

Climate Change Adaptation Strategy and Action Plan Kiama Municipal Council



- Final
- 29 July 2009



Australian Government
Department of Climate Change

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1. Introduction

1.1. Background and Context

Climate change has been recognised internationally as a significant issue with the potential to have a major impact on human and natural systems. The Australian Government Department of Climate Change (DCC) was established on 3 December 2007 to lead the development and coordination of Australia's climate change policies. They are responsible for policy advice, program implementation and project delivery in three areas including; mitigation through domestic emissions reduction, adaptation to unavoidable impacts of climate change and helping to shape a global solution through Australia's international climate change strategy (*DCC Corporate Plan, 2009-10*).

At a State level, the NSW Government Department of Environment and Climate Change (DECC) was established to provide a broader organisation able to respond to the challenges presented by climate change and further progress reforms in the sustainable management of the states land and water resources. In support of the Australian Government DCC commitment to climate change action, DECC are currently developing a Climate Action Plan, which will be the key NSW policy document setting out the strategic direction for government climate action over the next five years. The plan is aimed at getting communities and businesses 'climate ready' to deal with the challenges posed by climate change.

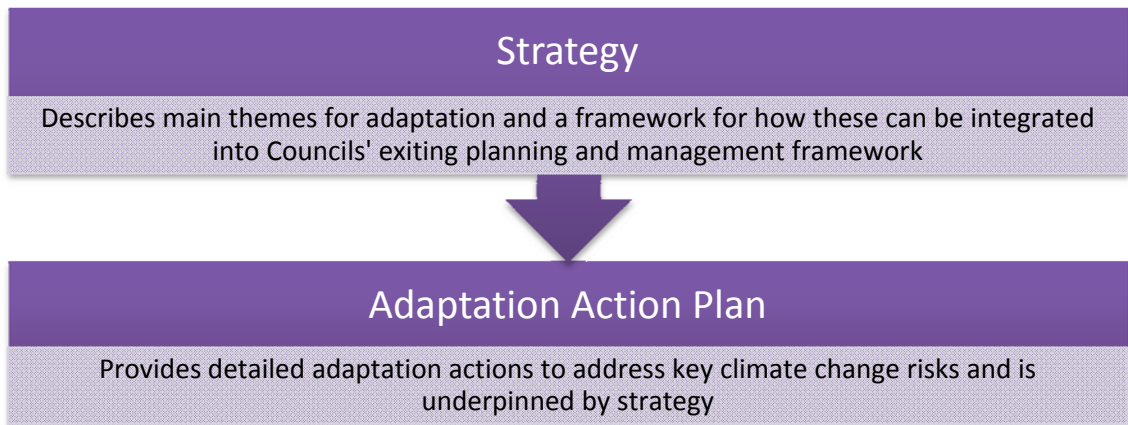
The role of Local government includes the provision of local community governance, leadership, policy setting and decision making and as such can work with the community to adapt to the physical, environmental, economic and social impacts of climate change. Although a three tiered Government response is required to address climate change, it is often local government who are closest to communities and the immediate impacts of climate change.

This project has been funded by a grant from the Australian Government's Local Adaptation Pathways Program (LAPP). The Australian Government's LAPP was established specifically to provide local government with resources to assist in assessing risks from climate change and developing an Adaptation Action Plan. The funding was provided to Kiama Municipal Council to develop a Climate Change Adaptation Action Plan, which was undertaken in collaboration with Wollongong and Shellharbour City Councils, administered by the Southern Councils Group.

1.2. Purpose and Scope

Climate change will present a number of risks and opportunities to Council which will need to be managed or capitalised on to maintain and secure the ongoing prosperity of the region. The Climate Change Adaptation Strategy and Action Plan (CCASAP) have been prepared to provide a coordinated and regional approach to tackling the challenges which climate change will present.

The purpose of the CCASAP is to provide guidance to Council on how to respond and adapt to climate change risks which have been identified as part of this project. The two components of the document are described below.



The adaptation action plan focuses on addressing extreme and high level risks resulting from climate change identified through a risk identification process which informed an earlier stage of the project. Other risks identified as being tolerable or low level risks are not addressed as part of this Strategy.

1.3. Southern Councils Group and Member Councils

The Southern Councils Group (SCG) is a voluntary association of seven Local Government Authorities (Bega Valley, Eurobodalla, Kiama, Shellharbour, Shoalhaven, Wingecarribee and Wollongong). The group was established in 2003 although there has been regional collaboration amongst a number of Illawarra Councils since 1975. The SCG mission statement is as follows:

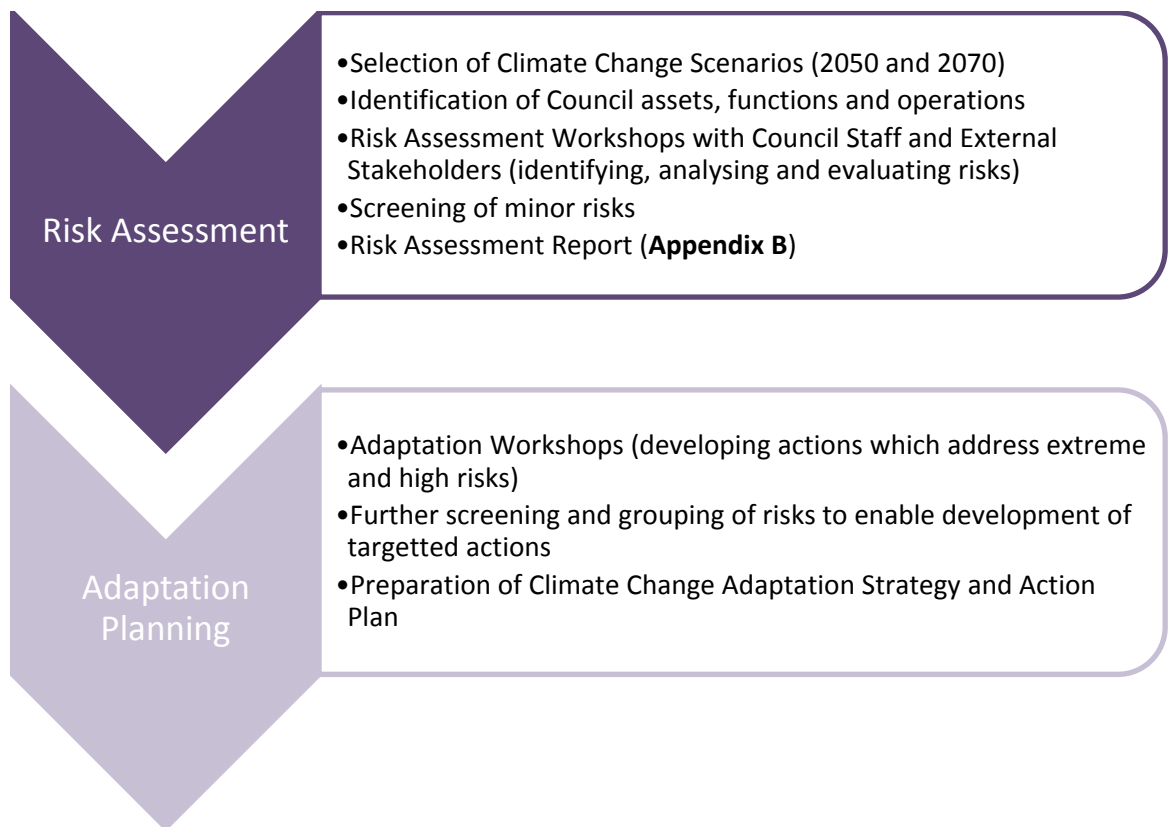
"To promote and foster the sustainable development of the Illawarra and South Coast by building on its diverse economic natural and cultural heritage through member council co-operation."

(SCG Strategic Plan, 2006-2009)

The CCASAP has been prepared for the member Councils of Wollongong, Shellharbour and Kiama. The SCG has a significant role to play in facilitating climate change adaptation across its member councils by coordinating activities, sharing information and providing a platform for advocating to state and federal government.

1.4. Methodology/Approach

The CCASAP has been prepared following the completion of two project stages. The project has been undertaken in accordance with the broader methodology developed in *Climate Change Impacts and Risk Management: A Guide for Business and Government* (¹Australian Greenhouse Office, 2006).



1.5. Communication and Consultation

The CCASAP has been prepared in consultation with Wollongong, Kiama and Shellharbour Councils, in addition to a number of external stakeholders. To maintain consistency with the risk assessment workshops, the same delegates were invited to attend the adaptation planning sessions. These were held between 27 April and 7 May 2009 and a list of attendees is provided in **Appendix D**.

¹ Now the Department of Climate Change

2. Climate Change Risk Assessment

2.1. Climate Change Scenarios

Two climate change scenarios were selected for investigation in the risk assessment, 2050 and 2070. The predicted changes in key climate variables are summarised in **Table 1** with details provided in the Risk Assessment Report (**Appendix B**). Predictions were reported based on the following information;

- DECC (2008) ‘Summary of climate change impacts – Illawarra region’;
- CSIRO (2007) ‘Climate Change in Australia’ (based on the IPCC fourth assessment report)

■ Table 1 Climate Change Scenarios

Climate Variable	2050	2070
Temperature	+ 1.5 to + 2 C	+ 2 to + 4 C
Rainfall	-10% to -5%	-10% to -5%
Evapotranspiration	+ 4% to + 8%	+ 4% to + 8%
Sea Level Rise	+ 0.3m	+0.5m

2.2. Risk Assessment Workshops

Risks were identified through three workshops held between 3 and 10 February 2009. These workshops identified, analysed and evaluated climate change risks based on the following themes; planning and development, environment, infrastructure and infrastructure services and corporate and community services which reflect the core responsibilities of participant Councils’. The workshops were attended by key Council staff representing a range of disciplines, and external stakeholders from Government Agencies, Emergency Services etc. The findings of the risk assessment process were circulated to participants and Council Officers. Following their review, the report was sent to the Department of Climate Change (DCC) for consideration and comment.

