CLIMATE ADAPTATION MANUAL FOR LOCAL GOVERNMENT

Embedding resilience to climate change

VOLUME 2

ACELG
Australian Centre of Excellence for Local Government

City of Canada Bay

RPS

ACKNOWLEDGEMENTS

This guidance manual has been prepared by Dr Jane Inglis and Stella Whittaker from RPS, Andrew Dimitriadis from the City of Canada Bay Council (CCBC), and Stefanie Pillora from The Australian Centre of Excellence for Local Government (ACELG).

The authors would like to take this opportunity to thank all research partners for their active contributions in the preparation of individual case studies and in providing guidance to the overall direction of the research project. Special mention is made of Andrew Dimitriadis from the City of Canada Bay Council for providing extensive support in reviewing, editing and preparing the finalised manual.

Acknowledgement also needs to be given to the councils who provided in-kind support (see Volume 1, Appendix 4) and to the State Local Government Associations and to the National Climate Change Adaptation Research Facility (NCCARF) for funding and supporting a number of the initiatives referenced in this manual.

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CITING THIS REPORT

Inglis, J., Whittaker, S., Dimitriadis, A. and Pillora, S. 2014. *Climate Adaptation Manual for Local Government – Embedding resilience to climate change*. Australian Centre of Excellence for Local Government, University of Technology, Sydney.

ISSN 1838-2525

VOLUME 2: CASE STUDIES

FIGURES

TABLES

CS1.1 ICLEI BARC COUNCIL RESOLUTION WORKSHEET 5 – CANADA

The Building Adaptive and Resilient Communities (BARC) Tool offered by ICLEI Canada, aims to facilitate local governments in implementing the climate change adaptation framework described in *Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation*. This interactive web-based tool incorporates a comprehensive framework for undertaking adaptation initiatives in a community. Underpinning the adaptation methodology is a five milestone framework (initiate, research, plan, implement and monitor/review), with information provided to assist users in implementing each step. The workbook provides seventeen tools, ranging from basic to more complex and aims to assist communities operationalise the adaptation methodology described in the guide.

Sources:

- *What is the building adaptive & resilient communities (BARC) program?*, <http://icleicanada.org/programs/adaptation/barc>.
- *About the Guide*, <http://www.icleicanada.org/component/k2/item/3-changing-climate-changing-communities>.

CS1.2 WEST COAST ENVIRONMENTAL LAW (WCEL) CHECKLISTS FOR LOCAL GOVERNMENT – BRITISH COLUMBIA

The development of the Plan2Adapt climate information website began in early 2008, at the initiative of CitySpaces Consulting and Pacific Climate Impacts Consortium (PCIC). The concept was to develop an introductory information tool, aimed primarily at land use planners and local governments, to assist them in visualising climate change impacts and related uncertainties in British Columbia. The main purpose of the tool was to raise awareness of climate change and its potential implications at the local level, rather than to serve as a source for detailed technical analysis or planning specific projects.

Specific checklists and guidelines were also developed to assist local governments in exploring the entry points for integrating climate change adaptation into policy and operations, as well as the scope of responsibilities that may be affected. It is meant to trigger further investigation and discussion about adaptation options and strategies. It is important to start assessing potential climate change impacts, as well as options for addressing impacts, based on community vulnerability, resources, capacity, local context and other factors in all council decision-making. Council meeting papers are an essential starting point.

Sources:

- Tyler, S., Opitz-Stapleton, S. & Tyler, K.H. 2012, *Guidelines for Climate Information Tools*, Pacific Climate Impacts Consortium, <http://www.pacificclimate.org/sites/default/files/publications/P2A%20Guidebook.pdf>.
- Plan2Adapt, <http://www.pacificclimate.org/analysis-tools/plan2adapt>.

CS1.3 CSIRO BOARDROOM DIRECTORS

CSIRO and partner researchers in 2012 set out to communicate adaptation to climate change to the 'big end of town' and to gather soft data, acquire information and present issues back to the National Climate Change Adaptation Research Facility (NCCARF), the founder of this research. The approach to the research challenge differed from a traditional technical, analytical or academic method. Action learning principles were used to engage a community in which the CSIRO, as advisors to corporate Australia and as co-researchers, have social capital and standing. Through trusted information sharing networks, private closed-door meetings and one-on-one conversation with executives and senior management from over 100 companies, the CSIRO shared ideas, gathered research and refined information and tested their findings.

This project has identified that considerable research gaps exist, but has also provided direction for organisations and researchers. Individual corporations and private sector peak bodies urgently need to explore the risks and opportunities that climate change and responses to climate change bring. This is especially so for the ICT, aviation, energy, insurance and finance sectors.

Sources:

- Johnston, G., Burton, D. & Baker-Jones, M. 2013, *Climate change adaptation in the boardroom*, National Climate Change Adaptation Research Facility (NCCARF), <http://files.dlapiper.com/files/Uploads/Documents/climate-change-adaptation-in-the-boardroom.pdf>.

CS2.1 CLIMATE ADAPTATION STRATEGY – CITY OF VANCOUVER, CANADA

The City of Vancouver has included a detailed action matrix in their adaptation strategy which details key policies, procedures and accountability across departments in relation to climate change. The main aim of the matrix is to integrate climate adaptation measures into business, risk management and project planning functions across the council. The Strategy is a living document and will continue to be revised and updated as climate change science and adaptation practices evolve.

Sources:

- City of Vancouver, *Climate adaptation Strategy*, City of Vancouver, <http://vancouver.ca/files/cov/Vancouver-Climate-Change-Adaptation-Strategy-2012-11-07.pdf>, esp. 'Appendix A: Detailed Action Matrix'.

CS2.2 KING COUNTY ADAPTATION STRATEGY – U.S.

King County in Georgia, USA, has developed a climate plan that incorporates climate adaptation responsibilities throughout all departments in the organisation, whilst referencing the adaptation actions that need to be included in the County's long term strategies. The climate plan brings together climate change actions from every area of the King County government and coordinates them to provide a united plan. Moreover the plan explicitly directs that relevant departments for each area are responsible for devising the tactical implementation of the strategies and goals put forth in the plan.

Sources:

- King County 2007, *King County 2007 Climate Plan*, King County, <http://your.kingcounty.gov/exec/news/2007/pdf/climateplan.pdf>.
- *Climate Change Response*, <http://www.kingcounty.gov/environment/climate.aspx>.
- King County climate change policy, <http://www.kingcounty.gov/environment/climate/king-county/climate-change-policy.aspx>.
- King County 2010, *King County Strategic Plan 2010–14*, King County, <http://www.kingcounty.gov/~/media/exec/PSB/documents/CWSP/1007_1182_KCStratPlan7_0727.ashx>.

CS2.3 CLIMATE ACTION PROGRAMME – MEXICO CITY, MEXICO

Mexico City created its Climate Action Program spanning 2008–2012. The City is reported to have achieved and exceeded its initiatives and goals by 10.2%, including creating a fully functional integrated program for adaptation to climate change. The drivers of its action on climate change include drought and flood risk, and rising temperatures. This Mexico City Climate Action Program is one of the priorities of the Mexico City government in the environmental sphere; in it, coordinated efforts, commitment, consciousness raising, cooperation, participation, and verification are proposed in the framework of the Mexico City Environmental Agenda and the Green Plan. The Program deals with a set of local actions that have global repercussions and a set of joint public policies that will be a reference point in both the national and international spheres.

The Interagency Commission on Climate Change in the Federal District, which includes representatives from 32 administrative units of the Federal District, is in charge of coordinating and evaluating the Mexico City Climate Change Action Program (MCAAP). The plan breaks up actions into early alert tasks and medium term impact tasks. Some of these initiatives include protection of native vegetation to maintain diversity and resilience of agricultural systems (early alert), rural development and soil and water conservation on agricultural lands (medium term), and alternative reforestation with species resilient to climate change (medium term).

With the creation of the Interagency Commission on Climate Change in the Federal District, the Secretariat of Environment has been able to institutionalise public policies to address climate change and has encouraged the active participation of citizens, NGOs and industry.

Sources:

- Lapeyre, M.B. et al. 2008, *Mexico City Climate Action Program 2008-2012 Summary*, Secretaría Del Medio Ambiente, <http://www.sma.df.gob.mx/sma/links/download/archivos/paccm_summary.pdf>.
- Baker, J.L. 2012, *Mexico Case Study Overview. Climate Change, Disaster Risk and the Urban Poor: Cities Building Resilience for a Changing World*, The World Bank, <http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1306291319853/CS_Mexico_City.pdf>.
- Delgado, M. 2011, 'Water, Energy, and Food Security in Mexico City', in K.O. Zimmerman (ed.), *Resilient Cities 2: Cities and Adaptation to Climate Change – Proceedings of the Global Forum 2011*, ICLEI – Local Governments for Sustainability, Bonn, pp. 105-11.

CS2.4 UTILISING THE RISK MANAGEMENT PROCESS TO EMBED CLIMATE ADAPTATION INTO COUNCIL OPERATIONS – MELTON CITY COUNCIL, VIC

Contact: Risk Management Coordinator or Sustainability Officer at csu@melton.vic.gov.au.

Background: In 2010, Western Alliance for Greenhouse Action (WAGA), a coalition of seven western Melbourne councils, collected and collated regional climate adaptation risk data with the help of a consultant. Melton City Council participated in a workshop to gather raw data on what it saw were its climate adaptation risks.

A regional report was prepared that detailed 88 risks in total. Of these, 17 were classed as regional priority risks, and they were provided to Council from WAGA's Project Officer in 2013, along with WAGA's views on adaptation strategies. The Project Officer proposed to enter the 17 risks into Melton's online organisational Risk Register as a service, and part of a mainstreaming project.

In 2008 Melton City Council established an online Risk Register and management had over time learnt to identify, record, treat, review and report on their enterprise risks. This had become part of business as usual, and the skill and ability of leaders to understand, critique, allocate fair and appropriate responsibility for action, and be accountable for those actions, had grown substantially, and had plateaued. It was time to consider a specific and important area of organisational risk – climate change.

Process for embedding: The Risk Management Coordinator worked with the WAGA Project Officer to mainstream climate risk adaptation into Council's risk management process. The following steps were undertaken:

The Project Officer and Risk Management Coordinator presented the opportunity to integrate climate risk adaptation into Council processes to the Council Executive.

The Executive mandated a day-long workshop that involved two of the three general managers, five of the 17 managers plus other staff. The WAGA data was 'Meltonised' by the leaders. They critiqued the descriptions, identified current risk controls, suggested further appropriate mitigations, volunteered to be responsible for carriage of the initiative, and agreed on timeframes. As Melton has a business rule that actions in the Risk Register must have a due date that is within 12 months of the lodgement date, the stakeholders were obliged to identify what could be done immediately to adapt over a much longer horizon.

After the workshop the Risk Management Coordinator held meetings with subgroups to ensure all were comfortable with the data. All participants had a chance to comment and discuss the initiative so that agreement could be reached.

The WAGA Project Officer was available by phone at all times to provide clarity and technical advice about the risks and potential adaptation approaches. Once the 'Meltonised' regional climate adaptation risk data was finalised, the officer entered the risks into Melton's Risk Register.

Risk 'owners' are now undertaking their agreed actions, and are accountable to their line managers.

Discussions are underway with WAGA about how the Project Officer can review, audit and receive reports on how Melton is progressing with its agreed actions.

Specific examples of climate adaptation actions being implemented or explored include:

The Economic Development and Tourism Plan adopted by Council in November 2013 includes an action regarding the education of local businesses about the impacts of climate change and ways that costs associated with climate change can be reduced.

Council is investigating the development of a Council-based Snap Send Solve application similar to the one developed by the City of Greater Geraldton that directs enquiries from the Snap Send Solve application directly into our corporate back end systems. This could be used across Council for residents and officers to report issues such as drought-induced drain blockages.

By not just uploading the risks into the Risk Register and taking the long route of engaging stakeholders in not one, but a series of discussions, Melton City Council has arrived at understanding and commitment about climate adaptation.

Refer to Table 1 for a snapshot of the risk register.

Lessons learnt:

Risk management is an effective tool for embedding climate adaptation. Staff, including those in engineering, facilities and capital projects, typically have a high level of 'comfort' with risk as a business tool.

Creating a 'mature' risk management process requires someone with specific and ongoing responsibility – e.g. a risk management coordinator. This staff member should be reasonably senior, and will be the process expert – whereas the line managers will be the content experts – for risk data.

The risk management officer should be supportive, persistent, polite and non-judgemental about the line managers' non-conformance regarding risk processes. Conversations that focus on potential events and impacts on objectives usually compel action.

Using raw data for climate risk assessment and adaptation planning that belongs to Council and to specific departments (e.g. engineering) will encourage engagement and ownership.

The Executive and management team had years of risk management experience in using risk as a business tool, and a fluency in discussing risk data. This enabled mainstreaming.

The 12 month due date rule focused attention on what can be achieved in the short term, while the robust and regional WAGA data provided assurance that those short term actions were valid in the broader and longer term contexts.

There were champions in key roles – the Melton City Council Executive commended the initiative at the start; the WAGA Project Officer provided regional climate adaptation content expertise; Council's Risk Management Coordinator originally picked up, and then facilitated, the completion of the whole mainstreaming project; and the leaders (line managers) provided local content expertise.

Table 1: Snapshot of the risk register

ID	Department	Risk Standards	Risk Rating	Risk Issue(s)	Current Controls	Mitigation Action	Due Date
2301	Business Growth and Sustainability	Financial & Economic Leadership & Corporate Governance	Medium	Climate Change and extreme weather events damages businesses and industry which leads to increased costs to business and a slowing of local economy and job losses.	Economic Development Strategy Business Training programs Work with organisations that are already providing assistance in this area (for residents and local businesses such as the SES (Floods), Red Cross (REDiPLAN), and Brotherhood of St. Lawrence; Buy Local program and policy.	Ensure businesses are fully aware of the potential impacts of Climate Change by incorporating information into training sessions and networking events; promote opportunities to businesses to capitalise on climate changes (e.g. agriculture, building (Western BACE)).	Jun 30, 2014
2315	CEO	Leadership & Corporate Governance	Very High	Current strategic planning and budget processes do not encourage long-term adaptive management to climate change.	5 Year Capital Works Plan	(1) Encourage staff to take leadership on climate change adaptation; (2) Include climate risk and adaptation selection criteria into Council's project investment decision making, e.g. New Initiatives; (3) Include climate change adaptation considerations into future community planning.	Jun 30, 2014
2300	Engineering Services	Assets & Security	High	Councils are unable to finance the asset renewal gap for reduced lifespan of assets due to changed climate conditions.	Asset Management Plans and Asset Lifecycle Matrix.	Review current Asset Management Plans, maintenance programs and asset registers to ensure that they support robust and effective long-term adaptation to climate change, including an update of the Asset Lifecycle Matrix to include provisions for decision-making on managing climate change risks.	Jun 30, 2014

CS2.5 CREATING A CLIMATE ADAPTATION AND MITIGATION POLICY IN A REGIONAL LOCAL GOVERNMENT – CITY OF GREATER GERALDTON, WA

Contact: Climate Change Coordinator at council@cgg.wa.gov.au.

