



# Climate Change Adaptation Implementation Plan

2017

## Background

A revised Climate Change Adaptation Strategy was endorsed by Council on 9 August 2016. This Strategy provides a management framework for Council to reduce its vulnerability and strengthen its resilience to the increasing intensity and frequency of extreme weather events in Ku-ring-gai, as predicted by climate scientists in their medium and long term climate regional modelling.

To inform this Strategy, a workshop was conducted for managers and key staff to step them through the adaptation planning process. A framework was provided for each manager and their staff to identify and evaluate climate change related risks according to their likelihood and consequence and plan adaptations. Where requested, Environment and Sustainability staff also attended team meetings to assist managers and their staff in this process. Each risk identified as either 'unacceptable', 'undesirable' or 'acceptable with controls' was required to have an adaptation nominated.

The Risk Matrix used to inform this adaptation planning process is included as Appendix 1 in the 2016 Climate Change Adaptation Strategy and the list of climate change risks and adaptations (or risk controls), as identified by managers and their staff, is included as Appendix 2 in the Strategy.

The Climate Change Adaptation Implementation Plan 2017 provides managers with details of the methodology adopted to prioritise the adaptations included in the 2016 Climate Change Adaptation Strategy, the results of the prioritisation exercise and a link to the prioritised list of climate change adaptations, in response to bush fire, storms and flood, heat stress and drought.

## Prioritising climate change adaptations (or risk controls)

Appendix 2 (adaptation planning table) of the 2016 Climate Change Adaptation Strategy formed the basis for the prioritisation of the climate change adaptations. The extreme weather events identified as particularly relevant to Ku-ring-gai were bush fires, severe storms and flash floods, heat waves and drought (primary hazards). Managers and their staff identified and submitted a total of 276 possible adaptations covering all areas of Council. Storm and flash flood received the most attention with 99 (36%) adaptations created, followed by 81 (29%) for bushfire, 62 (22%) for extreme heat and 34 (12%) for drought.

### Prioritisation methodology

The adaptations were firstly 'cleaned' up. This initial step involved clarifying the intent of some adaptations with the relevant managers, the removal of any adaptations not climate change specific, detecting and deleting duplicates, consolidating similar adaptations into a single action and identifying adaptations with responsibility for implementation across multiple sections of Council.

This resulted in 39 bushfire related adaptations, 45 storm and flood related adaptations, 20 heat stress related adaptations and 17 drought related adaptations to be prioritised.

Council's 2010 *Climate Change Adaptation Strategy* developed a method for analysing the cost/benefit of community based adaptations for specific risks relating to bush fire, extreme heat, storms and floods, and drought, which was reviewed and adjusted for this process.

A set of criteria and ‘trigger questions’ were developed to assess each potential adaptation across the Triple Bottom Line (financial, environmental and social) and, importantly, the capacity of the adaptation to reduce the weather hazard specific risk.

<b>Table 1 – COST / BENEFIT CRITERIA APPLIED FOR TRIPLE BOTTOM LINE AND RISK</b>				
	<b>Financial</b>	<b>Environmental</b>	<b>Social</b>	<b>Risk</b>
<b>Storms &amp; floods</b>	<i>Impact on:</i> <ul style="list-style-type: none"> <li>- Capital costs</li> <li>- Operational costs</li> <li>- Employment</li> <li>- Insurance premiums / availability</li> <li>- Litigation</li> <li>- Strengthened resilience and recovery</li> </ul>	<i>Impact on:</i> <ul style="list-style-type: none"> <li>- Resource consumption</li> <li>- Air emissions</li> <li>- Catchment hydrology</li> <li>- Noise emissions</li> <li>- Erosion potential</li> <li>- Water quality</li> <li>- Biodiversity resilience</li> </ul>	<i>Impact on:</i> <ul style="list-style-type: none"> <li>- Equity (who pays, who benefits)</li> <li>- Local business</li> <li>- Social services</li> <li>- Security, crime, vandalism</li> <li>- Community cohesion</li> <li>- Community health</li> </ul>	<i>What effect will adaptation have on reducing the impact / risk of:</i> <ul style="list-style-type: none"> <li>- Hail &amp; lightening</li> <li>- Emergency communication preparedness</li> <li>- Flood &amp; soil saturation</li> <li>- Wind strength / shear force</li> <li>- Airborne debris</li> <li>- Dust storm</li> </ul>
<b>Bush fire</b>	“ “ “	“ “ “	“ “ “	<i>What effect will adaptation have on reducing the impact / risk of:</i> <ul style="list-style-type: none"> <li>- Ember attack</li> <li>- Radiant heat</li> <li>- Continuity of power &amp; water supply</li> <li>- Evacuation preparedness</li> <li>- Emergency communication preparedness</li> <li>- Fuel load and spatial transference</li> </ul>
<b>Heat stress</b>	“ “ “	“ “ “	“ “ “	<i>What effect will adaptation have on reducing the impact / risk of:</i> <ul style="list-style-type: none"> <li>- Road and rail disruption</li> <li>- External temperature exceeding 35°C</li> <li>- A/C unit operational capacity exceeded</li> <li>- Power failure as demand exceeds supply</li> <li>- Indoor thermal levels exceeding comfort</li> <li>- Residents seeking cool spaces to spend daylight</li> </ul>

				hours - Communication preparedness
<b>Drought</b>	“ “ “	“ “ “	“ “ “	<i>What effect will adaptation have on reducing the impact / risk of:</i> <ul style="list-style-type: none"> <li>- Severe water stress</li> <li>- Water restrictions imposed</li> <li>- Disruption to ecological flows</li> <li>- Scarcity forcing supply price rises</li> <li>- Supply restrictions to water dependent facilities</li> <li>- Disruption to water dependent maintenance services</li> </ul>

Costs were expressed as negative impacts to the Triple Bottom Line (TBL) criteria and benefits as positive impacts to the TBL criteria, combined with the capacity of each adaptation to reduce risks specific to the weather hazard under consideration.