2.3. Results

Kiama Municipal Council identified a total of 74 risks across all functional areas, with approximately 85% classified as extreme or high.

3. Climate Change Adaptation

3.1. Defining Climate Change Adaptation

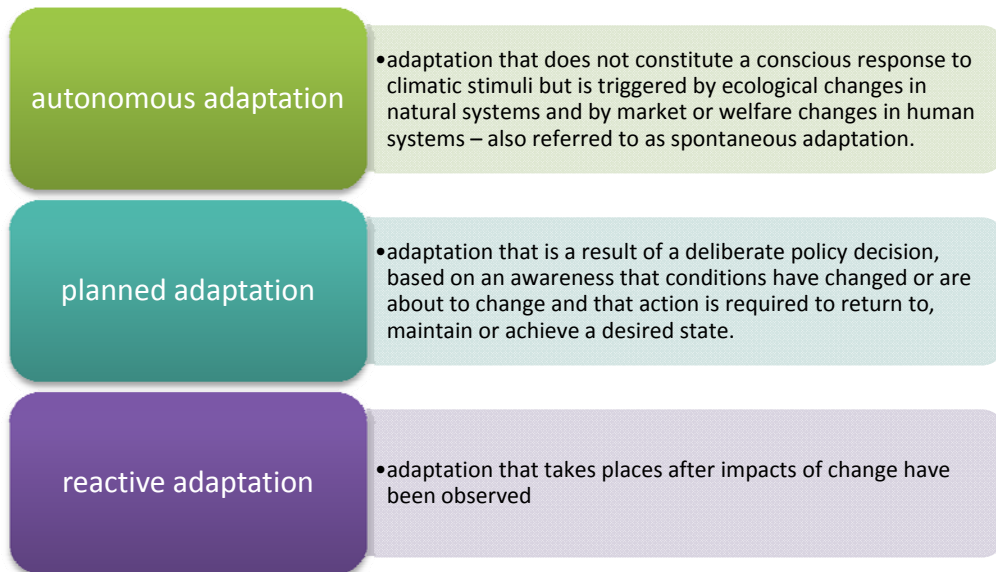
Climate change adaptation is defined as:

“the adjustment in natural or human systems in response to actual or expected climate changes or their effects; which moderates harm or exploits beneficial opportunities”.

(Climate Change Adaptation Actions for Local Government, 2007)

There are three main types of adaptation (**Figure 1**). This project is centred on planned adaptation which follows recognition from Councils that climate change will occur, and management of the associated risks is required.

■ **Figure 1 Types of Adaptation**



(²Australian Greenhouse Office, 2007).

3.2. Adaptation and Mitigation

The focus of this Strategy is climate change adaptation rather than climate change mitigation. Climate change mitigation relates to management and reduction of energy consumption and greenhouse gas emissions. Over 220 Councils in Australia are actively pursuing strategies to

² Now Department of Climate Change

reduce their corporate and community greenhouse gas emissions through the cities of Climate Protection (CCP) program. While Councils have devoted significant time and resources over the past decade to reducing anthropogenic greenhouse gas emissions, it is only more recently that there has been a focus to adapt and prepare for predicted climatic change and variability (ICLEI, 2008).

Whilst it is recognised that mitigation and adaptation should be considered simultaneously, this strategy is directed towards developing adaptation measures. Adaptation actions are essentially management responses to risks associated with climate change which exploit existing opportunities and are focussed towards sustainable outcomes. Planned adaptation actions often complement existing controls and practices which Council use to manage their operations (for example, monitoring programs, flood risk mapping, design standards, etc). In taking a proactive approach to climate adaptation planning through the development of a Strategy and Action Plan, Council have the potential to reduce the costs of climate change impacts, provided the response measures are carefully considered and implemented.

3.3. Why should Councils prepare an adaptation plan?

Councils have a legal, social and economic responsibility to their local community to adequately plan for, and adapt to, risks posed by climate change. The role of the local government to protect the community has been described as:

“Local government provides for the health, safety and welfare of its community and if a council cannot show that it has taken preventative action against any threat to the health, safety and welfare of its community, it faces the possibility of liability costs – costs which can be reduced if a Council identifies the threats to its community and implements appropriate strategies to prevent these threats”

(Local Government of Tasmania, 2004).

In preparing an adaptation plan, Councils are taking a responsible and proactive approach to safeguarding the future of their communities and assets. There are number of reasons why Council should prepare an adaptation strategy, which are highlighted in **Figure 2**.

■ **Figure 2 Reasons to undertake a Climate Adaptation Strategy and Action Plan**



Climate change adaptation planning is a forum to respond to community concerns regarding climate change and to increase community awareness. It can also be used as a mechanism to increase the capacity of councils' and other authorities to respond to climate change risks by increasing access to education and encouraging information sharing and working in collaboration with other agencies. Fostering a strategic, regional response will not only assist in long term adaptation planning but also increase efficiencies in responding to emergency responses during extreme weather events, i.e. bushfires, flooding, strong winds etc.

An issues paper prepared by Griffith University (2007) indicates that local governments are at risk of incurring legal liability if they fail to take reasonable steps to take into account the likely effects of climate change. This paper recommended that local government take into account relevant State planning policies regarding flooding, bush fire and landslide, referral agencies advice and relevant Federal and State Government climate change strategies when making policies and decisions potentially subject to climate change implications.

3.4. Adaptation process

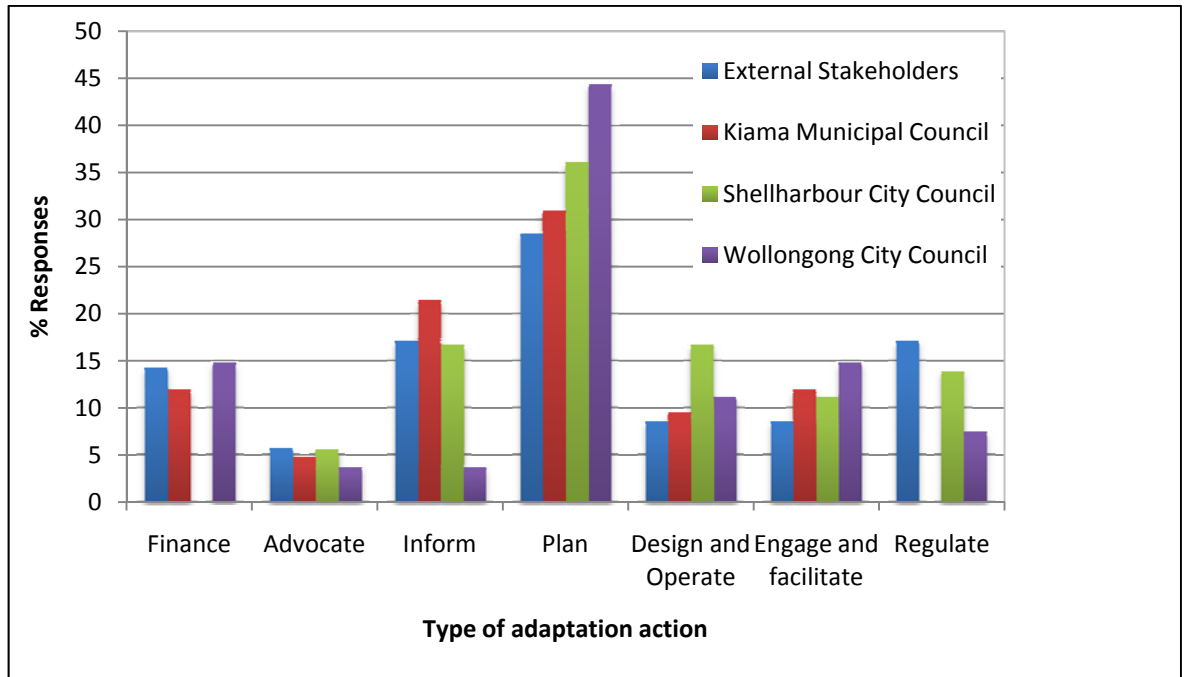
The development of the CCASAP included investigation of adaptation options which would be considered appropriate to address the high and extreme risks identified. Adaptation actions can be formed by considering a suite of adaptation tools, as illustrated in **Figure 3**.

■ **Figure 3 Adaptation Tools**



During the workshop process, delegates were asked to nominate three adaptation actions in response to climate change risks (in general) or by considering one specific risk. The results of this exercise are shown in **Figure 4** Distribution of Adaptation Tools selected. The majority of responses placed most importance on the planning, engaging and informing tools for adaptation. This supports the strategic framework which has been designed for climate change adaptation. It is also conclusive that often combinations of tools are required to develop adaptation actions.

■ **Figure 4 Distribution of Adaptation Tools selected**



3.5. What do Councils need from an adaptation strategy and plan?

During the workshops conducted in each LGA, there was much discussion around how the adaptation plan can and will be implemented. It is important to Councils that the plan can be easily integrated into the current planning framework, therefore allowing facilitation into Council business. To achieve this goal effectively, the adaptation plan has been designed to sit within an over-arching strategy which provides the general direction of climate adaptation for Councils. This design seeks to align the implementation of the plan with Councils existing planning and reporting framework, which is currently being updated. The key attributes required for the Adaptation Strategy and Plan are;

- ✓ Clear actions which can be assigned to Council departments for ownership
- ✓ Measurable actions which can be linked to targets and performance criteria
- ✓ Timeline driven to ensure actions are implemented

4. Climate Change Adaptation Strategy

4.1. Purpose

The Climate Change Adaptation Strategy will provide Councils with a framework to undertake climate change adaptation actions. It recognises that for climate adaptation to be effective Councils must enhance internal integration, build relationships with State and federal Governments and coordinate with external stakeholders from business, industry and community services. It also recognises that before Council can implement adaptation actions, consideration must be given to the process of endorsement to ensure the plan gains leverage for implementation.