Background: The City of Greater Geraldton is proactive with its community in planning for future change as exemplified in its purpose statement 'serving today while building tomorrow'. As part of minimising future risk, the City developed a Climate Change Adaptation Action Plan, which identified that:

Increased temperatures and reduced rainfall projected for the region threaten to i) adversely impact the farming, fishing and tourism industries, which are amongst the region's main employment generators, ii) diminish natural biodiversity, and iii) cause loss of local habitats and species.

Sea level rise presents major issues for vital port and other foreshore built and natural infrastructure.

This climate adaptation planning activity was undertaken in partnership with three other local governments, resulting in a list of 68 individual risks, 12 potential opportunities and 63+ recommended actions for mitigation and adaptation. Broadly, the identified climate change risks related to increased maintenance, running, repair, relocation and resourcing costs, loss of amenity and natural assets, human health and safety hazards, and reduced economic viability. Examples of high priority actions identified include:

BDNRM 11 – Ensure biodiversity issues are integrated into Structure Planning, recognising the need for higher priority to be given to protection of existing stands of vegetation and corridors

LUP 2 – Identify locations most vulnerable to sea level rise and storm surge inundation and develop a long term plan for management that considers avoiding (e.g. setbacks from the coast); adapting (e.g. raising building and infrastructure heights); defending (e.g. beach stabilisation, nourishment, restoration, groynes) and retreat (e.g. purchasing land to move development back from the shoreline)

CSCG 8 – Review outdoor event schedule and strategies, aiming to minimise the number of events occurring in high heat wave risk periods, and to ensure adequate shading and drinking facilities are in place for those events that cannot be rescheduled (e.g. Australia Day).

A critical step in the adaptation planning process has been the development of a supporting Climate Change Policy to provide clear processes and direction internally, and to show the community that the City is serious about the issues that affect them. A climate change coordinator position was also established to drive further implementation within council operations.

Methodology: The Climate Change Policy development was driven and owned by the Directorate of Sustainable Communities in collaboration with the following departments:

- Environmental Health and Sustainability – Project leadership team and policy officer development.
- Urban and Regional Development – Planning framework support.
- These groups were assisted by the Directorates of:
- Creative Communities – Stakeholder engagement and feedback for establishment of correct and lasting messages.
- Community Infrastructure – Guidance on project boundaries and implications.

The project team was given the mandate to develop a climate change policy that was encompassing of Council operations and community expectations whilst recognising any key budgetary, asset management, infrastructure, planning and environmental implications.

Process for adaptation planning including policy creation:

Policy Creation

Executive Management Team Endorsement – A proposal was submitted to executives of each operational directorate at their weekly meeting to undertake the creation of the Climate Change Policy with background information, budgetary and resourcing implications and proposed processes and outcomes discussed. The proposal was approved.

- Internal and External Stakeholder Consultation – A series of workshops and follow-up meetings/reports were held with key management, operational staff, and external community stakeholders to identify:
- the intended scope of the policy within Council operations
- legislative requirements for addressing climate change
- resourcing implications in achieving those requirements.
- current levels of understanding of climate risks and barriers and opportunities for addressing those risks
- activities completed or being undertaken that fit with actions identified in the Adaptation Action Plan.
- responsibilities, ethical obligations and priorities for acknowledging/recognising the impacts/implications of climate change
- expected commitments in appropriate planning and investment from a community perspective for mitigation and adaptation.

Resultant information from these sessions was used in conjunction with policy templates from the Western Australian Local Government Association (WALGA) to create a Draft Climate Change Policy document. This document was reviewed and refined by members of the working group and through internal stakeholder channels.

Council Endorsement of Draft Climate Change Policy:

Once the Draft Climate Change Policy had been developed it had be taken to Council for endorsement. The processes for adoption of the Draft Climate Change Policy were as follows.

Council Concept Forum – Closed to public session for councillors and executive staff involving a short presentation on the Draft Climate Change Policy components with question time. The Draft Climate Change Policy was approved for inclusion in the upcoming Council Agenda Forum.

Council Agenda Forum – Preliminary review of council agenda for upcoming Ordinary Meeting of Council with proposed Draft Climate Change Policy set on the agenda. Further clarifying questions received and responded to at this forum.

Ordinary Meeting of Council – Draft Climate Change Policy listed on publicly available agenda and community able to submit questions prior to council meeting, to be asked at the meeting in person. Draft Climate Change Policy was put forward for adoption and on its success entered the process for community consultation.

Community Consultation on Draft Climate Change Policy:

Following council endorsement community consultation was undertaken to ensure community understanding and gain feedback on the draft Climate Change Policy. Consultation activities included advertising in the local newspaper and consultation sessions. Assessment of community responses was made through the formal feedback process and appropriate changes were made to the Draft Climate Change Policy content and layout in accordance with those responses.

Formal Council Adoption of Policy:

Following the period of community consultation, formal feedback and policy refinement, the final version of the Draft Climate Change Policy was put forward for adoption at the next available Council Agenda Forum and Ordinary Meeting of Council. Council formally adopted the Climate Change Policy and it is now publicly available via the Council website with subsequent annual reviews undertaken.

The Council Climate Change Policy itself is more than just a static document; it is a living tool that has been used as a base reference for undertaking further actions in policy development and strategic planning, and for obtaining external funding for Council mitigation and adaptation projects. It is also useful and for the community in obtaining Council funding for relevant projects.

As a result of undertaking the development of this Climate Change Policy the following has been realised:

- Council taking a position on climate change and human responsibility and internal cross-departmental responsibility in undertaking actions for mitigation and adaptation.
- Council signing the WA Local Government Climate Change Declaration to demonstrate their political commitment to locally appropriate climate change management, and to participate in a sector-wide leadership approach.

- Allocation of funding to working together in partnerships on funding applications and mitigation/adaptation activities.

Clarity on internal and external stakeholder understanding of climate change at a local level and interpretation of responsibility for action.

Two supporting products can be found in Table 2 (Climate Change Connections Worksheets) and in the attached Community Climate Change Perceptions Survey (below).

Lessons learnt:

- *Lack of locally relevant climate change information* – Community perceptions, understanding and acceptance of climate change are driven through access to information. Local access to clear information on regional climate change implications was hindered by inconsistencies and sometimes misinformation in the material provided through standard media channels such as television and newspapers. Utilisation of key research documents, including from the Intergovernmental Panel on Climate Change (IPCC), CSIRO, Bureau of Meteorology (BoM), and Department of Agriculture and Food WA (DAFWA), helped deliver clear information to stakeholders.
- *'Silo' mentalities and ineffective collaboration mechanisms* – Sharing of information between stakeholders and gaining public acknowledgement of positions on climate change from key figures/organisations is essential. Silos exist across and within organisations that hinder activities and the usual methods and formats of sharing information are not helpful in expediting timely outcomes. Undertaking a process of identifying barriers and also opportunities for stakeholders that assists in defining their roles is critical, as are templates for feedback and easy-to-understand mechanisms/tools for information flows.
- *Community understanding of council processes* – Within Council there are many processes that exist to enable clear outcomes to be achieved. Community expectations of timely action are at times not met due to these processes. Creation of the policy and any climate-related action requires the inclusion of information for the community about what the extent of Council's role and its responsibilities are and what legislated requirements Council must adhere to when fulfilling those roles and responsibilities. Inclusion of information on Council processes is important as part of any community consultation process.

Table 2: Climate Change Connections Worksheets

	NOW Where/what Are You /We Doing? How do we do it?	BARRIERS Blockers and fears that stop/limit action	PATHWAYS Ideas and solutions to get from NOW to FUTURE and overcome the BARRIERS	FUTURE Where /When Should/Do You Want Us/You To Be. Goals Aspirations and Hopes. Priorities.
COMMUNICATION Awareness-raising around climate change, sustainability. Who is responsible? How to do it? Where? With whom? When?				
COLLABORATION Connecting with existing groups? Engaging community Who do you know? New groups needed How do we work together? Who does it What works, what doesn't?				

	NOW Where/what Are You /We Doing? How do we do it?	BARRIERS Blockers and fears that stop/limit action	PATHWAYS Ideas and solutions to get from NOW to FUTURE and overcome the BARRIERS	FUTURE Where /When Should/Do You Want Us/You To Be. Goals Aspirations and Hopes. Priorities.
INFORMATION What do we want? How do we want it (forms)? How do we send it? Who needs it? Who has it? Who should look after it? How old is it? When should it be updated?				
ACTION What have you seen? What works? Where? Who? What purpose etc.? What do you like?				

ATTACHMENT: COMMUNITY CLIMATE CHANGE PERCEPTIONS SURVEY

1. Please enter the postcode of your normal place of residence _____

2. What is your age group and your gender?

   ☐ <18 ☐ 18-34 ☐ 35-55 ☐ >55 ☐ M ☐ F

3. Have you heard the term 'climate adaptation' before?

   ☐ Yes ☐ No

4. What do you think climate adaptation means?

   _____

   _____

   _____

5. Have you done anything to adapt to climate change?

   ☐ Yes ☐ Not sure ☐ No (**skip to Question 8**)

6. What have you done to adapt to climate change? (list up to 5 things)

   _____

   _____

   _____

7. Have you moved away from an area because of the potential effects of climate change?

   ☐ Yes ☐ No ☐ Not Applicable

8. Have you taken out extra property insurance due to potential effects of climate change?

☐ Yes ☐ No ☐ Not Applicable

9. Which of the following statements best describes your point of view (select one option only) Please also indicate from your experience what you think the majority of your region's views are.

You		**Region**
☐	I don't think that climate change is happening (**skip to Question 15**)	☐
☐	I have no idea whether climate change is happening or not (**skip to Question 15**)	☐
☐	I think that climate change is happening, but it's just a natural fluctuation in Earth's temperatures	☐
☐	I think that climate change is happening, and I think that humans are largely causing it	☐

10. How often do you….

	Very Much	Somewhat	Not Very Much	Not at all
Feel concerned about climate change?	☐	☐	☐	☐
Think climate change will affect you personally?	☐	☐	☐	☐
Think climate change will affect future generations in this region?	☐	☐	☐	☐
Agree that: 'This region should be reducing its emissions regardless of what other regions do'?	☐	☐	☐	☐

11. What aspects of climate change are you most concerned about for your region?

12. What actions would you like to see taken to address these concerns?

13. Who is responsible for making sure these actions take place?

14. What do you imagine the future of this region to be like if no actions are taken?

15. How many of your friends do you think share your views on climate change?

☐ None ☐ A few ☐ Some ☐ Most ☐ All

16. Do you openly express your views on climate change?

☐ Never ☐ Sometimes ☐ Mostly ☐ Always

17. What sort of response have you generally received when expressing your views?

☐ Positive ☐ Neutral ☐ Negative

18. How much do you agree	Very Much	Somewhat	Not Much	Not at all
Company's views/credentials on climate change/environment affect my purchasing decisions	☐	☐	☐	☐
Political party's views/credentials on change/environment affect my voting?	☐	☐	☐	☐
I could easily change my mind about climate change?	☐	☐	☐	☐

19. Are you aware of and do you support....	Aware?		Supportive?		
	Yes	No	Yes	No	Don't Know
The federal government's Clean Energy Future Package?	☐	☐	☐	☐	☐
Local Climate Change Adaptation Action Plans?	☐	☐	☐	☐	☐
The Carbon Farming Initiative?	☐	☐	☐	☐	☐
Carbon Pricing (Tax)	☐	☐	☐	☐	☐

20. How do you rate your level of understanding of carbon pricing (Tax).

☐ Low ☐ Medium ☐ High

21. What do you think will be the impact on you (or your business) from carbon pricing?

_____

_____

_____

22. Where do you hear or source information about climate change (tick all that apply) and how reliable do you think it is?

	Source	Reliability			
Source	Yes	Not Reliable	Low	Medium	High
Friends and Family	☐	☐	☐	☐	☐
Print Media (Newspapers and Magazines)	☐	☐	☐	☐	☐
Websites and Email Newsletters	☐	☐	☐	☐	☐
Social Media (You Tube, Facebook, etc.)	☐	☐	☐	☐	☐
Television (News and Documentaries)	☐	☐	☐	☐	☐
Radio	☐	☐	☐	☐	☐
Scientists	☐	☐	☐	☐	☐
Environmental Organisations or Consultants	☐	☐	☐	☐	☐
Government	☐	☐	☐	☐	☐
Other _____	☐	☐	☐	☐	☐

	Source	Reliability			
Source	Yes	Not Reliable	Low	Medium	High
Other _____	☐	☐	☐	☐	☐

Do you have any other comments you would like to make?

_____

_____

_____

✂----------

Please complete the following if you wish to enter the draw to win a XXXXXXXXXXXX. Your details will be separated from your answers once tabulated and never given to any third party.

NAME: _____ PH: _____
EMAIL : _____

Please notify me about future climate change and sustainability initiatives? ☐ Yes ☐ No

CS2.6 COUNCIL RESILIENCE HEALTH CHECK – BARWON SOUTH WEST, VIC

Contact: Senior Executive Sustainability and Climate Change, RPS Group at info@rpsgroup.com.au.

Background: The Barwon South West Climate Resilient Communities Project CRC is a joint collaboration between 10 local governments and the Victorian Department of Environment and Primary Industries. It involves the local government areas of Greater Geelong, Queenscliff, Colac Otway, Golden Plains, Surf Coast, Warrnambool City, Moyne, Corangamite, Glenelg and the Southern Grampians. The partners involved include Barwon Water, Wannon Water, Corangamite CMA, Glenelg Hopkins CMA, G21 Geelong Regional Alliance, Great South Coast Group and the Western Coastal Board. The project was supported by KPMG in partnership with the RPS Group.

The project's aims were to assist municipalities and key partners to understand and respond to risks and opportunities presented by future climatic changes and extreme weather events. A key component of the project was to develop an understanding of the current adaptive capacity of the councils themselves, in terms of their internal operations, using research into better practice responses to climate change adaptation.

The health check is intended to be a snapshot at a point in time and will change as a council updates and introduces new approaches, policies and procedures in response to climate change. To do this, a unique health check tool was developed.

The project process: The project comprised three components:

(1) a high-level health check tool survey that was completed by a cross-section of Council representatives and provides a qualitative review of the current adaptive capacity across the local government area,

(2) a detailed survey that identifies the current nature and extent of climate change risk and adaptation-related documentation, processes and systems and indicates a council's current level of adaptive capacity. This is completed by one respondent, often in collaboration with, and with input from, other areas of the council as relevant, and

(3) a broad self-assessment survey that provided an indication of the awareness and engagement on adaptation across the council – this was undertaken by a number of people from a range of departments across council.