This resulted in each adaptation having four separate scores – a score for its financial performance, its environmental performance and its social performance, as well as a score for how effective it would likely be in reducing key risk factors associated with that particular form of extreme weather event, that is:

<p><b>TOTAL SCORE FOR ADAPTATION</b></p> <p>=</p> <p><b>financial score + environmental score + social score + risk reduction score</b></p>
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Possible scores ranged from +3 (strongly positive) to +2 (moderately positive) to +1 (mildly positive) to 0 (neutral effect neither + or -) to -1 (mildly negative) to -2 (moderately negative) to -3 (strongly negative).

Cost/benefit was not restricted to simple monetary terms but instead integrated the full scope of a sustainable decision making context and included non-monetary values, as set out in Table 1.

To determine which adaptations performed best these scores were combined and cross referenced using the Borda count method. This method allows a single ‘winner’ to be identified, followed in turn by others in order of their performance, across all the criteria included in the analysis. This means those adaptations scoring best were not only strong performers in terms of reducing the risk but also more sustainable. This makes these adaptations a priority in terms of where Council should invest its time and money, or where external funding should be sought. This type of analysis is regarded as a form of multi-criteria analysis.

## The Borda count method

The Borda count is a method by which 'voters' rank options in preference order.

For the Borda count method, the option (or adaptation, in this case) gets 1 point if it is the lowest scored adaptation/s, 2 points for each next-to-last adaptation/s, etc, all the way up to N points for the highest scored adaptation/s (where N is the total number of scores).

For example, Table 2 shows the 'financial' scores for heat stress adaptations ranged from 7 to -2, correlating to Borda count points from 8 to 1.

**Table 2 – Financial scores and Borda count for heat stress adaptations**

Adaptation score	Borda count point
7	8
4	7
3	6
2	5
1	4
0	3
-1	2
-2	1

The result is a list of options ranked from the most preferred option to the least preferred option.

The Borda count method was applied to each of the 39 bushfire related adaptations, 45 storm and flood related adaptations, 20 heat stress related adaptations and 17 drought related adaptations, allowing the adaptations to be ranked from the highest to the lowest preferred option across the financial, environmental and social criteria and their capacity to reduce the key risk factors associated with the extreme weather event. The combined Borda count score ultimately determined the prioritised list of adaptations relating to each weather hazard.

## The results

The methodology adopted enables managers to analyse each adaptation for its potential performance across the TBL and its ability to reduce risk exposure to extreme weather events, to guide the investment of staff and financial resources.

The descriptions in Table 3 should be considered when making decisions regarding the timing and implementation of the planned adaptations:

**Table 3 – Descriptions to consider when deciding on priorities**

<b>Higher scores</b> - strong performance across the Triple Bottom Line criteria with a clear ability to reduce key risks (highest third of scores)
<b>Medium scores</b> – moderate performance across the Triple Bottom Line and/or in the ability to reduce key risks (middle third of scores)
<b>Lower scores</b> – limited performance across the Triple Bottom Line and/or a limitation in reducing key risks (lower third of scores)

The prioritised list clarifies where investment could be made in the short, medium and longer-term. Those adaptations that are likely to produce the most positive response for least cost are usually assigned to the short term. Where higher levels of investment are required or the return on investment may be less immediate, medium and longer term time horizons may be more appropriate.

Lower priority adaptations may also be pursued in the short term if they are consistent with current budget allocations and operational requirements or they can be clustered together into a single project to create a more attractive return on investment. Prioritisation needs to be approached with a very flexible mind set to capture the dynamism of the TBL over time. The world and its socio-political and environmental circumstances are changing rapidly; what was deemed optimal yesterday may not be tomorrow. For this reason adaptations can be re-oriented at any time according to conditions to allow managers the ability to respond rapidly and maintain control over the process.

### **Multi-hazard adaptations**

Those adaptations that received higher scores across two or more weather hazards are:

- Ensure a series of Event Risk Management Plans (ERMP) are in place and implemented, that are appropriate to the size and nature of the event, in accordance with Council's ERMP template
- Ensure that Emergency Management Plans are in place and implemented for Councils' key facilities
- Ensure periodic, independent evaluations of Council's risk preparedness, including evacuation plans, business continuity plans and emergency management plans, to ensure plans are up to date and effective.
- Provide staff training on disaster preparedness and response and contingency plans, practiced regularly
- Conduct a vulnerability assessment of Council's infrastructure, buildings and facilities for weather hazards and implement a prioritised works and maintenance program, based on a cost / benefit analysis, to build resilience
- Develop and implement an emergency management communications strategy (including templates for media monitoring and reporting to the GMD)
- Draft operational tasks, performance measures and project bids to include consideration of potential risks of weather hazards

The multi-hazard performance of these adaptations warrants additional consideration by managers when guiding staff and financial investment.