A new planning and reporting framework (**Figure 5**) for NSW local government has been introduced. These reforms replace the former management Plan and Social Plan with an integrated framework. It also includes a new requirement to prepare a long-term Community Strategic Plan and Resourcing Strategy. The new system recognises that communities do not exist in isolation – they are part of a larger natural, social, economic and political environment that influences and, to a large extent, shapes future direction. (*Draft Planning and Reporting Guidelines for local government in NSW, 2009*). If Councils are to embrace the challenges posed by climate change, the adaptation strategy must be aligned within this framework, where it may be considered to be included as a statutory requirement. This will allow the adaptation actions to be executed, monitored and reviewed in line with reviewing climate change risks and other government operations.

- **Figure 5 Planning and Reporting Framework**



4.2. Vision

The climate change adaptation strategy has been prepared to:

"protect the diversity of the Illawarra region by taking a proactive approach in adapting to climate change; one which seeks to minimise climate change risks and capitalise on opportunities raised, by promoting an integrated response from all levels of Government, businesses and the local community to safeguard the economic, environmental and social sustainability of the region."

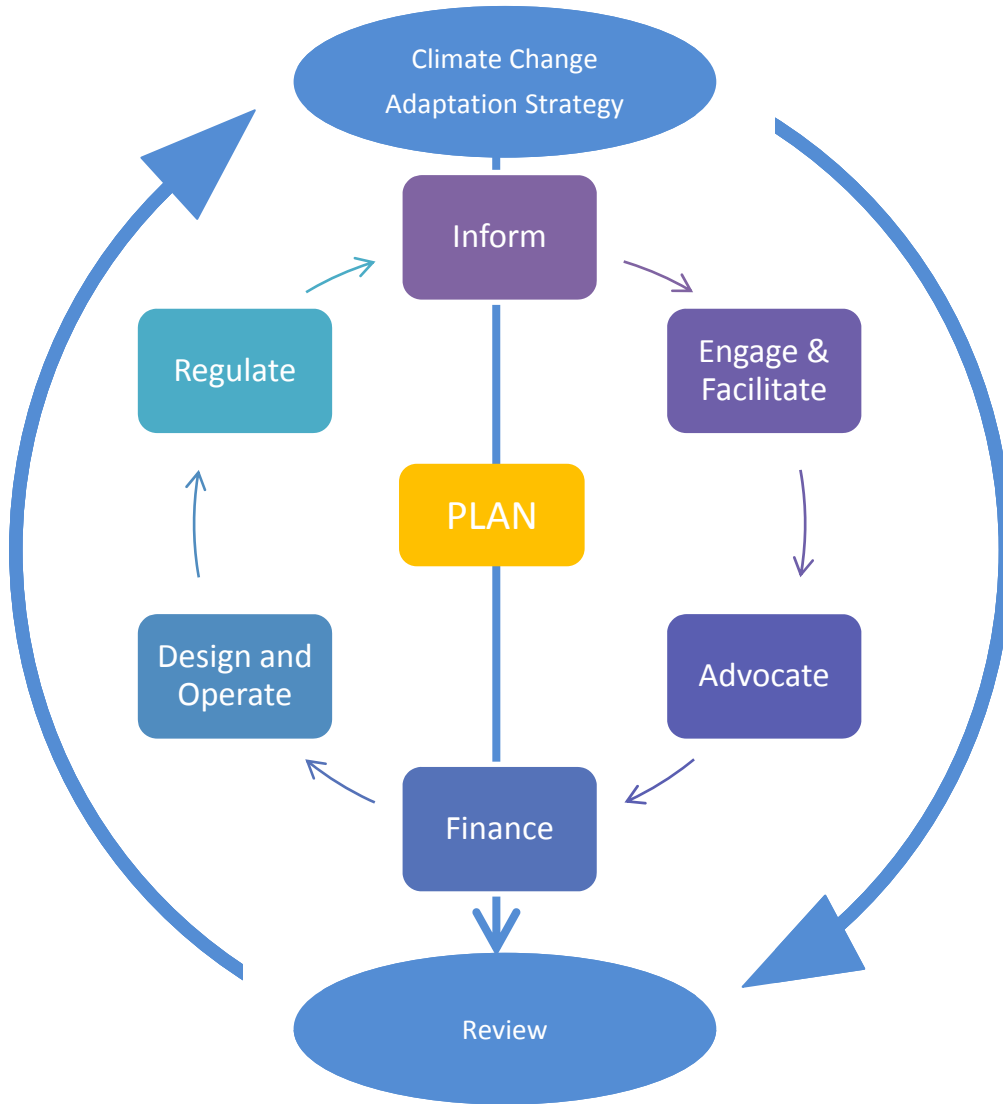
4.3. Objectives

The main objectives of the strategy are to:

- Promote a cultural shift towards considering climate changes risks in all Councils' long term planning, financial management, operations and service delivery
- Utilise SCG as a vehicle to lobby to all levels of government to support adaptation actions
- Engage with the local community to increase awareness of climate changes risks and encourage ownership of initiatives
- Build on existing links and relationships between all levels of Government, volunteer groups and organisations to deliver a consistent approach to adaptation

The strategy framework emphasises the process which should be considered to gain Council endorsement to the suggested adaptation actions developed in the plan. It recognises that this is the first step to planning for climate change adaptation and Councils need to start with planning to implement changes before they can advocate to government bodies to seek financial assistance. A strong planning focus will enable a strong foundation to implement other adaptation responses, as set out in **Figure 6** Climate Change Adaptation Strategy Framework.

■ **Figure 6 Climate Change Adaptation Strategy Framework**



4.4. Approach for Adaptation Action development

Development of adaptation actions utilised the tools described above to address high and extreme risks identified in the risk assessment. Workshop delegates were asked to select adaptation options from a predefined list (**Appendix C**) or develop actions within the workshop forum.

5. Climate Change Adaptation Action Plan

5.1. General

The Adaptation Action Plan was developed during the workshops and contains a number of actions to address risks, reasons for selecting the actions, level of priority (high, medium and low), and timeline for implementation. It also indicates who would be responsible for the action and identifies other Stakeholders involved in the process.

Following the workshops, further work was undertaken to refine and screen the actions. The screening process involved qualitative consideration of the issues identified in **Table 2** below and linking similar risks which would have the same adaptation actions.

■ Table 2 Climate Change Adaptation Screening Criteria

Criterion	Description
Effectiveness	Ability of the action to reduce vulnerability and risk either directly or indirectly.
Immediacy	Ability of the action to provide immediate risk mitigation or benefit.
Financial viability	Ability of the action to be implemented within existing budget allocations, revenue expansion schemes (i.e. rates or levies) or cost sharing with other levels of government or public/private partnerships (i.e. grants).
Political feasibility	Action is within the scope of Councils' responsibility or sphere of influence and is considered an acceptable course of action by Councillors and Council Officers.
Community acceptance	Action would be acceptable to the community and does not unduly infringe upon the rights of residents and businesses.
Flexibility	Action is able to respond to new information about climate change, and can be modified over time.
Concurrent effects	Action avoids negative environmental, social or other unintended consequences and offer benefits beyond mitigating climate change related risk where possible.

Source: Adapted from Climate Change in the Western Port Region: Risks and Adaptation

5.2. Adaptation Actions

Climate Change actions for Kiama Municipal Council are shown in **Tables 3 to 6**. This provides an 'at a glance' adaptation plan with associated priorities for implementation. Supplementary detail on each action is provided in **Appendix A** including details of Lead Agency, key stakeholders and timeframes (where short is 1-2 years, medium is 2-5 years and long is 5 – 10 years).

5.3. Key adaptation actions

Key adaptation actions provided in the plan include the following:

- 1) Further investigations to refine climate change projections;
- 2) Planning (corporate, land use, emergency management, catchment, parks, infrastructure, natural resources, pest management, risk management, economic development);
- 3) Advocacy to State Government agencies and peak industry bodies for increased research, funding and collaboration;
- 4) Education and information programs for the local community (often complementing existing initiatives, for example 'Sustainable Illawarra');
- 5) Reviewing Design Standards (infrastructure, water supply, waste facilities, buildings);
- 6) Reviewing Finance arrangements (investment, budgets, procurement, subsidies, grants, rebates and levies);
- 7) Regulatory/policy change;
- 8) Modifying Council and Southern Council Groups operations and service delivery;
- 9) Building community capacity;
- 10) Building organisational capacity.