Table 3 provides an overview of each of the categories in the Health Check tool. The Health Check survey questions were designed around the five key elements of climate change adaptation planning.

The health check can be used by individual councils to establish a baseline of their capacity, and a scoring methodology, in order to repeat the survey as an evaluation tool for the council's adaptation activities.

Table 3: Overview of Health Check tool

HEALTH CHECK ELEMENTS	DESCRIPTION
Complying	The extent to which a council is meeting its current relevant legislative requirements, e.g. obligations under the emergency management, local government, water, land use planning and other regulations relating to climate risk.
Engaging	This covers a council's governance framework and participatory processes in relation to extreme weather events, changing climatic conditions and their impacts, e.g. documentation and communication of a chain of command, the integration of climate change considerations throughout the organisation (e.g. planning instruments) and the extent of climate change-related roles and responsibilities are specified. It considers the engagement and empowering of key stakeholders and their awareness of climate change risks and emergency management protocols.
Assessing	This is the identification and assessment of risks related to future extreme weather events and a changing climate (e.g. whether the council currently has a climate change adaptation plan or strategy) and whether council has undertaken any risk exercises (e.g. vulnerability assessment mapping, risk mapping, climate exposure analysis).
Responding	This is action planning and implementation of responses to climate change and extreme weather events (e.g. how well a council has previously responded) and whether any changes were made to its response strategy to incorporate lessons learnt and how often climate change impacts are considered in the review of any strategic and operational documents (e.g. emergency management plans, fire management plans, risk registers).
Monitoring	This involves measuring, monitoring and review of initiatives (e.g. the extent to which a council remains relevant, up-to-date and reflective of current initiatives and considers the comprehensiveness of its activities in terms of procedures, activities and responsiveness).

The survey results and health check indicators are combined and weighted and the results presented graphically as a gauge to enable the ranking of the adaptive capacities of each municipality relative to the other municipalities in the Barwon South West region (Figure 1).

The higher on the ranking, the greater the adaptive capacity of the municipality, based on the health check results comparative to the other Barwon South West Councils.

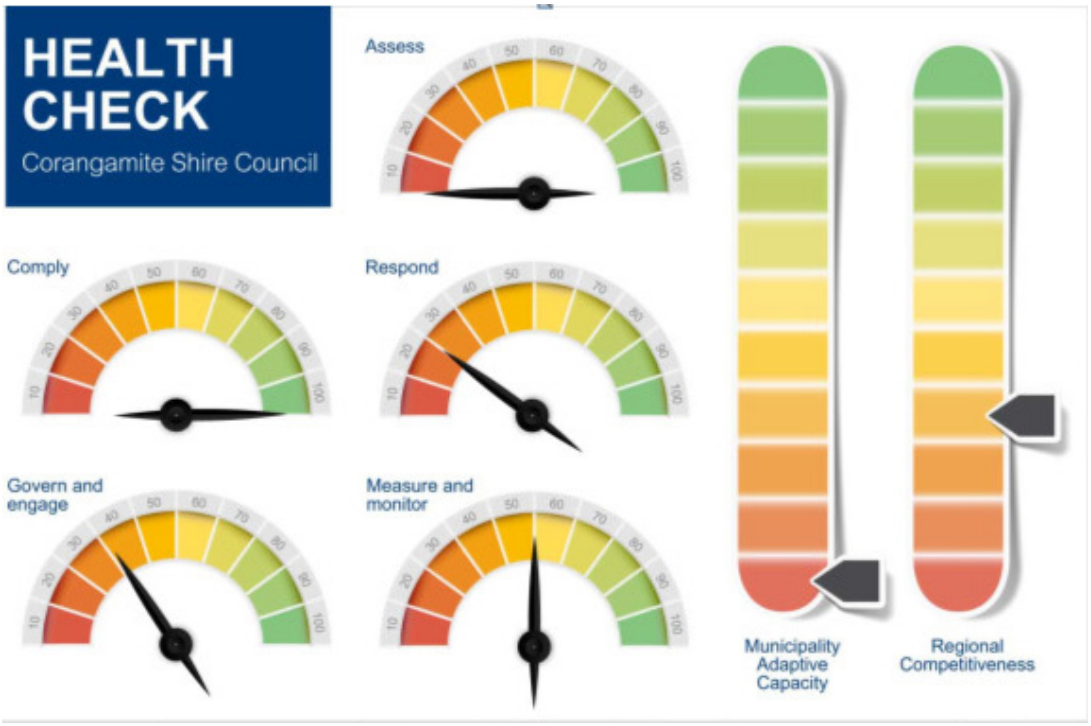


Figure 1: Illustrative dashboard output from the project

Lessons learnt and project findings: Across the region the level of preparedness for climate change risks and impacts varied considerably. Compliance was very high, whereas risk identification and assessment were the weakest components across the board. Due to the lack of an adaptation plan or strategy in a majority of councils, it was difficult to find a robust, or complete, response to climate change. Councils generally were stronger on the governance and engagement components of the health check. Other findings included:

- For a range of extreme events, there was a chain of command that had been documented and/or communicated. But this documentation was not always comprehensively undertaken for all possible extreme events.
- The weaker component of governance and engagement was the embedding of climate change adaptation responses into planning instruments, as in the specification of climate adaptation roles and responsibilities amongst council employees.

- Most of the councils had undertaken some type of risk assessment exercise, however in many cases they were not comprehensive and do not necessarily link to the actions that have been undertaken as part of the response strategy.
- There was a wide variation amongst councils on whether they considered climate change impacts in their strategic and operational documents such as operational plans, fire management plans and health and wellbeing plans.
- Measurement, monitoring and review are important components of any adaptation plan or strategy, as they evaluate effectiveness and inform a process of ongoing review and improvement, however all councils were lacking in this element.

CS2.7 CLIMATE CHANGE ADAPTATION STRATEGY – CITY OF GEELONG, VIC

Contact: Coordinator Sustainability at contactus@geelongcity.vic.gov.au.

Background: Located some 75 kilometres south west of the Melbourne CBD, the City of Greater Geelong covers 1,247km^2 comprising country, coastal and suburban areas. The City of Greater Geelong has an estimated resident population of 217,574, with 45km of coastline. Key climate risks within the local government area include:

Coastal Planning

- Physical damage to property from inappropriately sited development – existing and future development
- Loss of infrastructure
- Erosion of soft shorelines
- Increased cost or inability to obtain insurance for residential and business properties

Asset Management

- Inadequate design of capital assets for future climatic conditions
- Increased cost of maintenance to Council due to damage to assets

Emergency Management

- Increased demand on Council personnel and budgets to respond to and recover from extreme weather-related events
- Increased psychological burden of extreme events.

The development of the Climate Change Adaptation Strategy had a primary focus on internal Council stakeholders to develop awareness and a shared understanding of priority climate change risks that impact on Council's programs and services. The Strategy acknowledged the uncertainties associated with the impact of climate change on Council's operations and provided a framework for organisational change to embed climate risks into decision-making.

Process for developing the Strategy: The Strategy was driven by the Environment and Wastes Services Department but developed in partnership with a broad cross-section of Council representatives including councillors and the Executive Management, Corporate Strategy, Strategic Planning, Leisure Services, Property Services and Risk Management teams. The development of the Strategy included an eight-month engagement program including:

- a presentation to the Executive Management team and councillors

- staff surveys
- one-on-one interviews
- two workshops
- a period for community feedback.

The Climate Change Adaptation Strategy calls for a holistic risk management approach. This includes the following four major tasks to underpin the Strategic Objectives:

1. Mainstreaming consideration of climate change risks and adaptation throughout Council

2. Adopting robust decision-making processes for responding to climate change impacts and planning for adaptation across Council

3. Forming extensive networks both internally and externally.

4. Establishing a process for continuous monitoring, review and improvement of the processes established under this Adaptation Strategy

Implementation of the above major tasks is intended to develop an integrated approach across Council. The Strategy underpins a wide range of day-to-day climate change adaptation initiatives including coastal planning and vulnerability mapping and support programs for communities vulnerable to an increase in heat waves.

Due to the complexity and range of potential climate change impacts on Geelong, the development of the Climate Change Adaptation Strategy was critical for providing a framework for action, particularly in guiding Council's planners, decision-makers, operations and services.

The following Strategic Objectives have been developed to guide future adaptation planning:

- Lead the City of Greater Geelong community in adapting appropriately to climate change.
- Build awareness and understanding of climate change across Council and within the community.
- Acknowledge the links between climate change and other challenges and opportunities for the City of Greater Geelong.
- Plan for decisions that remain viable under the widest possible range of climate futures.
- Use lessons from the results of the decisions to inform better decisions in the future.
- Link with others to drive understanding of and action on climate change adaptation.
- Implement solutions that:
    - are cost-effective
    - are transparent and defensible
    - recognise the needs of vulnerable groups

- ensure equitable outcomes.

There are four major tasks to support delivery of the Strategy:

1. Mainstreaming consideration of climate change risks and adaptation throughout Council. Below are a number of actions and documents designed to facilitate this:

- the formation of a cross-council adaptation working group
- a climate change risk register
- a centralised council climate change impact document
- a division-level risk assessment process supported by a Climate Change Adaptation Toolkit to assist staff and achieve this action for each of the five divisions within Council
- staff engagement
- clearly defining roles and responsibilities.

2. Adopting robust decision-making processes for responding to climate change impacts and planning for adaptation across Council. The Adaptation Strategy aims to assist all of Council develop robust strategies that:

- remain viable under the widest range of probable climate futures
- are most insensitive to broken assumptions
- increase flexibility and keep options open
- maximise their value when planned as part of a portfolio of actions
- build resilience and redundancy into physical, organisational and social systems
- can be implemented within planned budgets or are based on evidence that is good enough to justify budget/revenue increases.

3. Forming extensive networks both internally and externally. This includes strong working relationships with other authorities, community groups and business sectors (for further details see the Adaptation Strategy).

4. Establishing a process for continuous monitoring, review and improvement of the processes established under this Adaptation Strategy (for further details see the Adaptation Strategy).

The Strategy also includes a range of actions to be undertaken which include in part consideration of climate impacts and strategic document review in the following areas:

- coastal planning
- asset management
- emergency management

- vulnerable people
- open space
- biodiversity
- building community engagement.

Key lessons learnt:

- To effectively consider climate impacts, the City of Greater Geelong realised it had to change the way we do day-to-day business. This meant that we needed to embed climate change considerations and processes into our strategic planning, risk management and asset planning.
- The City of Greater Geelong realised that it can be difficult to implement process change in a large organisation due to a lack of resources dedicated to this task and because existing resources may be focussed on managing day-to-day demands.
- Systematic change that is implemented and measured as part of a strategic program will take time. The City of Greater Geelong has carried out an assessment of what actions have been carried out to date and has measured progress against actions. Evaluation of whether the Strategy implementation has been effective in meeting its strategic objectives has been scoped and is planned to be carried out in the near future. Key progressive steps for Geelong are:
    - drive adaptation as a mainstream: issue 0-2 years
    - embed adaptation: 2-5 years, and
    - continuously review progress.
- Climate change considerations can be easily included in any impending strategic document review. Also, some simple changes to the existing risk management system and asset planning templates can flag the need to consider climate change impacts.
- However, identifying thresholds for what level of assessment is required and which methodology should be applied can be problematic. Additional resources and expertise to key areas of Council identified as requiring process improvement should be considered as part of any adaptation strategy.
- It was evident that there was a lack of climate change assessment tools tailored to local government that could be easily incorporated into existing risk management and asset planning procedures. Challenges included:
    - longer-term and scenario planning including the development of locally relevant scenarios
    - assessing uncertainty
    - time allocation and resources required to carry out assessments
    - integration of climate change assessments into existing processes on a regular basis.

The following are some of the programs the City of Greater Geelong is implementing as part of the Adaptation Program:

- Bellarine Peninsula and Corio Bay Climate Change Risk Assessment Program
- integration of the Climate Change Adaptation Toolkit into day-to-day business
- climate change adaptation corporate training program
- understanding support context for embedding climate change into Council's program
- ongoing corporate strategy and policy reviews to include climate change considerations
- a Heatwaves and Social Vulnerability Program.

Further information on these programs can be accessed via the Council contact (above).

CS2.8 ICLEI BUILDING ADAPTIVE AND RESILIENCE COMMUNITIES TOOL (BARC) – CANADA

ICLEI Canada has developed the Building Adaptive & Resilient Communities (BARC) Tool, designed to assist local governments with climate change adaptation planning. This interactive web-based tool takes users through the Five Milestone process outlined in ICLEI Canada's *Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation*. This tool is made up of a series of exercises designed to assist communities in adapting to the impacts of climate change through the development of a municipal climate change adaptation plan.

BARC is the only program of its kind in Canada. It offers a step-by-step solution to developing and implementing an adaptation or resilience plan and provides municipal climate change experts with help in every step in the process. ICLEI staff are also ready to help with presenting expected climatic changes, identifying impacts for your community, preparing vulnerability and risk assessments, and developing an adaptation plan (from setting objectives and targets to identifying local adaptation options). The *Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation* is a compendium of resources, including 17 Worksheets, that provide a milestone-based framework to assist local governments in the creation of adaptation plans to address the relevant climate change impacts associated with their communities. Although climate change adaptation is a complex process, this guide aims to provide a straightforward methodology for adaptation planning. Each milestone represents a fundamental step in the adaptation planning process, starting with the initiation of adaptation efforts (by building an adaptation team and identifying local stakeholders) and culminating with a monitoring and review process that analyses the successes and reviews the challenges of the adaptation plan and its implementation.

There are many sections of the Guide particularly relevant to embedding activities. These include:

Implementation – this includes resources on gaining council support and selecting implementation tools – training, pilots and internal communication; Building and Tasking your Adaptation Team; Drivers and Constraints.

Sources:

- *What is the building adaptive & resilient communities (BARC) program?*, <http://icleicanada.org/programs/adaptation/barc>.

CS3.1 DEDICATED CLIMATE ADAPTATION STAFF – NEW YORK CITY, U.S.

Contact: PlaNYC at <http://www.nyc.gov/html/planyc2030/html/contact/contact.shtml>.

Background: NYC released climate adaptation plans in 2007 and 2011 – PlaNYC – but their recent work is an entirely climate adaptation-focused plan for the city government following the millions of dollars in damage and 43 lives lost to Hurricane Sandy in October of 2012. Mayor Bloomberg called the new $20 billion plan 'A Stronger, More Resilient New York'. It was released in June 2013.The climate change drivers identified by the city include a rise in temperature and precipitation, increased frequency and intensity of extreme weather events, and sea level rise infringing on the city's 500 miles of coastline.

