propose models of adaptive support for SLSCs based on associated levels of adaptive capacity.
- Develop an implementation program to facilitate the delivery of such support

Outputs

[11] A NCCARF application submitted to the Social, Economic and Institutional Dimensions funding round in March 2011 may provide input into this assessment. The project entitled '*Beach Tourism, Recreation and Safety in a Changing Climate*', if successful, may provide input into this activity. Consequently, the outcomes should be reviewed prior to funding this work.

- Final report summarising the outcomes of the adaptive capacity assessment
- A framework (establish survey and evaluation methods) for assessing adaptive capacity of SLSCs. This tool would be re-applied by SLSA to monitor change over time.
- An implementation program for adaptive support.

Delivery timeframe

The program should be delivered over a 6-month period, allowing 2 months for data collection through the self-assessment survey.

Budget

Consulting fees $45,000.

Resourcing:

Climate change adaptation specialists