■ **Table 3 Adaptation Actions – Planning and Development**

Identified Risk	Adaptation Tool	Adaptation Action	Priority
Reduction in land for future urban and industrial expansion and continued viability of assets	Inform	<ul style="list-style-type: none"> Undertake additional research to refine climate change impacts 	H
	Plan	<ul style="list-style-type: none"> Develop constraints mapping based on bushfire risk areas/flooding/coastal erosion Review/Update Regional Strategy to identify areas most vulnerable to climate change 	H
Increased cost of development and land acquisition due to climate change impacts/threats	Plan	<ul style="list-style-type: none"> Review and update LEP/DCP 	M
Restriction in subdivision location			
Damage to existing and future development and infrastructure from flooding/sea level rise	Plan	<ul style="list-style-type: none"> Prepare flood risk mapping for the LGA to inform which areas are at risk from flooding. Include Climate change allowance in all technical studies Include guidance provided by DECC in the draft sea level rise policy statement Review maintenance programs Review and update LEP/DCP following advice from technical studies. 	H
Increased risk to existing agricultural practices due to water demand/warmer temperatures	Advocate	<ul style="list-style-type: none"> Advocate to State and federal Government for funding assistance for technical studies 	H
	Advocate	<ul style="list-style-type: none"> Advocate to the NSW Department of Primary Industries to: <ul style="list-style-type: none"> Review land use capability mapping. Allocate increased resources to developing and implementing a community education program to raise awareness about improving efficiency of water use and utilising sustainable farming practices. 	M
	Plan	<ul style="list-style-type: none"> Include diversification of the agricultural economy as part of Council Business Plan and 10 year financial plan Develop a regional water strategy which plans for long term supply-demand changes 	L

Increased damage to crops/livestock	Inform	<ul style="list-style-type: none"> ■ Educate landowners on necessary provision of shelter and refuge for livestock 	M
Climate impacts on housing and building design (existing and future)	Advocate	<ul style="list-style-type: none"> ■ Advocate to Australian Building Codes Board for higher standards for designs to address <ul style="list-style-type: none"> – Extreme heat conditions – Increased storm intensities – Flood proofing 	M
	Plan	<ul style="list-style-type: none"> ■ Review Council Flood Policy for existing and new developments 	H
Increase power failures and black outs		<ul style="list-style-type: none"> ■ Investigate options for alternative energy supply to essential Council and community services such as hospitals/water and sewerage infrastructure and emergency services. ■ Coordinate with Integral energy to find out current procedures for managing blackouts. 	M

■ **Table 4 Adaptation Actions – Corporate and Community Services**

Identified Risk	Adaptation Tool	Adaptation Action	Priority
Increased potential for injury and death (e.g. strong winds causing tree falls)	Inform	<ul style="list-style-type: none"> Prepare/review and implement a Public Health Plan which includes a community awareness raising/ community education program regarding risks associated with coastal storms, strong winds and intense rainfall and flooding 	L
	Advocate	<ul style="list-style-type: none"> Advocate to the NSW Department of Community Services to review and increase capacity of community services 	M
Increased requirement for mental health services	Engage	<ul style="list-style-type: none"> Engage with health service providers to share resources 	L
Increased number requiring assistance (particularly vulnerable groups)			
Loss of recreational amenity (i.e. sports fields)	Plan	<ul style="list-style-type: none"> Review/update risk assessments for Council owned sports fields 	L
Increased public health risk due to declining water quality	Inform	<ul style="list-style-type: none"> Install information boards to alert local community to risks in waterways 	L
Increased risk of respiratory illness	Inform	<ul style="list-style-type: none"> Prepare community education leaflets on respiratory illness 	L
	Plan	<ul style="list-style-type: none"> Review Council OHS Policy 	L
Increased heat stress and outdoor working	Plan	<ul style="list-style-type: none"> Prepare/review and implement a Public Health Plan which includes an extreme heat strategy. 	H
		<ul style="list-style-type: none"> Prepare/review open space strategy plans to include provision of shade in communal areas such as playgrounds, pools, parks etc and availability of drinking water fountains 	

Increased pressure on emergency services (resources and facilities)	Advocate	<ul style="list-style-type: none"> Advocate to local emergency services (RFS, SES, Police Ambulance services) to increase resources to have adequate capacity for extreme events 	H
	Engage and Facilitate	<ul style="list-style-type: none"> Encourage Council staff to volunteer for the SES 	M
	Finance	<ul style="list-style-type: none"> In collaboration with SES, secure funding for more investment in equipment (boats, Council trucks etc) 	H
Increase risk of food borne disease through inadequate refrigeration	Inform	<ul style="list-style-type: none"> Develop a power failure toolkit for food shop owners and operators 	M
Increasing cost of insurance premiums and liability claims	Plan	<ul style="list-style-type: none"> Re-assess annual budget allocations as part of the financial and management plan 	H
Loss of holiday parks and tourist revenue	Plan	<ul style="list-style-type: none"> Develop a regional tourism development strategy which seeks to capitalise on beneficial opportunities while considering diversification of the economic base. 	L
	Finance	<ul style="list-style-type: none"> Introduce a tourism levy 	L
Loss of transport services	Plan	<ul style="list-style-type: none"> Review/update disaster management plans to make allowance for climate change impacts 	M
	Design and Operate	<ul style="list-style-type: none"> Review/update designs for public transport facilities to include climate change impacts Future designs of bus shelters (for example) should make adequate shade provision if people have to wait for extended periods of times 	H

■ **Table 5 Adaptation Actions - Environment**

Identified Risk	Adaptation Tool	Adaptation Action	Priority
Increased bush fire risk to vegetation	Plan	<ul style="list-style-type: none"> ■ Review and update Biodiversity Strategy ■ Improve bush fire research and risk management for predicted climate change scenarios 	H
	Engage	<ul style="list-style-type: none"> ■ Coordinate with other Stakeholders to build a standard approach across Councils 	M
	Advocacy	<ul style="list-style-type: none"> ■ Advocate to RFS to review the 'Planning for Bushfire Protection Guide' at least every two years to account for predicted climate change scenarios 	M
Habitat Loss due to drying of swamps and wetlands	Plan	<ul style="list-style-type: none"> ■ Develop a monitoring program to assess the impact of sea level rise on coastal habitats 	M
Loss of sub tidal/tidal habitats due to climate change and subsequent loss of biodiversity		<ul style="list-style-type: none"> ■ Update/Review estuary management plans ■ Make planning provisions in LEP/DCP which preserve biodiversity of the area by providing species migration corridors 	
		<ul style="list-style-type: none"> ■ Develop a Regional Biodiversity Strategy to address future climate change ■ Update vegetation mapping 	
Increased weed infestation	Finance	<ul style="list-style-type: none"> ■ Build internal capacity to resource increased weed maintenance programs 	L
	Engage	<ul style="list-style-type: none"> ■ Coordinate with CMAs, RFS and private landholders to increase capacity to control weeds 	L
	Advocate	Advocate to NSW Government Department of Primary Industries for: <ul style="list-style-type: none"> – Ongoing funding and support for the delivery of NSW Invasive Species Plan. – Development of best practice guidelines for roadside weed control programs. – Funding for weed management on Council land 	M

<p>Increased stagnation of water bodies leading to algal blooms</p> <p>Reduction in water quality due to sedimentation and high flows carrying litter</p> <p>Increased leaching from contaminated sites</p>	Plan	<ul style="list-style-type: none"> Review/ increased water monitoring program to detect and report algal blooms, water borne diseases and other potential contaminants. Develop a long term catchment water security strategy 	H
	Plan	<ul style="list-style-type: none"> Develop and implement dune restoration monitoring programs 	M
	Advocate	<ul style="list-style-type: none"> Advocate to DECC to gain policy guidance on implementing the coastline management manual. 	M
<p>Coastal erosion of beaches and dune system</p> <p>Increased erosion of wetlands and rivers due to higher flows</p>	Engage	<ul style="list-style-type: none"> Engage with Southern Rivers CMA to develop management strategies to address the impacts of climate change 	H

■ **Table 6 Adaptation Actions - Infrastructure**

Identified Risk	Adaptation Tool	Adaptation Action	Priority
Increased rainfall intensity reduces asset life	Plan	<ul style="list-style-type: none"> ■ Prepare technical studies which model the impacts of increased rainfall intensity on the stormwater network. ■ Prepare and review asset management plan/s for the stormwater network and stormwater management plan/s every five years. Plans should consider the projected long term impacts of climate change 	M
	Engage	<ul style="list-style-type: none"> ■ Engage universities to undertake technical studies on the changes in intensity duration curves with different climate change scenarios 	H
	Finance	<ul style="list-style-type: none"> ■ Seek additional funding for preparation and implementation of asset management plans for capital and recurrent expenditure for the stormwater network 	L
Sea level rise increases likelihood of submerged outlets and increased system upgrades	Plan	<ul style="list-style-type: none"> ■ Prepare Coastal hazard assessments for key assets 	L
Inundation of Sewage Treatment Plants due to overloading and reduction in system capacity	Plan	<ul style="list-style-type: none"> ■ Review/prepare monitoring and maintenance programs for sewage treatment network 	M
Increased pressure on water supply	Plan and Engage	<ul style="list-style-type: none"> ■ Prepare a long term water strategy which responds to a climate change future which includes: <ul style="list-style-type: none"> – Identification of the need for additional/alternative water supply and storages – Identifies the appropriateness of the water supply network to respond to projected climate change – Considers long term projections of drinking water demand 	H
	Inform	<ul style="list-style-type: none"> ■ Promote the use of water tanks/grey water within the LGA through information brochures and leaflets 	H
Increased damage to pavements and roads	Regulate	<ul style="list-style-type: none"> ■ Review design standards for infrastructure 	M

Increased maintenance cost of assets	Finance	■ Review Council budget allocations to make adequate provision for road repair works	L
Back up power supplies	Engage	■ Review Disaster Management plans in consultation with other stakeholders	M

6. Implementation of the Strategy and Plan

6.1. Implementation

Implementation of the CCASAP will require a coordinated effort by Councils', SCG and other authorities and internal coordination within each agency. There are a few recommendations which Council may consider to facilitate this process:

- ***Climate Change Adaptation Strategy Launch*** – host an event to launch the strategy, inviting Council General Managers, representatives from State and Federal Government bodies;
- ***Climate Change Adaptation Strategy Open Day*** – host an open day to raise awareness of the project and gain support from the local community;
- ***Website Update*** – dedicate a page of the Council website to climate change adaptation issues and actions.
- ***Illawarra Climate Change Forum*** – provide a web based portal of information for sharing knowledge between Councils

While this is a long term Strategy, its emphasis is on actions which are achievable within the next ten years. Achieving these actions is likely to require advocating for the inclusion of short term, high priority actions in State Government budgets and Council Corporate Strategic Plans and Operation Management Plans to ensure that sufficient resourcing is obtained to achieve these actions.