Dedicated climate adaptation staff: Mayor's Office of Long-Term Planning and Sustainability (OLTPS) was created in 2006 and serves to develop, implement and track the progress of the 2007 and 2011 PlaNYC, and other multi-department issues of infrastructure and the environment. OLTPS holds biweekly meetings with all relevant agencies to review the status of each of the 127 initiatives in PlaNYC. The office promotes the integration of sustainability and adaptation goals and practices into the work of city agencies and the lives of New Yorkers.

Mayor Bloomberg created the office in 2006 within the Mayor's Office of Operations, which is responsible for performance reporting and special mayoral initiatives. It was necessary to have the support of Director of Operations who had the credibility needed to get city agencies to fully engage with the planning process. The Office also hired a Sustainability Advisory Board of local and national experts to guide them through strategies and initiatives and provide analytical and research support. OLTPS was made a requirement within the Mayor's Office and charged with updating PlaNYC every four years by the Local Law 17 of 2008.

- The dedicated climate adaptation staff includes a director, deputy director, senior policy advisors (3), policy advisors (8), and policy analysts (3).
- The roles and responsibilities of these staff include:

    1. Support city executive and senior management team in the design of overall strategy and process for the project
    2. Develop criteria, policies and procedures for sustainable programs
    3. Maintain updated Sustainability Plan and Climate Action Plan
    4. Draft procedural and training manuals, process flow charts, and implementation plans
    5. Coordinate and lead city's Green Team
    6. Develop Sustainability Plan and Climate Action Plan

7. Track and report about sustainability programs underway on a regular basis through the city's performance management program

8. Track, monitor, and report utility usage and greenhouse gas emissions of city operations

9. Track, monitor, and report greenhouse gas emissions at the community level

10. Foster, develop, and launch projects in partnership with city departments and external stakeholders

11. Identify and secure funding resources from outside sources (ex. Federal grants) for projects

12. Represent the city at key meetings

13. Develop a multi-faceted communication strategy within the organisation and the community to promote the city's efforts locally, state-wide, and nationally to gain recognition

14. Perform financial analysis on ongoing and new projects.

Climate Adaptation Task Force and New York City Panel on Climate Change: In 2008 Mayor Bloomberg launched the Climate Adaptation Task Force and the New York City Panel on Climate Change (NPCC). The task force develops adaptation strategies to secure the city's infrastructure from the effects of climate change. The task force, which was one of the 127 initiatives proposed in PlaNYC, is made up of multiple city and state agencies, authorities and private companies that operate, maintain, or control critical infrastructure in New York City. Advising the task force is the NPCC, which is modelled after the International Panel on Climate Change. It is composed of a panel of experts from academic institutions and the legal, engineering, and insurance industries. Together, these groups will begin the process of creating a coordinated plan to adapt NYC's roads, bridges, and tunnels; mass-transit network; water and sewer systems; electric, gas, and steam production and distribution systems; telecommunication networks; and other critical infrastructure to the coming changes in climate.

Local Law 42 of 2012 mandated the New York City Panel on Climate Change and requires it to update its climate projections at least every three years, and within one year of an Intergovernmental Panel on Climate Change update. The Law also mandated the Climate Adaptation Task Force within the city's government and requires an updated risk assessment within one year of new projections from NPCC.

The updated climate impact projections from NPCC's second report informed the new adaptation plan 'A Stronger, More Resilient New York.' NPCC discovered that the next few decades will see substantially worse climate change effects than was predicted in their report four years earlier. By maintaining the panel in law, New York's city government is now able to adapt to continuously update and adapt to new climate change predictions.

- Duties of the Task Force:
    - Create an inventory of existing infrastructure that may be at risk from the effects of climate change.
    - Develop coordinated adaptation plans to secure these assets based on New York City-specific climate change projections.
    - Draft design guidelines for new infrastructure that take into account anticipated climate change impacts.
    - Identify adaptation strategies for further study that are beyond the scope of individual stakeholders.
- Duties of NPCC:
    - Develop a unified set of climate change projections for New York City.
    - Create a set of tools to help task force members identify at-risk infrastructure and develop adaptation strategies.
    - Write draft protection levels to guide the design of new infrastructure.
    - Issue a technical report on the localised effects of climate change on New York City – similar to the IPCC's landmark 2007 report on global climate change.

Sources:

- The City of New York, Office of the Mayor 2008, *Mayor Bloomberg Launches Task Force to Adapt Critical Infrastructure to Environmental Effects of Climate Change* [Press Release], The City of New York, <http://on.nyc.gov/RkIyXr>.
- Bagley, K. & Galluci, M. 2013, *Is NYC's Climate Plan Enough to Win the Race Against Rising Seas?*, InsideClimate News, <http://www.philly.com/philly/news/science/Is_NYCs_Climate_Plan_Enough_to_Win_the_Race_Against_Rising_Seas_insideclimate.html>.
- Weissman, S., Varghese, S. & Wood, Z. 2013, *Effective Governance for Multi-Jurisdictional, Multi-Sector Climate Adaptation*, University of California, <http://www.abag.ca.gov/jointpolicy/pdfs/Task%207c4%20Decision%20Making.pdf>.
- The City of New York 2011, 'Implementation', in *A Stronger, More Resilient New York*, The City of New York, <http://www.nyc.gov/html/sirr/downloads/pdf/final_report/Ch20_Implementation_FINAL_singles.pdf>.

CS3.2 CLIMATE CHANGE ADVISORY TASK FORCE – MIAMI-DADE COUNTY, U.S.

Contact: Office of Sustainability at green@miamidade.gov.

Background: Miami is a coastal community located at sea level and surrounded by water on three sides, with a typical land elevation of only three to ten feet above mean high water. In 2007, the Organisation for Economic Cooperation and Development (OECD) quantified the vulnerability of various municipalities across the world towards climate change and identified Miami–Dade County as having the highest amount of vulnerable assets exposed to coastal flooding (for the 2070s) with a projected potential damages cost of approximately $3.5 trillion. Additionally, many key economic drivers for the county are weather dependent (e.g. tourism and agriculture). This drove Miami–Dade County to create a Climate Change Action Plan with the goal to balance and institutionalise sustainability and climate action by building these concepts and strategies into the county's standard operations and planning processes.

Climate Change Advisory Task Force (CCATF): CCATF was created in June 2006 to advise the Board of County Commissioners (BCC), and includes 25 appointed members, 23 of whom are appointed by the BCC with recommendations from the County Manager, and two of whom are appointed by the Mayor. The task force also includes of over 150 representatives of key community sectors. CCATF has been a vehicle for community engagement in Miami-Dade County's climate adaptation process. The primary responsibilities of the task force are to advise the BCC on strategies and policies with respect to implementation of the Climate Change Action plan and its updates, and to recommend adaptation measures to be taken in response to climate change challenges. The task force must supply an annual report of its recommendations on or before the first day of June each year.

Some important recommendations to the County on embedding climate adaptation from 2010 include:

- A new policy to require the County to initiate an analysis on climate change and its impacts on the built environment, addressing development standards and regulations to avoid investments in infrastructure, development/redevelopment and public facilities in hazard-prone areas. The current approach to land supply/demand planning will also be evaluated against the risks associated with infrastructure investments in flood prone areas, and the CDMP long-term time horizon will be evaluated in relation to climate change impacts.
- A new policy that requires the County to establish a climate change checklist, or similar mechanism, to be used to evaluate proposed new development and redevelopment to assess the suitability of proposed use(s), density and/or intensity of use(s), and the level of risk of exposure to climate change impacts, among others.
- A new policy under the Conservation, Aquifer Recharge and Drainage Element Objective CON-1 requiring all County departmental master plans and strategic business plans to be amended to include and prioritise climate change mitigation and adaptation strategies. All departmental recommendations related to climate change shall be monitored, and annual progress reports shall be published in a central location (such as a website) that encourages and facilitates public review and participation.

To date 57 recommendations have been forwarded to the Board of County Commissioners and many have already been implemented as part of the Miami–Dade County plan, GreenPrint: Our Design for a Sustainable Future, including the following embedding actions:

- The County Manager met with key department directors in 2008 to start discussion of how to incorporate climate change planning into department strategic plans
- The county partnered with the National Oceanic and Atmospheric Administration (NOAA) in 2010 to provide introduction and training for climate adaptation to department heads and operational staff to expedite this process
- County staff are exploring ways to incorporate climate adaptation planning into departments' master planning processes by incorporating it into department scorecards
- The county worked with the US Geological Survey (USGS) and the US Army Corps of Engineers to build consensus on climate vulnerability and sea level rise mapping and planning parameters. This will be used to identify flood hazard-prone areas and create planning maps and tools.

Sources:

- International Council for Local Environment Initiatives (ICLEI) 2010, *Institutionalizing Climate Preparedness in Miami-Dade County, Florida*, ICLEI USA, <http://www.icleiusa.org/action-center/learn-from-others/ICLEI_Miami_DadeCase_Study_lowres.pdf>.
- Miami-Dade County 2010, *Climate Change Advisory Task Force Status of Recommendations – August 2010*, Miami-Dade County, <http://www.miamidade.gov/environment/library/reports/climate-change-recommendations-october-10.pdf>.
- Miami-Dade County n.d., *Greenprint Implementation Table*, Miami-Dade County, <http://www.miamidade.gov/greenprint/pdf/implementation_table.pdf>.
- *Miami-Dade County Regulations: Article CXXVI. Climate Change Advisory Task Force*, <http://miamidade.fl.eregulations.us/rule/coor/coor_ptiii_ch2_artcxxvi>.

CS3.3 CLIMATE CHANGE KPIS/PDS – MORNINGTON PENINSULA SHIRE COUNCIL, VIC

A number of Mornington Peninsula Shire Council employees have climate change-related responsibilities indirectly specified in their key performance indicators and position descriptions, including the Emergency Response Officer, the Team Leader – Natural Systems, and the Project Manager Drainage. These responsibilities are linked to requirements to implement relevant plans and strategies that include climate change actions or initiatives, and are in most cases specific to the position.

As an example, here is part of the position description for the Project Manager Drainage: Point 2 under 'Dimensions' demonstrates that this Project Manager is responsible for the delivery of Council's drainage strategy. The strategy clearly states Council's intention to deal with climate change, which indirectly means that this Project Manager is responsible for addressing climate adaptation. Further, Point 4, under 'Dimensions' focuses on the promotion of Water Sensitive Urban Design. This type of design will assist in building resilience to flooding and drought, again highlighting the team members' contribution to climate adaptation.

Sources:

- Mornington Peninsula Shire 2009, *Economic Sustainability Strategy 2009-2014*, Parliament of Victoria, <http://www.parliament.vic.gov.au/images/stories/committees/edic/local_economic_initiatives/subs/63B_-_2009-14_Economic_sustainability_strategy.pdf>.

CS3.4 CLIMATE ADAPTATION COORDINATOR – CITY OF GREATER GERALDTON, WA

Positions focusing on climate change roles and responsibilities are becoming more common within local government. The creation and maintenance of these positions is an indicator of a Council's commitment to addressing climate change impacts, and also demonstrates an appreciation of the importance of dedicated resources for effectively managing climate change. The City of Greater Geraldton created a Climate Change Coordinator position responsible for a number of tasks including:

- Seeking information on current and completed activities that align with identified adaptation actions
- Identifying barriers and opportunities present in current Council operations and stakeholder engagement processes.

Sources:

- *City of Greater Geraldton Climate Change Coordinator Position Overview*, <http://www.acelg.org.au/sites/default/files/CC-toolkit/CS3.4_Climate-Change-Coordinator-Position-Overview.pdf>.

CS3.5 PARTNERSHIPS – CITY OF ROTTERDAM, NETHERLANDS

The Rotterdam Climate Initiative is a partnership between the City of Rotterdam, the Port of Rotterdam, DCMR Environmental Protection Agency Rijnmond, and Deltalinqs, with the objective of reducing CO_2 emissions by 50% and climate proofing the city. The Climate Office addresses a comprehensive climate file, including both mitigation and adaptation. The office is managed by the Director Sustainability and Climate Change of the City of Rotterdam, Paula Verhoeven. The Rotterdam Climate Change Initiative (RCI) combines key stakeholders into a single, permanent body with authority and a political mandate. As a result climate change projects and plans that are put forward by the RCI receive widespread support, with the partnership also able to draw on its large pool of resources to implement key programs.

Implementation of the programme is a joint activity of the Municipal Public Works Department and the Department of Urban Development. These two departments collaborate actively with the Municipal Health Service (GGD), the Sports and Recreational Department, the Water Boards, various government bodies, NGOs and knowledge institutes. They report to the Municipal Executive. The RCI board are jointly responsible for the coherence, quality and progress of the programme.

Sources:

- *About the Rotterdam Climate Initiative*, <http://www.rotterdamclimateinitiative.nl/en/about-us>.

CS3.6 MANAGER AND DIRECTORATES REQUIREMENTS AND STAFF TRAINING – KENT COUNTY COUNCIL, U.K.

Contact: Climate Change Programme Manager at county.hall@kent.gov.uk.

Background: The Kent Environment Strategy, which maps out how the County will address major challenges and opportunities over the next 10–20 years, contains the priority to manage the impacts of climate change. The Kent Adaptation Action Plan was developed in response to this requirement. The plan identifies key actions to be taken over the next two years in varying priority sectors throughout the County government. As part of the Kent County Environment Strategy and Adaptation Action Plan, staff in the organisation, including managers and directorates, are required to commit to the delivery of sustainability and climate change actions.

To further embed climate adaptation into Kent County Council daily operations, staff training resource packs and workshops have been developed to educate staff on emergency planning and managing climate risks for their services.

Process for embedding: All staff in the organisation are required to commit to delivery of the environment strategy, which incorporates adaptation. This requirement is part of the County's induction processes and is embedded in their environment policy commitments. The commitment to the delivery of the environment strategy is also a 'Kent Manager' requirement (Figure 2). Staff must demonstrate how they have contributed to the strategy's delivery in a training course for all managers.