6.2. Monitoring Strategy

The CCASAP must be monitored on a regular basis to ensure priority actions are being implemented and that they continue to adequately respond to identified risks.

Annual monitoring is intended to include:

- Reporting on implementation of actions;
- Consideration of any barriers and challenges to implementing the CCASAP;
- Consideration of any new information regarding climate change risks;
- Revising any priorities to implementing the CCASAP;
- Identifying opportunities to revise the CCASAP or bring implementation back on schedule.

Annual monitoring should be reported in each Council's annual report.



6.3. Review of Strategy

It is anticipated that this Strategy will be reviewed every five years, or earlier as required by Council. Kiama Municipal Council will review progress to implement the Strategy, and will determine whether major changes in direction are required to take account of new information, new risks or other changing circumstances.

The first review of the Strategy is anticipated to commence in 2014 and will be aligned with revision of each Council's corporate strategy.

6.4. Next Steps – Communication and consultation

The outcomes of the project will be reported to Council, for review of its alignment with planning directions. Following this process, the actions will be incorporated into future Management Plans.

7. References

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ICLEI (2008), Cities for Climate Protection Australia Adaptation Initiative, *Local Government Adaptation Toolkit*.

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Appendix A Detailed Adaptation Action Plans

A.1 Planning and Development

Identified Risk	2050 Risk Rank	2070 Risk Rank	Adaptation Tool	Adaptation Action	Reason For Action	Priority	Timeframe	Lead Agency	Other Stakeholders
Reduction in land for future urban and industrial expansion and continued viability of assets	Extreme	Extreme	Inform	<ul style="list-style-type: none"> Undertake additional research to refine climate change impacts 	To inform a long term Develop Strategy Council need to undertake additional research into climate change projections. Information can be gleaned from regional studies being undertaken by DECC/University of New South Wales. Once the research project has completed (2009), these results should be used to inform strategic planning.	High	Medium	KMC -ES	UOW, DECC, DCC
Increased cost of development and land acquisition due to climate change impacts/threats			Plan	<ul style="list-style-type: none"> Develop constraints mapping based on bushfire risk areas/flooding/coastal erosion Review/Update Regional Strategy to identify areas most vulnerable to climate change 	Preparation of constraints mapping will guide spatial planning updates to the Illawarra Regional Strategy and provide information on which areas of the LGA are particularly vulnerable to extreme events	High	Medium	KMC, SCG	DoP
Restriction in subdivision location	High	High	Plan	<ul style="list-style-type: none"> Review and update LEP/DCP 	LEP and DCP manage the location of land use and development across the region. Policies and provisions could be used to identify areas where certain uses are encouraged and areas where other uses are prohibited (including due to water shortage or other impacts associated with climate change)	Medium	Medium	KMC-ES	DoP
Damage to existing and future development and infrastructure from flooding/sea level rise	High	Extreme	Plan	<ul style="list-style-type: none"> Prepare flood risk mapping for the LGA to inform which areas are at risk from flooding. Include Climate change allowance in all technical studies Include guidance provided by DECC in the draft sea level rise policy statement Review maintenance programs Review and update LEP/DCP following advice from technical studies. 	<p>Increased flood damage to infrastructure may require more careful monitoring of the conditions of infrastructure assets. Councils have an existing asset management plan which may need to be reviewed and updated to consider climate change impacts.</p> <p>When the DCP and/or LEP are next scheduled for review, consideration should be given for future projections of climate change and impacts on existing and future flood risk areas. Any flood policies adopted by Council should be consistent with the guidelines contained in the NSW Floodplain Development Manual.</p>	High	Short	KMC – E and W, ES, GIS	DECC
			Advocate	<ul style="list-style-type: none"> Advocate to State and federal Government for funding assistance for technical studies 	GIS is a powerful tool which Council can use to assess land capability and risks to locations within the LGA from climate change impacts. KMC need to seek to prioritise areas which require topographical survey (Lidar) and advocate to Government for financial assistance to commission the acquisition of this data.	High	Short	KMC	State and Federal Govt
Increased risk to existing agricultural practices due to water demand/warmer temperatures			Advocate	<ul style="list-style-type: none"> Advocate to the NSW Department of Primary Industries to: <ul style="list-style-type: none"> Review land use capability mapping. Allocate increased resources to developing and implementing a community education program to raise awareness about improving efficiency of water use and utilising sustainable farming practices. 	The Kiama region relies on its agricultural lands for long term food production and therefore sustaining agricultural practices is critical. Climate change may influence the type of crops which can be supported influence the current irrigation regime. Raising awareness of potential changes in water demand will allow landowners to adapt to new agricultural practices.	Medium	Medium	KMC - ES	DPI

Identified Risk	2050 Risk Rank	2070 Risk Rank	Adaptation Tool	Adaptation Action	Reason For Action	Priority	Timeframe	Lead Agency	Other Stakeholders
			Plan	<ul style="list-style-type: none"> Include diversification of the agricultural economy as part of Council Business Plan and 10 year financial plan Develop a local water strategy which plans for long term supply-demand changes 	The agricultural economy relies heavily on optimum climate conditions to sustain productivity levels. Climate change threatens the consistency of these conditions and poses a significant risk to the economy. To address this, Council should plan through the LEP towards economic diversification to spread the risk. Council Draft LEP should seek to provide opportunities for agricultural diversification and identify employment lands as shown in the Illawarra Regional Strategy.	Low	Long	KMC,SCG	DoP, Sydney Water
Increased damage to crops/livestock	Extreme	Extreme	Inform	<ul style="list-style-type: none"> Educate landowners on necessary provision of shelter and refuge for livestock 	Projected warmer temperatures and variable rainfall increases vulnerability of existing crops and livestock. Landowners may need to build shelters for livestock and be informed on changing optimal seasons for agricultural production	Medium	Medium	DPI, SCG Land Management Program	
Climate impacts on housing and building design (existing and future)	Extreme	Extreme	Advocate	<ul style="list-style-type: none"> Advocate to Australian Building Codes Board for higher standards for designs to address <ul style="list-style-type: none"> Extreme heat conditions Increased storm intensities Flood proofing 	The Building Code of Australia (BCA) contains performance requirements and also the building solutions (prescribed building standards) which apply to building construction in high wind areas. The BCA contains State and Territory variations to address the various climatic conditions found throughout Australia. These building standards enable construction to respond to impacts associated with climate change and are continually updated and modified to reflect changing environmental conditions, community expectation and changes in building technology. A Council of Australian Government (COAG) report on protection from natural disasters made recommendations that priority be given to reviewing the BCA and standards in respect of mitigating the effects of natural hazards. This work is ongoing, in conjunction with several other organisations including Emergency Management Australia and Standards Australia.	Medium	Medium	KMC- ES	BCA,
			Plan	<ul style="list-style-type: none"> Develop Council Flood Policy for existing and new developments based on mapping and according to NSW Floodplain Development Manual 	An increase in flood risk may require Council to revise the flood planning levels which are currently applied across the LGA. Any revisions to flood planning levels must be included with the LEP/DCP and be consistent with the guidance provided in the NSW Floodplain Development Manual,	High	Medium	KMC – E and W, ES	DECC
Increase power failures and black outs	High	High	Plan Advocate	<ul style="list-style-type: none"> Investigate options for alternative energy supply to essential Council services such as hospitals/water and sewerage infrastructure and emergency services. Coordinate with Integral energy to find out current procedures for managing blackouts. 	Reduced availability of power supply including increased occurrences of black outs may result from increased storms and bushfires. Provision of alternative energy generation including backup power supply is costly and not typically provided for all uses. Hospitals, water and sewerage infrastructure and aged care facilities have been identified as essential infrastructure which requires an ongoing power supply.	Medium	Medium	KMC- E and W & Risk	Integral



Identified Risk	2050 Risk Rank	2070 Risk Rank	Adaptation Tool	Adaptation Action	Reason For Action	Priority	Timeframe	Lead Agency	Other Stakeholders
Back up power supplies	High	High	Engage	<ul style="list-style-type: none"> Review Disaster Management plans in consultation with other stakeholders 	<p>Council must coordinate with all major Stakeholders (Integral, Sydney Water, emergency services) to ensure contingency plans are in place to address increases in power outages.</p> <p>A number of power failures have occurred in the Kiama region in the past. The risk to water supply continuity is low as reservoir detention times are of the order of 4 or more days (<i>Sydney Water, 2009</i>). Integral Energy has responded efficiently to previous power outages and continued coordination will help identify any enhanced risk posed by climate change.</p>	Medium	Medium	KMC	Sydney Water, all emergency services, LEMC

A.2 Environment

Identified Risk	2050 Risk Rank	2070 Risk Rank	Adaptation Tool	Adaptation Action	Reason For Action	Priority	Timeframe	Lead Agency	Other Stakeholders
Increased bush fire risk to vegetation	Extreme	Extreme	Plan	<ul style="list-style-type: none"> Review and update Biodiversity Strategy Improve bush fire research and risk management for predicted climate change scenarios 	<p>Council have an existing Biodiversity Strategy to include climate change allowances and determine appropriate actions.</p> <p>Identify increased locations of green waste which may be susceptible to bush fire. There will be an increase in green waste so more emphasis on APZ</p>	High	Medium	KMC-ES	DECC, RFS, IRBMC
			Engage	<ul style="list-style-type: none"> Coordinate with other Stakeholders to build a standard approach across Councils 	Coordination with Wollongong and Shellharbour Council will allow similar management principles to be rolled out across the region. This will enable mobilisation of resources and equipment to assist with maintenance initiatives.	Medium	Long	KMC-ES	DECC, RFS, IRBMC, SCA
			Advocacy	<ul style="list-style-type: none"> Advocate to RFS to review the 'Planning for Bushfire Protection Guide' at least every two years to account for predicted climate change scenarios 	Planning for Bushfire Protection, A Guide for Councils', Planners, Fire Authorities and Developers, NSW Rural Fire Services 2006, contains guidelines for suitable defensible space, access considerations, vegetation management, on site emergency management arrangements, water supply provisions, site assessment for building construction requirements and planning framework for developments in rural and urban areas close to land likely to be affected by bush fire. These Guidelines are intended to be reviewed and updated as new research becomes available or at least every two years.	Medium	Long	KMC-ES	RFS
Habitat Loss due to drying of swamps and wetlands Loss of sub tidal/tidal habitats due to climate change and subsequent loss of biodiversity	Extreme	Extreme	Plan	<ul style="list-style-type: none"> Develop a monitoring program to assess the impact of sea level rise on coastal habitats Update/Review estuary management plans Make planning provisions in LEP/DCP which preserve biodiversity of the area by providing species migration corridors Develop a Regional Biodiversity Strategy to address future climate change Update vegetation mapping 	<p>Council require a more detailed assessment of ecosystems and habitats which will be most vulnerable to climate change. Mapping the vulnerable habitats will allow planning provisions to be incorporated in to the LEP/DCP.</p> <p>Future impacts of climate change on habitats must be considered in the preparation of estuary management plans.</p>	Medium	Long	KMC-ES	SRCMA
Increased weed infestation	High	High	Finance	<ul style="list-style-type: none"> Build internal capacity to resource increased weed maintenance programs 	Southern Councils Group employs a Noxious Weeds officer who is responsible for weed control. The capacity of this person may need reviewing to meet the demands of increased weed maintenance in a climate changed future.	Low	Long	KMC –E & W, SCG, SRCMA	

			Engage	<ul style="list-style-type: none"> Coordinate with CMAs, CVA, Landcare Illawarra and private landholders to increase capacity to control weeds 	Engage stakeholders who have roles in weed control to develop best practice guidelines for the local area. Coordination with the RFS will allow possible integration between weed control and bush fire management practices.	Low	Long	KMC, SCG Weeds Officer	SRCMA, CVA, LI Illawarra District Weeds Authority,
			Advocate	<p>Advocate to NSW Government Department of Primary Industries for:</p> <ul style="list-style-type: none"> Ongoing funding and support for the delivery of NSW Invasive Species Plan. Development of best practice guidelines for roadside weed control programs. Funding for weed management on Council land 	The NSW Department of Primary Industries (DPI) has prepared the NSW Invasive Species Plan and the Weeds Strategy to manage priority weeds and pests in key locations in NSW. DPI are able to allocate grants for noxious weeds control and inspection programs on roadsides and on council lands to local councils' and other weed control authorities to help tackle weed issues. Weed Officers provide assistance regarding; weed identification and advice; weed management programs; educational material and weed identification and local area knowledge.	Medium	Medium	KMC	DPI, IDNWA
<p>Increased stagnation of water bodies leading to algal blooms</p> <p>Reduction in water quality due to sedimentation and high flows carrying litter</p> <p>Increased leaching and inundation of contaminated sites</p>	High	High	Plan	<ul style="list-style-type: none"> Review/ increased water monitoring program to detect and report algal blooms, water borne diseases and other potential contaminants. Develop a long term catchment water security strategy including mapping of water sources and contaminated sites 	Monitoring programs would allow early detection of contaminants which may be at risk of entering the water supply system. Development of a long term strategy would coordinate activities at a catchment scale and encourage a whole of authority approach.	High	Short	KMC-Eng/Env	DECC, DWE, DPI, SCA, SRCMA, Sydney Water Streamwatch groups
	High	High	Inform	<ul style="list-style-type: none"> Continue community education stormwater campaigns including schools education 	Continued awareness of the impacts of human behaviour on ecosystems will aid in mitigation efforts.	Medium	Medium	KMC-Env	Local schools, builders and community
<p>Coastal erosion of beaches and dune system</p>	High	Extreme	Plan	<ul style="list-style-type: none"> Develop and implement dune restoration monitoring programs 	The impact of climate change will increase coastal and inland erosion by rising sea levels, increased rainfall intensities and increases in flow magnitudes and subsequent velocities. Flood studies will help inform the risk of erosion in inland watercourses but a monitoring program should be developed to more adequately inform Council of the risks to coastal assets from climate change. Monitoring the changes in the natural system will allow management measures to be planned.	Medium	Long	KMC-Eng	SRCMA

<p>Increased erosion of wetlands and rivers due to higher flows</p>			<p>Advocate</p>	<ul style="list-style-type: none"> Advocate to DECC to gain guidance on implementing the coastline management manual. 	<p>NSW Coastline Hazard Policy introduces a range of planning and structural measures which provide for</p> <ul style="list-style-type: none"> the establishment of a state wide management system which requires balanced management of the coastline; the control the potential for losses in new development through the application of effective planning controls designed to ensure that the development is compatible with the hazards; a reduction in the impact of hazards on existing developed areas through the construction of protective works and/or the voluntary purchase of property at equitable prices; and the construction of beach improvement works to protect or enhance the recreational amenity of the State's most heavily used beaches and their associated sand dune systems <p>The policy needs to be reviewed and updated to enable a consistent approach to adapting to future climate change projections for Councils.</p>	<p>Medium</p>	<p>Long</p>	<p>KMC-Eng & ES</p>	<p>DECC</p>
			<p>Engage</p>	<ul style="list-style-type: none"> Engage with Southern Rivers CMA, CVA, Landcare groups to develop management strategies to address the impacts of climate change 	<p>Council have representatives on the Coastal and Marine Working Group which provides advice to the SRCMA in facilitating the Coastal and Marine Program. This forum can be used to plan for adequate management of the wetlands, rivers and coastal zones due to the impacts of climate change. Engage local Landcare groups to target rehabilitation and coastal protection areas</p>	<p>High</p>	<p>Short</p>	<p>KMC-Env</p>	<p>SRCMA, CVA. Landcare groups</p>

A.3 Community and Corporate Services

Identified Risk	2050 Risk Rank	2070 Risk Rank	Adaptation Tool	Adaptation Action	Reason For Action	Priority	Timeframe	Lead Agency	Other Stakeholders
Increased potential for injury and death from extreme weather events (e.g. strong winds causing tree falls)	High	High	Inform	<ul style="list-style-type: none"> Prepare/review and implement a Public Health Plan which includes a community awareness raising/ community education program regarding risks associated with coastal storms, strong winds and intense rainfall and flooding 	Public Health Plans, which sets the strategic direction for Councils' to improve health and wellbeing outcomes for the local community, are not mandatory in NSW. Preparation of a health plan could include development of a community awareness raising/education program to inform the community about risks associated with extreme weather events and potential failure of sea walls and flood defences. These actions should be facilitated through the SES with Council seeking an agreement with the SES in relation to community awareness.	Low	Long	KMC-ES	SES
Increased requirement for mental health services	High	Extreme	Advocate	<ul style="list-style-type: none"> Advocate to the NSW Department of Community Services to review and increase capacity of community services 	Climate change impacts including extreme heat, flooding and bush fires can increase the level of stress and ill health amongst the local community. Councils must seek to build organisational capacity to be able to respond to a rising demand in mental health and counselling services due to the impacts of climate change.	Low	Medium	KMC-Comm Services	Department of Community Services
Increased number requiring assistance (particularly vulnerable groups)	High	Extreme	Engage	<ul style="list-style-type: none"> Engage with health service providers to share resources 	Enhance collaboration of health services across the LGA and neighbouring Councils will assist with providing necessary services. It will also reduce cost of operations if equipment can be shared.	Low	Long	SCG	SESIAHS, Department of Health
Loss of recreational amenity (i.e. sports fields)	Tolerable	High	Plan	<ul style="list-style-type: none"> Review/update risk assessments for Council owned sports fields 	Sporting clubs already have risk assessments to determine if a facility is adequate for use. Climate impacts such as increased waterlogging of pitches or excessive drying of fields may require and update to the existing risk assessment. Council may consider rotating the use of the sports grounds to reduce the risk of compaction of turf and/or review the watering and drainage strategies currently applied.	Low	Long	KMC – E & W	Sports clubs, Sports Association
Increased public health risk due to declining water quality	High	High	Inform	<ul style="list-style-type: none"> Investigate the Installation of information boards to alert local community to risks in waterways 	Increases in flooding and runoff can raise pollution levels in waterways. Beachwatch and streamwatch monitoring programs can be used to inform the public displays and provide information on areas considered safe for swimming depending on conditions. Work in conjunction with Sydney Water.	Low	Long	KMC - ES	Streamwatch
Increased risk of respiratory illness	High	High	Advocate	<ul style="list-style-type: none"> Advocate to the Department of Health to prepare community education leaflets on respiratory illness 	Increases in bush fire occurrences can result in a reduction in air quality which can have a significant impact on the frequency of respiratory illness. People with pre-existing conditions (such as asthma) will need to take necessary precautions to protect themselves.	Low	Long	KMC - ES	Department of Health
				<ul style="list-style-type: none"> 					