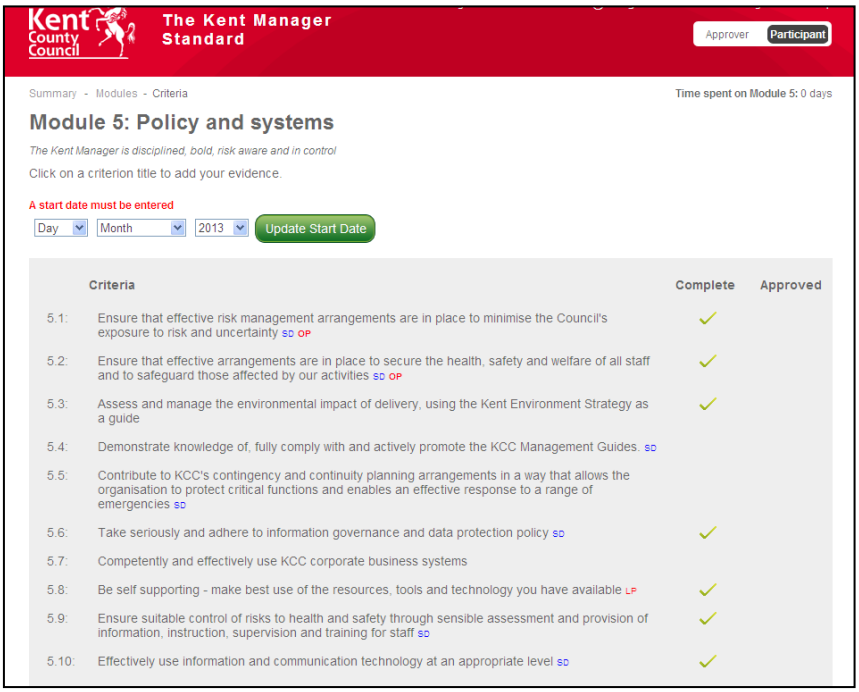


Figure 2: 'Kent Manager' screenshot

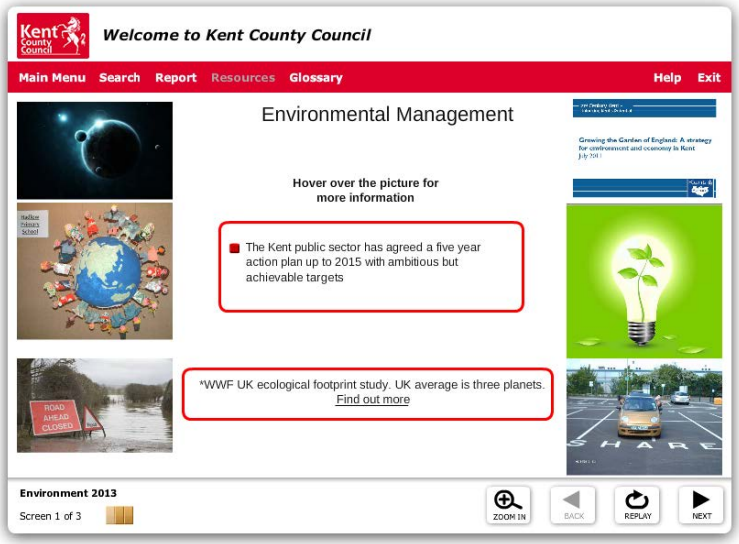


Figure 3: Induction screenshot

All Directorates are required to develop a Sustainability and Climate Change action plan each year. This requirement is part of Kent County's business planning process, and the progress and risks are reported on an annual basis to each directorate cabinet committee, and the Corporate Management Team. The plans include targets and minimum actions in sectors such as reducing energy use, minimising car travel, and staff engagement.

Evidence of the success of this organisation-wide 'accountability' approach in terms of embedding climate adaptation can be seen in case study CS6.2 where climate adaptation has been embedded in Kent County Council's procurement and contract process.

Further information on the array of Kent County Council's climate resilience initiatives can be found in the following sources:

- Kent County Council n.d., *Kent Preparing for Climate Change: Review of activity 2012*, Kent County Council, <https://shareweb.kent.gov.uk/Documents/environment-and-planning/environment-and-climate-change/kent-preparing-climate-change.pdf>.
- Kent County Council n.d., *Kent's Adaptation Action Plan 2011-2013*, Kent County Council, <https://shareweb.kent.gov.uk/Documents/environment-and-planning/environment-and-climate-change/Kents Adaptation Action Plan 2011-2013 .pdf>.

CS4.1 CITY STRATEGY AND OPERATIONAL PLAN ALIGNMENT WITH CLIMATE CHANGE CONSIDERATIONS – WILLOUGHBY COUNCIL, NSW

Contact: Sustainability Officer at email@willoughby.nsw.gov.au.

Background: Willoughby Council's Sustainability Action Plan 2011–2015 includes climate change and energy consumption as key target areas. Related activities include Council's climate change action community education campaign (ClimateClever). However, an important step toward embedding climate adaptation into Council decision-making has been to incorporate climate change considerations into key operational documents.

Process for embedding: Climate adaptation principles, goals and targets have been incorporated into:

- City Strategy 2013 – 2029
- Delivery Plan 2013 – 2017 (Figure 4)
- Operational Plan and Budget 2013–2014 (Figure 5)

This deeply embedded outcome was achieved through a risk assessment process as outlined below:

- In 2010, Council's insurance company Statewide Mutual initiated and funded a climate risk assessment of Council's operations. Consultants commissioned by Statewide facilitated a number of workshops that included key staff from each division including Community, Environmental, Infrastructure and Corporate Services.
- Workshop content included:
    - discussion around climate scenarios
    - identification of potential climate risks to Council operation
    - examination of current actions which reduce these risks
    - development of adaptation actions for risks rated 'high' or 'extreme'
    - incorporating high and extreme risks into a Climate Risk Assessment and Adaptation Report.
- The Report was presented and endorsed by Council with a recommendation that the assessment process (including climate scenarios, identified risks and action ratings) be reviewed on a regular basis.

- The outcomes of the Report and the endorsement of Council was shared and promoted with Council staff through branch meeting discussions, emails and intranet postings.

Lessons learnt: Key to successfully embedding climate adaptation into Council's planning documents were:

- The risk assessment process was initiated by Council's insurance company, which sent a clear and strong message to staff that Council may be liable if potential climate change impacts were not addressed.
- Senior management were engaged in building climate change resilience within Council and the community.
- Most managers were involved in the risk assessment process or provided comments, relevant to their team, as part of the Report's development.
- Council endorsed the Report.
- Actions were allocated to staff with relevant knowledge and experience from across Council rather than the Sustainable Environment Branch being responsible for ensuring all actions are implemented.

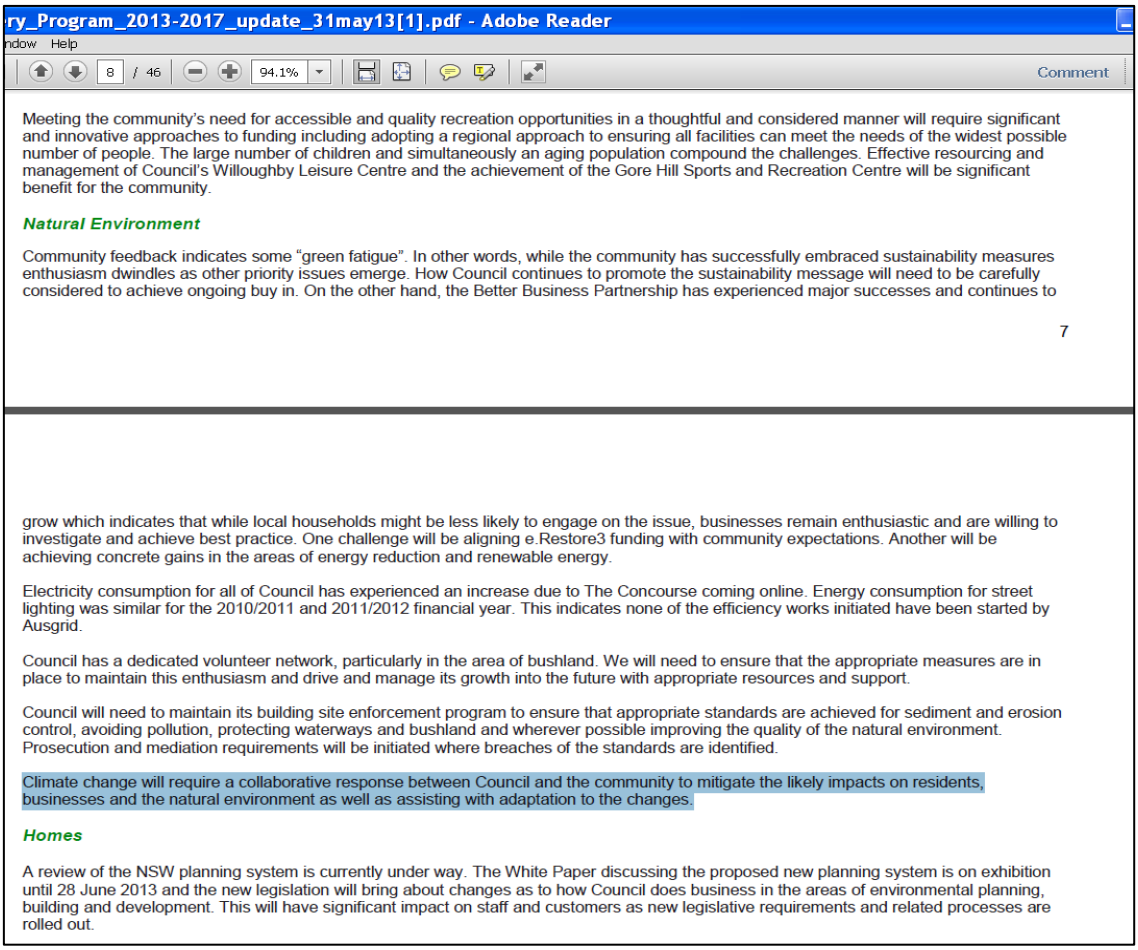
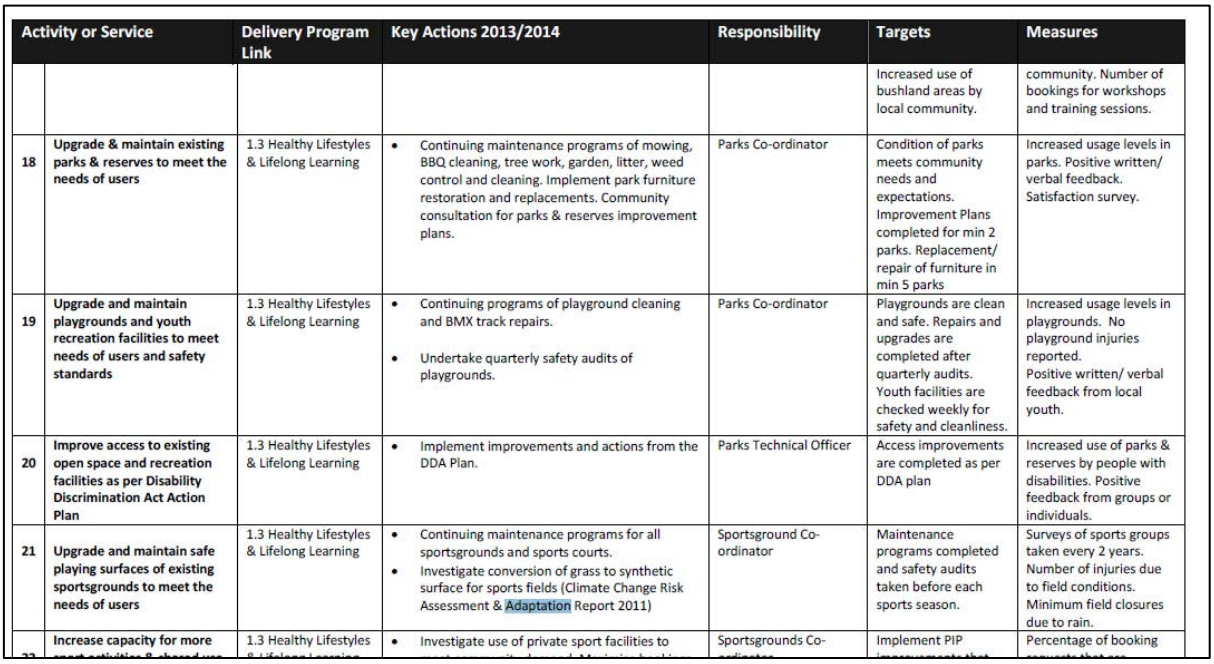


Figure 4: Screenshot of Draft Delivery Program 2013–17



	Activity or Service	Delivery Program Link	Key Actions 2013/2014	Responsibility	Targets	Measures
					Increased use of bushland areas by local community.	community. Number of bookings for workshops and training sessions.
18	**Upgrade & maintain existing parks & reserves to meet the needs of users**	1.3 Healthy Lifestyles & Lifelong Learning	• Continuing maintenance programs of mowing, BBQ cleaning, tree work, garden, litter, weed control and cleaning. Implement park furniture restoration and replacements. Community consultation for parks & reserves improvement plans.	Parks Co-ordinator	Condition of parks meets community needs and expectations. Improvement Plans completed for min 2 parks. Replacement/ repair of furniture in min 5 parks	Increased usage levels in parks. Positive written/ verbal feedback. Satisfaction survey.
19	**Upgrade and maintain playgrounds and youth recreation facilities to meet needs of users and safety standards**	1.3 Healthy Lifestyles & Lifelong Learning	• Continuing programs of playground cleaning and BMX track repairs. • Undertake quarterly safety audits of playgrounds.	Parks Co-ordinator	Playgrounds are clean and safe. Repairs and upgrades are completed after quarterly audits. Youth facilities are checked weekly for safety and cleanliness.	Increased usage levels in playgrounds. No playground injuries reported. Positive written/ verbal feedback from local youth.
20	**Improve access to existing open space and recreation facilities as per Disability Discrimination Act Action Plan**	1.3 Healthy Lifestyles & Lifelong Learning	• Implement improvements and actions from the DDA Plan.	Parks Technical Officer	Access improvements are completed as per DDA plan	Increased use of parks & reserves by people with disabilities. Positive feedback from groups or individuals.
21	**Upgrade and maintain safe playing surfaces of existing sportsgrounds to meet the needs of users**	1.3 Healthy Lifestyles & Lifelong Learning	• Continuing maintenance programs for all sportsgrounds and sports courts. • Investigate conversion of grass to synthetic surface for sports fields (Climate Change Risk Assessment & Adaptation Report 2011)	Sportsground Co-ordinator	Maintenance programs completed and safety audits taken before each sports season.	Surveys of sports groups taken every 2 years. Number of injuries due to field conditions. Minimum field closures due to rain.
	Increase capacity for more	1.3 Healthy Lifestyles	• Investigate use of private sport facilities to	Sportsgrounds Co-	Implement PIP	Percentage of booking

Figure 5: Screenshot of Operational Plan 2013–14

CS4.2 PREPARATION OF PUBLIC HEALTH PLANS ALONGSIDE CLIMATE ADAPTATION PLANS – CITY OF PORT ADELAIDE ENFIELD, SA

Contact: Environment Planner at customer.service@portenf.sa.gov.au.

Background: Climate change poses a range of potential health impacts for populations, which are identified and addressed in Council's Public Health Plan, supported by Council's broader adaptation planning and programs. The outcome is a consistent research and evaluation methodology, and the strategic delivery of programs to maximise the population's capacity to adapt to the projected impacts of climate change, and minimise the potential for existing health inequalities and vulnerabilities to be further exacerbated by the impacts of climate change.

South Australia recently passed legislation to mandate councils (individually or jointly as regional groupings) to prepare Public Health Plans. These plans must align with the general directions and goals of the State Public Health Plan, and be in accordance with the SA Public Health Act 2011 (This general requirement for Councils to include public health in their strategic planning frameworks is also in place in some other Australian jurisdictions, including Victoria). The SA State Public Health Plan specifies that the potential effects and risks posed by climate change to the health and wellbeing of communities be included as a standard element of the new Public Health Plans.

Port Adelaide Enfield Council has voluntarily prepared non-mandated Public Health Management Plans as part of its strategic framework since 1996, and has identified climate change as a key area of ongoing research and response by Council and the broader community. Incorporating climate change into the new compulsory Public Health Management Plans is an effective means of embedding climate adaptation into public health planning and programs – and also allows linkages to related Council planning and services such as open space planning, environmental management, community services, asset management, and emergency management – all of which have both public health and climate change relevance.

Process for preparing the Public Health Plan:

1. Council prepared an internal project plan which outlined the 'how', 'who' and 'why' of the Public Health Plan's preparation, including project management roles and responsibilities.
2. The preparation of the new Public Health Plan is being coordinated by Council's Strategic Planning section, which allows cross-council and inter-disciplinary collaboration, and joint 'ownership' of implementing and monitoring the Plan's delivery. Council is also participating in the preparation of a regional-level climate adaptation plan with two adjacent councils. This process is also being managed from within Council's strategic planning area.

3. A research report was prepared which provided a snapshot of the health of the City's population, and the social and demographic features of the community, the environmental and land use features of relevance to public health outcomes, local services and access (including emergency management), and projected trends in key health and social indicators – including vulnerable populations data which is a key input to climate adaptation planning. The data was garnered from a range of sources including the 2011 Census (Statistical Local Area data); the state government's Social Health Atlas data and analysis; Council's own survey and study data regarding social and community wellbeing in key areas such as youth health and Aboriginal and Torres Strait Islander health; and Council's land use and development projection information.
4. The above baseline public health profile of the City is being overlaid with specific research into the health-related issues and impacts of projected climate change in the region. The climate risk assessment (including scenario projection modelling) was undertaken via a separate project underway to assess the region's social, economic, and environmental vulnerability to climate change.
5. A key benefit of the joint planning process is the defining of mutually useful key data sets or indicators that can be applied to both the public health and climate change planning exercises, to ensure ongoing consistent and efficient monitoring, evaluation and trends analysis.

Lessons learnt:

- The coordinated preparation of Public Health Plans alongside Climate Adaptation Plans allows for integrated research and delivery of programs and projects, and the establishment of partnerships across varying professional areas and levels of government.
- The 'centralised' project management approach provides significant efficiencies in the research and consultation stages for both projects, and enables collaboration in the delivery and evaluation of both public health planning and climate adaptation planning.
- Council's GIS resources were found to be a valuable asset in the identification of spatial 'hot spots' where already vulnerable communities may be particularly affected by health-related climate change impacts, including bushfires and heatwaves. This can be done via a simple generation and layering of maps – the generation of each layer needs to be undertaken using a standard GIS method that then enables layers to 'talk' to each other, allowing correlations to emerge.

CS4.3 NEW YORK CITY PANEL ON CLIMATE CHANGE – NEW YORK CITY COUNCIL, U.S.

In 2008, Mayor Bloomberg established the New York City Panel on Climate Change (NPCC), with the mandate to provide New York City with the most up-to-date and comprehensive scientific, technical, and socioeconomic information about climate change and its impacts on the city and environs. 'Climate Change Adaptation in New York City: Building a Risk Management Response' is the first report of the NPCC. The report will help New York City develop, adopt, and implement policies to adapt the city's critical infrastructure to the changing climate.

This NPCC report outlines a powerful and novel framework for deploying sophisticated tools of risk management to address the city's climate adaptation challenges, and details with rigour and insight the critical challenges that climate change poses to New York City's energy, transportation, water and communications systems. The report also presents a coordinated set of climate projections prepared by the NPCC to be used by the many public agencies and private-sector organisations that manage critical infrastructure in the region as they develop adaptation strategies, and it describes how legal and regulatory tools can support adaptation policies.

At the very centre of the plan is the notion that climate change adaptation strategies should be incorporated into the management plans of critical city infrastructure through a mechanism called Flexible Adaptation Pathways. This mechanism suggests that strategies can evolve through time as climate risk assessment, evaluation of adaptation strategies, and monitoring continue. In terms of resilient strategies, the plan introduces design standards that are recalibrated depending on the climate change projects, so that long-lasting infrastructure will be prepared to withstand future threats. Adaptive management was addressed by means of focussing on strategies for responding to incremental changes (e.g. annual temperature and precipitation changes) as well as low probability, high impact events (e.g. extreme coastal flooding exacerbated by sea level rise), and link investments to the level of risk at a relevant point in time (i.e. phased strategies). NPCC incorporated scenario planning by establishing a climate change monitoring program to track and analyse key climate change factors, impacts and evolving-knowledge indicators, to gain an understanding of the performance of options against changing conditions.

Sources:

- 'Climate Change Adaptation in New York City: Building a Risk Management Response: New York City Panel on Climate Change 2010 Report', *Annals of the New York Academy of Sciences*, Volume 1196.

CS4.4 MULTI-CRITERIA ANALYSIS FRAMEWORK – SYDNEY COASTAL COUNCILS

Contact: info@sydneycoastalcouncils.com.au.

The Sydney Coastal Councils' Group (SCCG) recently completed the *Prioritising Coastal Adaptation and Development Options for Local Government* project. Central to this project was the development of a multi-criteria analysis framework (MCA) to support consideration of diverse adaptation management alternatives around future protection, development or redevelopment of coastal lands, with the tool ultimately linked to a Geographic Information System (GIS) to allow users to visualise, understand and assess potential adaptation options. It should be noted that the tool is not intended to provide a definitive solution but rather to provide a framework for an informed discussion around community values, outcomes, and the costs and benefits of adaptation options.

Sources:

- Sydney Coastal Councils Group 2012, *Prioritising Coastal Adaptation and Development Options for Local Government Project – A Guide to Monitoring and Evaluating Coastal Adaptation,* Final Report, Sydney Coastal Councils Group, <http://www.sydneycoastalcouncils.com.au/sites/default/files/ME%20Guide_Final_2012%20IA.pdf>.

CS5.1 RESOURCING CLIMATE CHANGE ADAPTATION – CITY OF ONKAPARINGA, SA

Contact: Manager Strategy and Sustainability, City of Onkaparinga at mail@onkaparinga.sa.gov.au.

Background: The City of Onkaparinga is a peri-urban area covering 518 square kilometres and 31 kilometres of coastline. This includes industrial areas in the north of the city, rural landscapes and townships in the north east, central and southern areas and urban areas along the coast. The internationally recognised McLaren Vale wine district is located in the city and is an important part of the local economy. The city is the largest South Australian council by population (approximately 160,000 residents that make up 10% of the state's population) and is an area of planned growth under the state's 30 year Plan for Greater Adelaide. Population estimates show that all current greenfield and infill opportunities (around 20,000 dwellings and 45,000 people) are likely to be exhausted by 2032.

As part of the 2007 review of its Community Plan, the community identified three emergent issues that were critical to planning for the future of the city and community's wellbeing. These were: renewing the economy, an ageing population and addressing climate change. In response the Council prepared the Climate Change Strategy 2008–2013 to ensure a planned approach to emissions reduction and adaptation issues, including clearly defining Council's roles and responsibilities (Figure 6). In approving the Strategy, Council established the Climate Change Response Fund (CCRF) to resource its implementation. The CCRF was established as a dedicated reserve fund and included a one-off general rate increase (not a levy) of 1% (earning the Council approximately $1 million in its first year) to fund projects and capital works on an annual basis, and an associated 0.15% general rate increase to fund ongoing operational costs i.e. staff and elected member training and the purchase of green power.

Preparing the strategy and establishing the fund

The following steps were taken in preparing the strategy and establishing the fund:

- A new senior position with climate change expertise was established to manage the preparation of the strategy and oversee Council's climate change response.
- A Science Panel was established to advise Council on the published scientific evidence and local impacts relevant to the area (Figure 7). The Panel included members with expertise in public health, transport planning, natural resource management, coastal management, economic development, renewable energy and climate science, and representatives from the Bureau of Metrology. The Panel's advice was used to prepare a discussion paper. This approach was taken to ensure an evidence-based approach was taken to identifying issues and setting policy. Council was also keen to ensure that it was not seen to be the arbitrator in any scientific dispute. The Panel proved to be an invaluable technique to ensure that the community, staff and elected members had confidence in the directions being taken in the strategy. The model was subsequently used by the SA Local Government Association in the preparation of the sector-wide climate change strategy. The Bureau of Metrology played a pivotal role in both the Science Panel and the LGA's group and generating and reviewing locally relevant data.

- In parallel to the preparation of the strategy, Council commissioned a preliminary risk assessment of the impacts of climate change on its coastal lands, given the extent of the coastline in the area and its economic, social and environmental importance. This study, known as the Caton Report, identified priority adaptation measures (planning, protection and monitoring) that needed to be actioned by the Council and others. A local climate change scenario was prepared as part of this study and was peer reviewed by Science Panel members and relevant government departments.
- During the strategy development phase a staff and elected member education program was delivered. This included presentations from the Science Panel members and other experts and community representatives. This process ensured that staff and elected members were well informed when making strategic and operational decisions relevant to climate change issues. It was also a factor in ensuring that Council was confident in its decision to increase general rate revenue to establish the CCRF.

  The above approach ensured that the strategy and fund were considered interdependent, both as a demonstration of Council's leadership in this policy area and as a prerequisite to effect practical and meaningful change.

  The Climate Change Strategy 2008–2013 is structured around five themes with foundation projects identified under each theme. Collectively these projects are the priorities that drive the implementation of the strategy and have been the focus of funding from the CCRF. Themes and some of the foundation projects relevant to adaptation are featured below.

Theme: Provide leadership

Foundation project: Carbon Neutral 2013

This project included a range of energy efficiency, renewable energy and offsetting measures for the organisation to achieve carbon neutrality by 2013. Funding from the CCFR allowed the pathways to achieve this target to be modelled under a number of scenarios and informed Council's choice of emission reduction measures that were also funded from the CCRF. The Green Building Initiative is the flagship project.

Theme: Prepare for change and manage uncertainty

Foundation project: Assessing Climate Change Risk and Corporate Adaptation Plan

This assessment of corporate risks and preparation of the corporate adaptation plan was undertaken in 2009, with funding from the national Local Adaptation Pathways Program. The climate change scenario used in the Caton Report was updated as part of this process. Funding from the CCRF has been used to fund the following priorities from the plan:

- the establishment of a city-wide early warning flood watch system
- the preparation of sustainable design guidelines to apply to all of Council's building upgrades and major developments
- the inclusion of climate change considerations in a city-wide sports and active recreation strategy

- coastal planning and management initiatives, including concepts and detailed designs for cliff stabilisation and beach protection measures and flood mapping and modelling in a number of coastal catchments.

In approving the Corporate Adaptation Plan, Council also approved the climate change scenario and its use in all relevant decision-making. This has proved to be an important directive for ensuring consistent use of climate change parameters in relevant mapping, modelling, planning and management responses (both strategic and operational).

Guidance that proved useful in this project was contained in the following reports:

- Climate Change Impacts and Risk Management: A Guide for Business and Government (Australian Government 2006)
- Climate Change Adaptation Actions for Local Government (Australian Government 2007)

This project also led to a regional adaptation planning project being developed with the neighbouring councils, Marion, Mitcham and Holdfast Bay (see Map 2). The Resilient South Project is jointly funded by the councils and the state and national governments through the natural disaster resilience grant scheme. A regionally- and sector-based integrated vulnerability assessment and adaptation plan will be completed by September 2014. The City of Onkaparinga played a lead role in facilitating this project's development, a role made possible by the seed funding made available through the CCRF.

The project has an emphasis on engaging regional stakeholders to identify how they can adapt, which includes investigations into the social and institutional dimensions associated with fostering resilience and adaptive capacity rather than purely focusing on technical issues. More information on the project can be downloaded from <http://www.resilientsouth.com>.

Theme: Protect resources and ecosystems

Foundation project: Local Biodiversity and Carbon Offset Project

The achievement of Council's Carbon Neutral 2013 target required the offsetting of residual emissions in 2013. This project explored options for generation and purchase of offsets with a policy preference for local biosequestration offsets. The CCRF was used to fund relevant studies.

Theme: Build knowledge and support action

Foundation project: Community Owned Renewable Energy (CORE)

The aim of this project was to increase the uptake of renewable energy with a focus on community-owned generation. The CORE project focused on residential solar panel installations (1–5 KW) and included an online solar assessment tool for all residences in the city (under licence from a private supplier) and the establishment of a panel of solar panel providers to assist residents in making a choice about which product to purchase. Although this project was part of delivering the emissions reduction objectives of the Climate Change Strategy it also has adaptation outcomes for those that have transitioned to decentralised renewable energy generation.

The CCRF model

The CCRF is structured around the following four categories (project and capital works only):

Adaptation: initiatives that help ensure that the organisation and our communities are prepared for and well adapted to the impacts of climate change.

Carbon Neutral by 2013: initiatives that deliver emission reduction and carbon offsets. (This category has been re-titled Corporate Emissions Reduction in light of Council's decision of 30 April not to retain the CN13 target but instead to achieve specified energy reduction targets that reduce the corporate emissions profile).

Low emissions city: initiatives that support emissions reduction by local communities, businesses and industry.

Strategy: initiatives that ensure the appropriate level of climate change planning and engagement are in place, including the review of relevant strategies and studies.

The fund operates as a dedicated reserve, with the Manager, Strategy and Sustainability having responsibility for the oversight of the fund but relevant business units being accountable for the delivery of initiatives funded from the CCRF. This management model has had its difficulties in terms of ensuring delivery is on track. A lesson learnt has been the need to have an integrated monthly reporting system in place to ensure oversight of the fund can be maintained and reported accurately.

Modelling of and bids for funding from the CCRF occurs each year as part of the annual budget process and includes a progress report against initiatives. Since the CCRF's establishment the following changes have been made to the fund and the associated operational funding:

2009–10 budget process – Council resolved not to increase its greenpower purchase and to fund the equivalent amount ($180,000 per annum) through the CCRF to support renewable energy initiatives. This change required a rescheduling of projects including extending the CCRF by another year to 2013–14

2011–12 budget process – as part of the budget balancing options Council approved an annual allocation from the CCRF for native vegetation restoration works (a climate change adaptation response) to reduce pressure on the operational budget

2012–13 budget process – to offset the impacts of the carbon price on the operational budget Council approved a reduction in the annual funding from 1% of general rate revenue to 0.75% with the remaining 0.25% being allocated to the general operating budget. To offset the reduction in funding the tenure of the CCRF was increased by two years (to 2015–16) with the funding in these years set at 0.25% of general rate revenue.