Increased heat stress and outdoor working	Tolerable	High	Plan	<ul style="list-style-type: none"> Prepare/review and implement a Public Health Plan which includes an extreme heat strategy. Prepare/review open space strategy plans to include provision of shade in communal areas such as playgrounds, pools, parks etc and availability of drinking water fountains 	<p>Councils should prepare a Public Health Plan which provides guidance on actions to take to minimise risk during extreme heat events. In preparing this strategy, Councils should seek guidance from the SESIAHS to ensure a consistent message is being disseminated. The strategy would identify a number of refuge centres, such as libraries, community buildings to be used during extreme heat events. These buildings would have adequate air conditioning and drinking water to support the visitors. The strategy should address the risk of heat stress at public events which are held within the LGA. This would include the increased provision of shade, drinking water and volunteer medical staff (e.g. St Johns Ambulance). Information on dealing with heat stress could be included with Council mail outs (for example with rate notices) to reduce paper usage and ensure the information is received and acknowledged.</p> <p>Council should include climate change risks in their long term master planning initiatives (e.g. Illawarra Strategy) to ensure adequate provision is made in public areas for shade and available drinking water supplies.</p>	High	Medium	KMC	Department of Health, DoP Workcover
Increased pressure on emergency services (resources and facilities)	Extreme	Extreme	Advocate	<ul style="list-style-type: none"> Advocate to local emergency services (RFS, SES, Police Ambulance services) to increase resources to have adequate capacity for extreme events 	An increased risk of bushfire and flooding will increase demand on emergency services. Organisation such as the SES, RFS etc must consider securing additional resources to meet this demand. This may require updating their recruitment strategies or enhanced collaboration with neighbouring operation centres.	High	Short	KMC	SES, RFS, Police Ambulance, LEMC
			Engage and Facilitate	<ul style="list-style-type: none"> Encourage Council staff and community to volunteer in emergency services organisations. 	Increased emergency service volunteer capacity will provide greater resilience to Climate Change impacts and aid Council and the community in recovery efforts.	Medium	Medium	KMC - HR	SES
			Finance	<ul style="list-style-type: none"> In collaboration with SES, secure funding for more investment in equipment (boats, Council trucks etc) 	An increase in extreme events will enhance the need for emergency vehicles to mobilise volunteers. More frequent use of these vehicles will require additional servicing and maintenance costs. Securing finances to purchase boats and trucks will allow Council and the SES to respond effectively. This equipment may also be shared with neighbouring Councils to increase operation efficiency.	High	Long	SCG	SES
Increase risk of food borne disease through inadequate refrigeration	High	High	Inform	<ul style="list-style-type: none"> Develop a power failure toolkit for food shop owners and operators 	<p>An increase in temperature will increase demand for food refrigeration. Consequently, this increases the risk of power failures if usage exceeds capacity. A food kit would provide shop and restaurant owners with information on:</p> <ul style="list-style-type: none"> Alternative power supplies Adequate storage of food Appropriate disposal of food Cleaning and sanitation 	Medium	Medium	KMC - ES	Food Authority, Dept of Health
Increasing cost of insurance premiums and liability claims	Extreme	Extreme	Plan	<ul style="list-style-type: none"> Re-assess annual budget allocations as part of the financial and management plan 	Increase in flooding and bush fire frequency may expose Council to increased liability claims for damage to property. Council should plan for this as part of the risk management process and Business Continuity Plans.	High	Short	KMC	All levels of Government

Loss of holiday parks and tourist revenue	High	Extreme	Plan	<ul style="list-style-type: none"> Develop a regional tourism development strategy which seeks to capitalise on beneficial opportunities while considering diversification of the economic base. 	<ul style="list-style-type: none"> The Illawarra region relies heavily on tourist revenue. Climate change impacts (such as warmer temperatures) may increase the number of visitors to the area. However, increased rainfall intensities and sea level rise may put these tourist attractions at risk. Council need to consider a long term plan to adapt to the changing tourism trends which may be observed with climate change. A long term economic strategy will assist Council to ensure the region's economy would be sustained in a climate change future. 	Low	Long	KMC	SCG
			Finance	<ul style="list-style-type: none"> Introduce a tourism levy 	<p>Additional revenue would enable tourist facilities to be modified to projected climate change impacts, for example:</p> <ul style="list-style-type: none"> Improved air conditioning in holiday parks, tourist offices, museums Tree planting to enhance natural shade provision in parks 	Low	Long	KMC	Chamber of Commerce
Loss of transport services	High	High	Plan	<ul style="list-style-type: none"> Review/update disaster management plans to make allowance for climate change impacts 	<ul style="list-style-type: none"> The Disaster Management Plan (DISPLAN) and associated sub plans document the existing arrangements for all agencies involved in managing an emergency. These plans must seek to make provision for the increased likelihood of extreme events (bush fires, floods, storm surge) due to climate change. The plans should address the risk of increased isolation of communities in extreme conditions and the possibility that residents may have to remain in their homes for sustained periods of time due to disruption of services, limited access to services etc. 	Medium	Long	KMC	LEMC and associated agencies
			Design and Operate	<ul style="list-style-type: none"> Review/update designs for public transport facilities to include climate change impacts Future designs of bus shelters (for example) should make adequate shade provision if people have to wait for extended periods of times 	<ul style="list-style-type: none"> Review the provision of shade and rain cover at bus stops and train stations. Future designs should include covered bus stops for protection of community from extreme heat and intense rainfall events. Climate change risks should be included in any future plans for structural upgrades of these facilities. 	High	Long	KMC-Comm Ser	CityRail, RTA, STA

A.4 Infrastructure and Infrastructure Services

Identified Risk	2050 Risk Rank	2070 Risk Rank	Adaptation Tool	Adaptation Action	Reason For Action	Priority	Timeframe	Lead Agency	Other Stakeholders
Increased rainfall intensity reduces asset life	Extreme	Extreme	Plan	<ul style="list-style-type: none"> ■ Prepare technical studies which model the impacts of increased rainfall intensity on the stormwater network following on from the review of Aust. Rainfall & Runoff data ■ Prepare and review asset management plan/s for the stormwater network and stormwater management plan/s every five years. Plans should consider the projected long term impacts of climate change and include: <ul style="list-style-type: none"> – Proposed monitoring of pipe condition. – Staged extensions to the pipe stormwater network, duplication of stormwater system and targeting high risk areas. – Proposed maintenance and replacement of the network including replacing pipes with pipes made of more resilient materials (appropriate to area) and improved construction techniques with improved bedding and backfill materials. 	<p>Council need to identify which assets are most at risk due to climate change impacts. A technical study which could provide updated rainfall intensities and use these to model the impacts on the network. Some information prepared as part of the flood studies and floodplain risk management plan may assist with this identification process. The results would indicate vulnerability of assets and prioritise where action is required as part of the asset management plan.</p> <p>Asset management plans are typically prepared to outline the existing condition of infrastructure assets including water pipes and stormwater drains and recommend maintenance and asset renewal. These plans could be prepared and reviewed to take into account the impacts of climate change and to consider construction techniques or materials in response to climate change impacts.</p>	Medium	Long	Engineering	DECC, Local Government Engineers Association
			Engage	<ul style="list-style-type: none"> ■ Engage universities to undertake technical studies through Research Centres. 	Council have existing links to the University of Wollongong and are well placed to facilitate some additional research in this field to inform technical studies and infrastructure upgrades.	High	Medium	KMC - ES	UoW
			Finance	<ul style="list-style-type: none"> ■ Seek additional funding for preparation and implementation of asset management plans for capital and recurrent expenditure for the stormwater network through: <ul style="list-style-type: none"> – Each Council's Corporate Strategic Plan. – Each Council's Operational Management Plan. – Advocacy to the Department of Water and Energy for increased funding for asset management, monitoring, maintenance and replacement and new stormwater drainage works. 	Funding for capital and operational expenditure for water supply infrastructure is typically sought through Council's annual Operational Management Plan. In addition, the Corporate Strategic Plan could also outline the staging of capital expenditure required to upgrade infrastructure. Additional funding may be required to respond to climate change impacts and could be sought from the Department of Water and Energy.	Low	Long	KMC	DWE

Sea level rise increases likelihood of submerged outlets and increased system upgrades	High	Extreme	Plan	<ul style="list-style-type: none"> Prepare Coastal hazard assessments for key assets 	<p>A coastal hazard assessment study would use latest sea level rise predictions to determine which assets are at risk of being submerged. The areas at risk could be mapped using Lidar data and overlaid with results from coastal models. The results from the study would provide the following information to be included in the asset management plan:</p> <ul style="list-style-type: none"> Condition of asset Cost of upgrade works Implications on design life and importance of design standard review 	Low	Medium	KMC - Engineering	DECC
Inundation of Sewage Treatment Plants due to overloading and reduction in system capacity	Extreme	Extreme	Advocate	<ul style="list-style-type: none"> Liaise with Sydney Water as they review/prepare monitoring and maintenance programs for sewage treatment network 	<p>Sydney Water are currently focussing on developing tools to assist their understanding of climate change impacts to their organisation over the next few years. This includes the collation of climate change science into a "ready reckoner" to provide consistent advice to planning and operations' vulnerability mapping of SW assets exposed to climate change risks, particularly extreme events and sea level rise. Council should coordinate with Sydney Water on these initiatives so to understand the associated implications on their operations.</p>	Medium	Medium	KMC - Engineering	Sydney Water, DECC
Increased pressure on water supply	Extreme	Extreme	Plan and Engage	<ul style="list-style-type: none"> Prepare a long term water strategy which responds to a climate change future which includes: <ul style="list-style-type: none"> Identification of the need for additional/alternative water supply and storages Identifies the appropriateness of the water supply network to respond to projected climate change Considers long term projections of drinking water demand Addresses demand for farming practices and bushfire fighting 	<p>Climate change projections may threaten the long term water supply security of the Illawarra Region. Council should coordinate with Sydney Water to understand how the availability of water may be affected and what strategies may be put in place to manage the change in the supply demand balance.</p> <p>Under the Metropolitan Water Plan prepared by Sydney Water, there are key actions associated with assessing potential climate change impacts on water supply. Sydney Water is currently working with other agencies, led by the Department of Water and Energy to model and assess these impacts.</p> <p>Sydney Water is also undertaking a review with the NSW Department of Planning into the effectiveness of BASIX. The result of this and other ongoing analysis by Sydney Water will be improved forecasting and planning for future water and waste water services</p>	High	Medium	KMC – ES & Eng	Sydney Water, DECC, DoP, Gerringong Gerroa Sewerage Scheme
			Inform	<ul style="list-style-type: none"> Promote the use of water tanks/grey water within the LGA through information brochures and leaflets 	<p>Council should encourage residents to be self sufficient and have access to their own water supplies not only for domestic uses but also to have back up supplies for emergency situations. Water saving initiatives strengthens the key objectives of the Sustainable Illawarra project.</p>	High	Short	KMC	
Increased damage to pavements and roads	Extreme	High	Regulate	<ul style="list-style-type: none"> Review design standards for infrastructure 	<p>Climate change impacts must be included in design standards. Consideration needs to be given to:</p> <ul style="list-style-type: none"> Increase level of maintenance (remedial repairs) Alternative construction materials (e.g. which may be more resilient to extreme heat) Decreased asset life 	Medium	Long	KMC - Engineering	
Increased maintenance cost of assets	Extreme	Extreme	Finance	<ul style="list-style-type: none"> Review Council budget allocations to make adequate provision for road repair works 	<p>Council will need to finance repair works to major and minor roads. Potential sources of funding could be NSW government or part funded by the RTA.</p>	Low	Long	KMC - Engineering	RTA, State Government