Lessons learnt: This flexibility has been required to ensure the operation of the fund is clearly set in the overall budget process and to safeguard any budget balancing requirements, particularly given the changing policy environment as it relates to carbon pricing. The approach has also been dependent on a high level of collaboration and climate change literacy from all the relevant business units within Council,

especially the Strategy and Sustainability Unit and the Financial Unit. Having an approved Climate Change Strategy in place has assisted this process in terms of setting clear expectations to guide any negotiations that are required.

A further lesson learnt is the need to ensure that all bids are fully costed, including any additional internal resources (direct and indirect costs) required to deliver the projects and capital works.

The Climate Change Strategy 2008–13 is under review in 2014. The outcomes of this review and the Resilient South Project Adaptation Action Plan will set the new directions for Council's response to climate change. This will involve a review of the CCRF.

Copies of all documents referred to in this case study can be downloaded from <http://www.onkaparingacity.com> or for hard copies and further information contact the Manager, Strategy and Sustainability.

Climate change roles

These role statements have been developed using a core set of principles that inform all of Council's decisions when considering what roles and responsibilities they have when delivering services.

Leadership

Council will analyse information and trends and integrate climate change considerations in its decision-making. We will demonstrate leadership through our own operations and services. We will monitor, review and report on Council's own performance against set targets and indicators. We will support community and business responses to climate change in the region.

Owner/custodian

We will ensure that climate change considerations are included in Council's management of infrastructure, assets, ecosystems and natural resources under its care and control.

Regulatory

We will apply land use planning and development control in regard to minimising the impacts and risks and associated with sea level rise and impacts on coastal zones and in minimising flooding and bushfire risks. We will ensure that public health is protected.

Information provider

We will provide information on greenhouse emission reduction measures that individuals and businesses can undertake.

Advocate

We will advocate on behalf of the community on climate change impacts relevant to the City and relevant state and federal government proposals to ensure the appropriate allocation of roles, responsibilities and resources.

Facilitator/initiator

We will facilitate or initiate community, business and other relevant parties' involvement in the development of a City-wide planned response to climate change.

Direct service provider

We will undertake services, capital works and projects that minimise the impacts of climate change in accordance with Council's adopted service levels, plans and strategic directions.

Figure 6: Climate change roles and responsibilities

Science Panel: Terms of reference

Purpose

The Science Panel provides scientific expertise and advice in the preparation of the City of Onkaparinga's Climate Change Strategy and Action Plan 2008–2012.

Role and function

The role of the Science Panel is to:

- provide advice on climate change science and research that should be taken into consideration in the development of the strategy
- assist in the preparation of the climate change scenarios for the initial risk and vulnerability assessment
- participate in the risk and vulnerability assessment process (depending on availability)
- assist in the review of the assessments findings
- identify priority research and development actions to include in the strategy, including opportunities for partnerships between Council and relevant science and research institutions
- provide advice on the appropriate mix of mitigation and adaptation responses
- assist in identifying relevant grant and funding sources.

Members responsibilities

- attend meetings.
- prepare prior to meetings, including reading of materials provided.
- contribute to discussions in a constructive manner.

Council's responsibilities

- provide relevant information, administrative support and reasonable level of resources to support the role and function of the Science Panel.
- record and report the outcomes of meetings.

Reporting

The Panel's advice will inform reports to the Senior Management Team and Council as appropriate.

Figure 7: Science Panel terms of reference

CS5.2 CLIMATE CHANGE PRIORITISATION TOOL – CITY OF MELBOURNE, VIC

Contact: Sustainability Branch, contact form.

Background: With a current population of 4.1 million spread over 7,700 square km, Melbourne is projected to become Australia's largest city by 2030. The municipality of the City of Melbourne (CoM) contains eleven suburbs, including Carlton, Docklands and parts of Port Melbourne and South Yarra. The City of Melbourne, as a local government, oversees Melbourne's city centre. As a capital-city council, it also speaks on behalf of Melbourne in local, national and international forums. It is the commercial, retail and transport focus of the metropolitan area. Its major features include the Port of Melbourne, sporting, leisure and arts complexes, parks and gardens, as well as universities and hospitals.

Climate change is projected to affect the area in four key ways: drought, increasing extreme temperatures, increasing rainfall intensity, and rises in sea level. Metropolitan Melbourne's climate readiness is important to its residents but also to Australia more broadly. This is not just because of the city's size and economic significance, but because Melbourne's efforts to build climate change resilience act as an example to other cities across Australia.

Most local councils in the metropolitan Melbourne area have taken proactive measures to identify and monitor climate change impacts and plan for climate change adaptation. The City of Melbourne's Climate Change Adaptation Strategy is an exemplar of how a local council can comprehensively respond to climate change.

In addition, in August 2013, the City of Melbourne launched the Inner Melbourne Climate Adaptation Network, whose 20 to 30 active members include state government departments, water authorities, industry and scientific organisations and emergency services organisations. Through initiatives like the Network, there is scope to build collaboration between local councils and the private sector in this field. Greater levels of engagement and more involvement of the private sector are needed to make metropolitan Melbourne climate-ready.

There have been a number of other specific initiatives in priority areas over recent years including:

- the Heat Wave Response Plan & VCCAR Heat Island and Infrastructure Project
- each year CoM holds four focus groups with residents and businesses
- guide for green roofs
- *Urban Forest Strategy 2012–2032*
- Climate Adaptation Plan (CAP) – economic evaluation adaptation pathways

- Municipal Emergency Management Plan.

CoM Climate Change Prioritisation Tool:

The sequence and prioritisation tool is based on an Excel spreadsheet and was developed to introduce rigour to resolving the question which of the over two hundred individual actions relating to adaptation should be undertaken first. This involved filtering and weighting each action. It is a robust approach that allows the Sustainability Team to work with other teams across Council to prioritise and sequence actions; it also enhances the integration of climate adaptation actions into each of Council's individual Branch Work Plans. The end result is an agreed top list of priority actions for each Branch. It enables the prioritisation of a large number of possible projects/ actions that have been recommended through various avenues (studies/ audits/ risk assessments etc.). Internally, the Sustainability Branch drove the process but it was fully supported by other sections of Council such as engineering, design, urban landscapes, property services, event and community engagement, as well as governance and senior management. The tool took about four months to develop, including engagement with the branches listed above. It is too soon to determine whether the tool is materially affecting areas of Council in their inclusion/understanding of adaptation. However the first results have just been received which will now be used to develop a four-year action plan over the next six months.

The tool has in-built calculations which it prioritises according to the greatest score – high scores are awarded to those actions that are flexible and viable in terms of different future climates (that is, they are able to cope with uncertainty in future predictions). The potential to address different priority climate impacts (e.g. drought and water scarcity, flooding, intense wind events, sea level rise and heat) is also weighted highly, as are links with other actions. A big challenge that the Council encountered in developing this tool was weighting adaptation actions across all the different functions of Council (e.g. public events, hard assets, community activities).

The development of the prioritisation tool has been a valuable process in helping implement the Climate Adaptation Plan and Council will look at whether it is able to share aspects of the tool with other councils.

More about the CoM adaptation approach:

The following background is extracted from the Victorian Centre for Climate Change Adaptation Research (VCCCAR) Navigator at <http://adaptation-navigator.org.au/page.php?id=23>.

The Council's adaptation pathway has been mapped by the VCCCAR project as illustrated in Figure 9. The VCCCAR Adaptation Navigator is a tool designed to assist councils in mapping out the optimimum pathway for their adaptaion approach. This tool is currently under development. As case studies several councils including the City of Melbourne have been mapped with the tool.

The pathway that the CoM has taken from start of their adaptation journey in 2007 has covered the following sequence of initiatives and key elements:

- collaboration with external partners

- assessment of climate risk
- identifying and prioritising adaptation options
- external engagement
- localising adaptation objectives
- monitoring and evaluation
- integrated assessments
- capturing monitoring and evaluating results
- development of decision support tools
- work on decision-making under uncertainty
- prioritising and implementing measures
- understanding the audience
- linkages with broader planning and goals
- external engagement.

The steps included key embedding activities such as:

- CoM undertakes an in-house audit of the recommended actions in the Adaptation Strategy
- The monitoring and evaluating framework
- CoM examines and undertakes an economic analysis for certain climate change impact areas
- The Sustainability Branch develops a Climate Change Adaptation Action Plan in consultation with branches
- Climate change actions to address risks are taken on by a variety of branches, which include actions to change their corporate planning
- Key actions in the Climate Change Action Plan are embedded into the corporate risk register requiring branches to annually report on their actions to minimise the risks.
- The Climate Change Action Plan is presented to Council, which endorses the plan.
- The CoM conducts scenario building to prepare for and adapt to the likely impacts of inundation.
- Annual monitoring and review of Climate Change Action Plan is carried out.

Lessons learnt:

- Development and release of a Climate Change Adaptation Strategy

- Undertaking research into risks to better understand their impact in the local, in this case Melbourne, context, including flooding and extreme heat waves
- Embedding adaptation actions and risk management into day-to-day operations.
- Working to better understand community expectations
- Understanding how much research an individual council, such as the CoM, needs to undertake to allow it to effectively manage the risk
- Appreciation that future climate impacts are uncertain and that this is challenging for planning and decision-making, in particular at the local scale

Figure 8: Example output from VCCCAR Adaptation Navigator

CS5.3 CLIMATE SOCIETAL COST BENEFIT ANALYSIS – CITY OF ROTTERDAM, NETHERLANDS

Contact: Office for Sustainability and Climate Change at <http://www.rotterdam.nl/contact_us>.

Background: The City of Rotterdam, the Port Authority, the employers' association Deltalinqs, and the DMCR Environmental Protection Agency started the Rotterdam Climate Initiative in 2007. Through the collaboration of these organisations as well as citizens, Rotterdam is working to achieve a 50% CO_2 reduction by 2025 and a 100% climate proof city by 2025. The first draft of the Rotterdam Climate Proofing Strategy was released in late 2012. The themes in the plan are centred on blue, or water-related, solutions: flood management, accessibility, adaptive building, urban water systems, and urban climate. Climate change resilience is being embedded in spatial planning, area development, project implementation and policy guidelines.

Rotterdam is in a low-lying delta of the Rhine and Meuse Rivers and is close to the North Sea, presenting the city with many challenges and drivers as climate change effects worsen. The city faces flooding from high river levels and increases in cloudbursts, as well as from rising sea levels. The city also faces longer periods of drought and higher temperatures contributing to the urban heat island effect. Rotterdam council is driven by these projected climate change impacts, but also by the opportunity to develop Rotterdam into a more attractive and economically strong city.

Rotterdam Climate Societal Cost Benefit Analysis (SCBA): The Rotterdam Climate SCBA was developed as part of the Rotterdam Adaptation Strategy. The SCBA assesses the costs and benefits of an investment from the point of view of society as a whole. Specific components of the tools include:

- It describes two scenarios in parallel – one with and one without the project. This exercise reveals the effect the project will have on society.
- It looks at a range of measures to be taken instead of at a single investment.
- It allows investors to compare different project alternatives.
- It calculates:
    - Direct effects – the costs and benefits that can be directly linked to the owners/users of the project properties (e.g. the users and the owner of a building or highway).
    - Indirect effects – the costs and benefits that are passed on to the producers and consumers outside the market that the project is involved with (e.g. the owner of a bakery nearby a new building, or a business company located near a newly planned highway).

- External effects – the costs and benefits that cannot be passed on to any existing markets because they relate to issues like the environment (noise, emission of CO2, etc.), safety (traffic, external security) and nature (biodiversity, dehydration, etc.).

The tool was used to assess The Sustainable Highway, a concept developed by Movares, which consists of a glass canopy covering the highway to eliminate noise and air pollution alongside the road. The results of the SCBA were part of the decision-making procedures for the project, and were also used as a tool to convince other stakeholders of the validity of the project in terms of its socio-economic effects.

Benefits of the SCBA:

1. It is an integrated way of comparing the different effects – All relevant costs and benefits of the different project implementations (alternatives) are identified and monetised as far as possible. Effects that cannot be monetised are described and quantified as much as possible.
2. Attention for the distribution of costs and benefits – The benefits of a project do not always get to the groups bearing the costs. A social cost-benefit analysis gives insight in who bears the costs and who derives the benefits.
3. Comparison of the project alternatives – A social cost-benefit analysis is a good method to show the differences between project alternatives and provides information to make a well informed decision.
4. Presentation of the uncertainties and risks – A social cost-benefit analysis uses several methods to take economic risks and uncertainties into account. The policy decision should be based on calculated risk.