Appendix B Risk Assessment Report



Appendix C Adaptation Matrix

EXAMPLE ADAPTATION TOOLS - For Workshop Purposes Only

	Finance	Regulate	Inform	Plan	Engage and Facilitate	Design and Operate	Advocate
G E N E R I C E X A M P L E S	Investment Budgets Procurements Subsidies Grants Rebates Levies	Regulations, laws Policies, codes Development Control Guidelines	Research Education Forums, seminars Website Information Brochures, interactive Local Media - TV, newspapers, radio	Corporate Planning Scheme Disaster Management Catchment Recreation Parks, natural areas Infrastructure Pest Management Economic Development Risk Assessment	Partnerships Community Groups Universities Inter-government liaison Industry bodies	Transport Infrastructure Water Supply Waste facilities Buildings, venues	NSW Government, Australian Government Peak industry bodies

	1	2	3	4	5	6	7
A	Build organisational capacity to advise on climate change matters (employ a climate change policy officer)	Review LEP in light of expected climate change	Develop an education program which explains climate change risks and actions which Council are taking	Consider Climate Change risks/impacts when preparing Council Corporate Strategic Plan and Operation Management Plan	Develop Strategic Alliances with other LGA's and other institutions which are committed to Climate Change Adaptation, e.g. membership of ICLEI	Design Council assets to allow for ease of future adaptation, e.g. room to add significant shade provision	Advocate to DCC to secure funds for implementation of action plan
B	Secure funds to provide climate adaptation grants for local residents	Review existing DCP and consider new DCP's for coastal and low lying areas which may be vulnerable to climate change	Build a forum for ongoing community engagement in Climate Change Issues use existing frameworks, i.e. 'Sustainable Illawarra Strategy'	Develop a KPI system to measure level of consideration of climate change in planning	Consult with local businesses, organisations and community to understand level of awareness of climate change impacts	Review guidelines and building regulations for critical infrastructure	
C	Secure additional revenue for climate adaptation planning through grants, levies etc	Assessment of Development applications against climate change risk criteria	Integrate research from DECC/UNSW to guide sea level rise policy	Review State of the Environment Reports to include reporting on Climate Change Impacts	Develop Climate Change Community Action Groups		
D	Secure financial allocations for climate adaptation planning in Council annual budgets		Raise the profile of climate adaptation in the Illawarra by 'branding' adaptation initiatives	Consider Climate Change risks as part of each Councils Business Continuity Plans	Develop a climate change steering Committee for SCG member Councils and representatives from all levels of Government		
E				Commit to reporting on the implementation of the adaptation plan on an annual basis			
F	Seek additional funding for provision of acquisition of lands unsuitable for residential development due to flood risk/sea level rise	Update Policies (land development, flood policies, DCP) based on technical studies	Educate the Local Community on increased frequency of flooding, bushfires using websites, community workshops	Update Flood Risk Management Studies and Plans to determine areas which are at increased risk.		Increase use of insulation in new buildings	
G	Commission studies for more detailed assessment of sea level rise. E.g. coastal hazards assessment and management plan	Review urban stormwater management Plans to plan for increased volume of rainfall		Commission Lidar survey to guide risk mapping	Make links with Universities who are undertaking research to update IFD curves and rainfall predictions	Reduce lighting and equipment loads to reduce overheating	Advocate for State Government funding to undertake technical studies (e.g. Flood risk management plans) to inform flood planning policies
H		Review LEPs to consider long term climate projections, bushfire risk, flooding etc		Review land use policy and provisions of LEP and DCP as new climate change data becomes available.		Optimise design of cooling systems to provide the best energy efficiency under higher temperature operating loads	Advocate to external agencies to review Disaster Management Plans, Bushfire Management Plans, local flood plans, Implement NSW Invasive Species Plan
I		Update constraints mapping to include flood liable areas/bush fire hazard mapping.		Prepare master plans/development plans, which take into account projected climate change, to guide long term use and development of areas			
J		Review/prepare design guidelines for street furniture, shelters and awnings	Support and publicise initiatives for sustainable land management.	Review land use capability mapping so agricultural land remains available			
K		Review design standards for future development which showcase best practice in climate sensitive building design	Educate local community on appropriate use of cooling systems to avoid excessive noise disturbance				

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	1	2	3	4	5	6	7
L M N O P	E N V I R O N M E N T	Increase in resources to maintain parks, forests and other green areas			Implement due restoration programmes, consider zoning beach use		Use of plants in open spaces which are native to the local Council area and have ability to adapt to changing climatic conditions
					Increase monitoring of sea level rise and coastal retreat		Protection of vegetation in vulnerable coastal areas (i.e. protecting productive ecological zones)
		Implement State planning controls for riparian buffers in LEP and DCPs.	Develop education programs targeting land management and agricultural practices	Review and update environmental control plans (such as weed management plans). Prioritise which parks/reserves are most at risk.	Partner with catchment management and NPWS to integrate weed control measures		Advocate to CMA to review Catchment Action Plan objectives and policies
		Apply for grants from the Environmental Trust to build capacity for Council staff and deliver community education programs regarding biodiversity loss.	Prepare regional/ localised studies which assess the impacts of climate change on biodiversity and identify 'biodiversity hotspots' which require further intensive management in a climate changed future.		Work with CMA to monitor changes in aquatic ecosystems/habitats		Advocate to the NSW Department of Environment and Climate Change
							Review the NSW Biodiversity Strategy taking into account projected climate change impacts on biodiversity.
Q R S T U V W	C O R P O R A T I V E S E R V I C E S A N D W		Educate the local community on changing bushfire/flood risk and how they can be better prepared	Prepare/review and implement a Public Health Plan which includes an extreme heat strategy which includes	Engage the local community to update the Council flood plans and disaster management plans	Include provision for shade structures in the design of new Council recreational facilities	
			Educate the local community on facilities which may be affected - sports grounds, clubs, beaches etc	Review risk assessment for Council owned sporting fields		Rotate the use of Council sporting grounds to allow lawns to recover and reduce watering requirements	
			A community education/awareness program which raises awareness about the impacts of extreme heat projected due to climate change.	Increase availability of water fountains in public areas	Partner with Department of Health to integrate strategies for managing extreme heat stress		
				Review program of Public events which may be at increased risk due to climate change	Partner with event organisers to plan for increased shade provision at public events		
		Increase investment in health care facilities to build capacity to cope with rising demand		Preparation of a public health plan which seeks to improve and foster a healthy community			
				Map areas which may be vulnerable to increase mosquito habitats			
				Increased water monitoring programs which can provide early detection of algal blooms and water borne diseases			

EXAMPLE ADAPTATION TOOLS - For Workshop Purposes Only

	Finance	Regulate	Inform	Plan	Engage and Facilitate	Design and Operate	Advocate
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	1	2	3	4	5	6	7
X		Develop a Regional Water Strategy which identifies the need for additional or alternative water supply sources	Educate the community on water efficient garden planting and watering		Create alliances with Sydney Water to review regional water strategies	Review current maintenance practices and update taking into account rainfall and extreme weather predictions	
Y	Apply for grants from the State Government to review urban stormwater provisions	Review Council policies for design of stormwater infrastructure, include provision for changes in rainfall intensities.	Research and develop water harvesting techniques which can be implemented on a lot basis	Prepare asset maps within a GIS system which provide information of condition and expected life cycle. Use information to plan upgrade works based upon long term climate projections		Update infrastructure design standards for stormwater management	Advocate to State and Australian Government to seek funding for implementation of regional water strategy
Z	Apply for funding support for local roads administered by Council	Identify opportunities to include Sustainable Urban Design systems into existing developments/infrastructure				Investigate options for alternative energy generation	Advocate to energy suppliers to develop emergency response plans for increased blackouts to support critical services
AA						Consider options to upgrade runway at Illawarra Airport to be able to accommodate aircraft in higher temperatures	
BB						Implement a staged construction process for infrastructure which has a design life >50 years to allow future climate change impacts to be taken into account	
CC						Increase monitoring and maintenance activities	



Appendix D Workshop Delegate Lists



Council Workshop 29 April 2009

Workshop Delegate
Andrew Knowlson
Paul Czulowski
Chris Fuller
Sue Pritchard
Rick Boyle
Clare Rogers

Julie Milevski

External Stakeholder Workshop 7 May 2009

Organisation	Workshop Delegate
SES –Region and Wollongong City Unit	Dianne Gordon
SES- Kiama Unit	David Leigh
Rural Fire Service	David Bartlett
Health Department	Glenis Lloyd
Department of Primary Industry	Craig Muir
DECC	Tony Hodgins
Dept of Planning	Graham Towers
Port Kembla Authority	Jim Robinson
Kiama Municipal Council	Sue Pritchard, Darren Brady