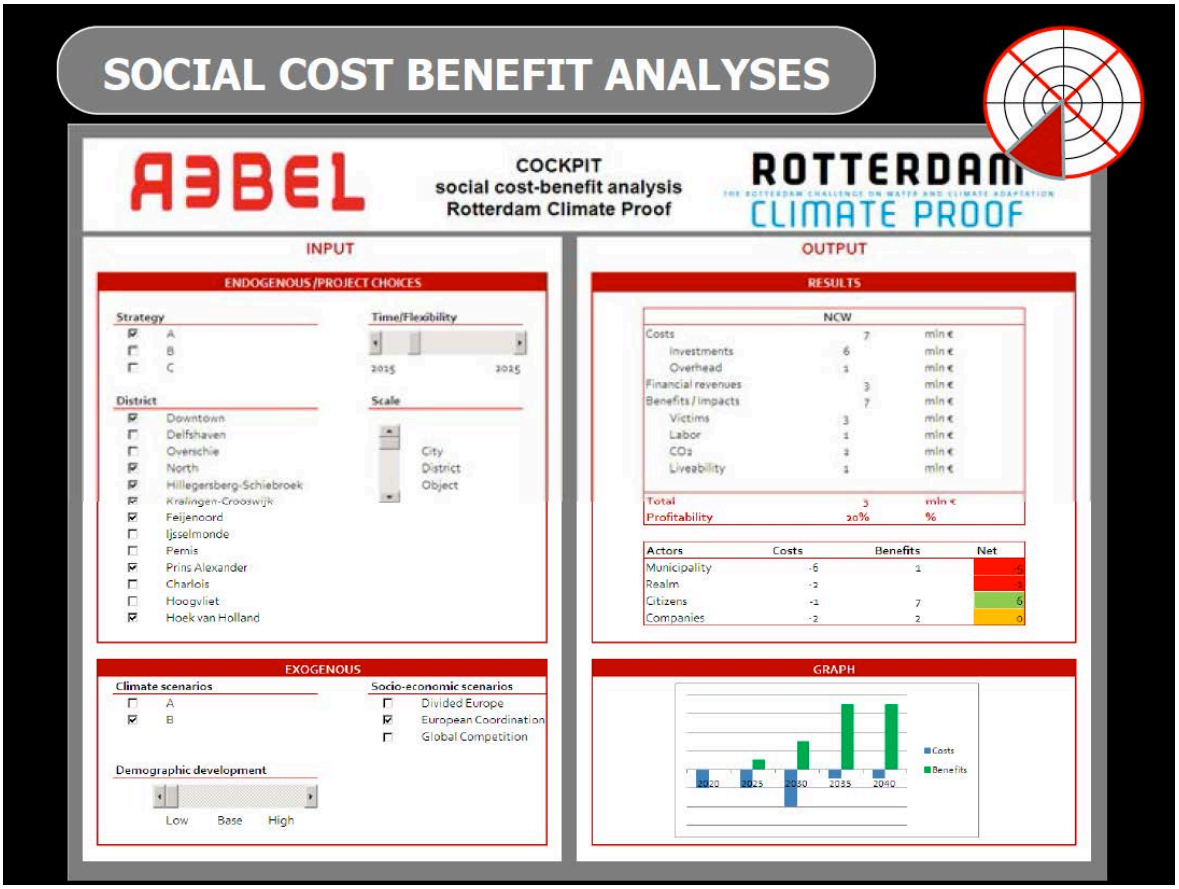


Figure 9: Snapshot of the SCBA tool

Sources:

- *Member in the Spotlight: Rotterdam, the Netherlands*, <http://www.iclei-europe.org/members/member-in-the-spotlight/archive/rotterdam/>.
- *Rotterdam Climate Change Adaptation Strategy*, <http://www.deltacities.com/cities/rotterdam/climate-change-adaptation>.
- Rotterdam Climate Initiative 2012, *Investing in Sustainable Growth*, Rotterdam Climate Initiative, <http://www.rotterdamclimateinitiative.nl/documents/Documenten/RCI_Duurzsmonitor_UK_2012 voor website.pdf>.
- *Social Cost Benefit Analysis*, <http://www.decisio.nl/wp-content/uploads/2012/04/SCBA-apr12-en.pdf>.
- Kroon, J.M. 2010, *The Sustainable Highway: A realistic alternative?*, Master's Thesis, Delft University of Technology, <http://repository.tudelft.nl/view/ir/uuid:fd6ba65d-ac0c-4cb7-a320-8776d70b4eb6/>.

CS6.1 CHANGES TO MAINTENANCE CONTRACTS TO ACCOUNT FOR CLIMATE CHANGE – MORNINGTON PENINSULA SHIRE COUNCIL, VIC

Contact: Manager – Infrastructure Maintenance at custserv@mornpen.vic.gov.au.

Background: Council identified that climate change would result in an increase in flood risk, specifically a 32% increase in rainfall intensity and a 0.8 metre increase in sea level. The projections are within the CSIRO range of increase by 2070, identified through a CSIRO study completed in conjunction with the regional Climate Change Alliance in 2008.

This information was used in the development of a Local Integrated Drainage Strategy (LIDS). The Strategy aims to ensure Council's drainage infrastructure is resilient to a change in climate and includes detailed flood mapping (accommodating the climate change parameters noted above) and infrastructure upgrades, to be implemented over a 10-year period. Council is four years into this program.

The flood mapping being developed under LIDS was used to inform the maintenance contracts as outlined below. Specifically, the flood maps were overlayed on the underground drainage and pits infrastructure to inform the development of the cleansing regime.

Changes to maintenance contracts: Two key maintenance contracts have changed:

- Sustainable Infrastructure Maintenance Services 2 (SIMS2) – Cleansing & Drainage Cleaning Services, and
- Sustainable Infrastructure Maintenance Services 2 (SIMS2) – Building Services

Both are 10-year contracts which commenced in April 2013.

Key changes are:

- SIMS2 – Cleaning & Drainage Cleaning Services:

  The frequency for cleaning underground stormwater drainage and pits: Under the previous contract (10 years – 2003 to 2013) these assets were cleaned every four to five years. Under the new contract they the cleaning is dependent on their risk profile. The risk profile has regard to a range of factors such as topography, housing density, age of drainage assets, stormwater capacity of drainage assets, availability of surcharge, overland flow paths, vegetation types, made or unmade streets, open drains or kerb and channel, and risk of damage to Council and private property. Frequency of cleaning now varies between six months and five years.

  The amount of drainage assessed by CCTV annually has been increased to allow for 5 km of CCTV of underground drainage to be assessed per annum for damage (cracked / scoured) pipes, faults with joints, leaks in pipes, tree root infestation, blockages or other operational problems. The

results of these CCTV investigations allow for the programming of appropriate repairs / renewal works.

- SIMS2 – Building Services:

  Introduced building gutter (spouting) and down pipe cleaning in needed to respond to increasing rainfall intensity / storm events, and the risk of building damage due to blocked or partially blocked gutters or downpipes overflowing into and damaging building. Previously this work was undertaken reactively on an as needs basis, typically after a rainfall event had caused damage. A frequency-based approach has now been developed to protect the 700 plus Council building stock. The stock are now cleaned at intervals ranging from six months to one year.

Lessons learnt:

- Consult and engage with all stakeholders early and before you prepare specifications for services to be delivered. This ensures 'buy in' and commitment by those needing a service to be delivered.
- Once services delivery commences, provide ongoing opportunities for stakeholders to be engaged through continued regular communication.
- Be prepared to review, monitor and adjust service delivery in response to changing needs, expectations and pressures.

The activity specification 'A4-1 Clear Culverts Pipes and Pits' is included below. This has been extracted from the SIMS2 Cleansing & Drainage Cleaning contract which defines the drainage cleaning service levels, standards and outcomes to be delivered by the service provider (contractor), including work method requirements application to the maintenance activity.

A4-20 is supporting (scoping) information for the clear culverts pipes and pits activity. It comprises a map of the shire defining drainage catchments across the Council area and the frequency of drain cleaning for each catchment (Figure 11). These drainage catchments are the same catchments used by the Council as part of the progressive review of drainage management throughout the Shire and in the assessment of the impacts of climate change into the future.

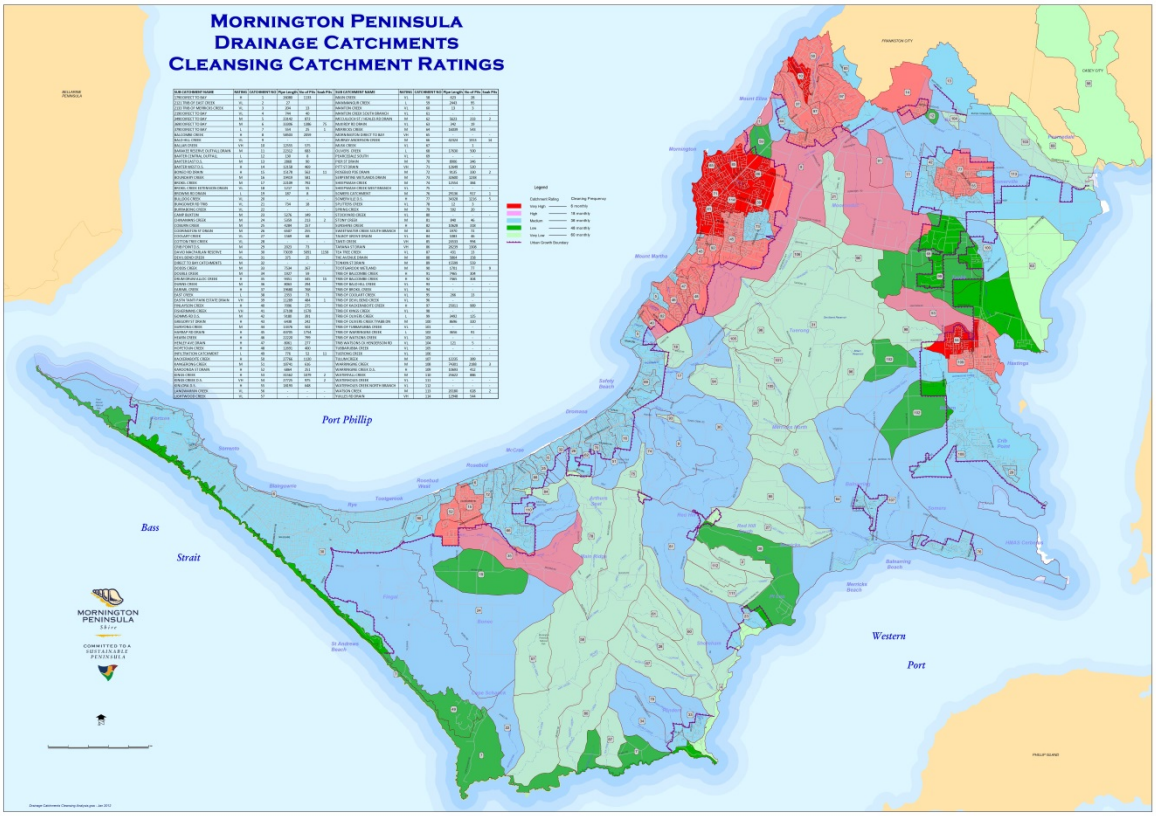


Figure 10: Information for the Clear Culverts Pipes and Pits activity (see larger image)

A4-1 Clear Culverts, Pipes and Pits (DCP)

ACTIVITY DEFINITION (What work is included?)

This activity covers the inspection, defect reporting and clearing of all constructed stormwater drainage structures whether located in the road network, in public car parking areas, drainage reserves and easements, foreshores or parks. These include all types, such as extended kerb inlets with or without grate, side entry pits and junction pits, connections from inlets to the main drain, culverts, pipes and energy dissipaters.

This Activity covers the regular inspection and cleaning of all Soak Pits within the Shire as detailed in Annexure 9

The Contractor is required to clear all drainage structures of silt, vegetation, rubbish and debris which will affect inlet, outlet capacity for drainage to reduce risk of flooding.

This activity includes the conducting of CCTV of a nominated length of underground drainage each contract year.

Refurbishment of Soak Pits is undertaken by other contractors and is not part of this Contract..

All maintenance of Road Culverts is undertaken by the Safer Local Roads contractor.

The cleaning of the downstream outfall from the pipe end is undertaken by the Safer Local Roads contractor.

PERFORMANCE DISTRESS & DEFECTS (What do we look for?)

Silt, vegetation rubbish and debris present in drainage structures.

Local flooding, local scour and erosion, downstream siltation, pavement failures.

Damage to asset

PERFORMANCE CRITERIA (Why do we do it?)

Stormwater drainage structures are cleared to ensure surface flows are accepted by the piped system to avoid blockages, pit surcharges and damage to pipe joints. This will provide protection from flooding.

ACTIVITY STANDARDS (What is required?)

All pits and culverts shall be maintained to ensure no single pit, culvert or pipe shall record a

reduction in waterway area of >30% in any outlet system. All kerb inlets, side entries, grates and pipe inlets shall be cleared to prevent blockage, or bypass to downstream inlets and subsequent surcharge and or flooding.

Zero reduction in waterway area for works covered by the routine cleaning program.

No water to bypass or overflow the Soak Pit except in an extreme storm event.

CONTRACT FORMAT (Is it a Lump Sum, SOR or Dayworks Rate Item?)		WORK UNIT
LUMP SUM		Number or lineal metre.

ACTIVITY SPECIFICATION		CLEAR CULVERTS, PIPES AND PITS	DCP

WORK METHOD REQUIREMENTS (Contractors undertaking to provide quality)

1. A schedule shall be prepared by the Contractor setting out a program for pit and stormwater pipe inspection and cleaning in accordance with the details set out in Annexure 9. Such inspection will include visual assessment of pipes and culvert barrels and joints where accessible and cleaning of pits. This schedule (program) will be prepared within 3 months of the contract commencing, approved by the Superintendent, and be reviewed at least annually.
2. Pipes and Pits which have been cleaned as part of the scheduled cleaning program shall remain at or within intervention level for the remainder of the Contract Term.
3. Inspect drainage critical points and high risk locations, after rainfall and during high intensity storms to verify capacity and intervention compliance.
4. Before execution of any clearing operation within the road reserve appropriate signs will be erected in compliance with the approved Traffic Management Plan.

2. Cleaning & Maintenance shall include some or all of the following:
   - Mechanical cleaning and flushing of pipes and Soak Pits
   - Removing tree roots and other intrusions into the drain
   - Report broken pipes and pits to Safer Local Roads Contractor.
   - Video recording of pipes
   - Hand cleaning of pits
   - Inspection for public risk
   - All of the above methods are included in the Lump Sum amount for this Activity.
3. Where heavy rains are forecast the Contractor shall pay particular attention to those

locations (high risk areas/low points) which are prone to flooding and likely to endanger property or the public and minimise such damage or danger where necessary.

4. All collected debris and silt will be immediately removed to an appropriate location for responsible and legal disposal at the cost of the Contractor
5. 7 Where high pressure water is used to clear a structure due care shall be provided to avoid damage to the structure or transference of debris to a downstream drainage constriction.
6. The Contractor shall ensure that all works undertaken within private property are carried with a minimum of disruption to the occupier
7. Defect, damage and public safety reports are to be made upon discovery to the Roads Maintenance Contractor.
8. The contractor shall comply with all requirements of OH&S including Entry to Confined Spaces.
9. The Contractor must undertake CCTV inspection of 5,000 lineal metres of the underground drainage network both on road and through easements per annum. The Contractor must also allow for cleaning an additional 2,000 drainage pits and 100 Soak Pits per annum. These costs form part of the Lump Sum Amount.
10. The recording of information from the CCTV inspections must comply with the Sewer Inspection Report Code. Camera positions are to be to an accuracy of 0.3metres, levels recorded to Australia Height Datum and photographs to be taken at all significant defects. All photographs are to be in colour.

Note: A drainage low point is defined as the lowest part of a stormwater network located within the road reserve where, in major storm events, stormwater may pond due to the capacity of the pit, side entry pit, junction pit, soak pit or outfall drain, and flooding of the adjoining roadway or private property may occur.

ACTIVITY SPECIFICATION	CLEAR CULVERTS, PIPES AND PITS	DCP

PERFORMANCE REQUIREMENTS		
Asset	**Intervention Level**	**Response Time**
Drain	Waterway area restricted by more than 30%	14 days

PERFORMANCE REQUIREMENTS

Asset	**Intervention Level**	**Response Time**
Drain	Waterway area restricted by more than 50% Low point completely blocked and flooding of private property could result	24 hours
Drain	Low points blocked by more than 30%	48 hours
Soak Pit	Soak Pit is failing to operate with grate covered or silt up to the bottom row of outlet holes.	1 month
Soak Pit	Soak Pit has failed to operate and all water is unable to enter the pit or flooding of private property is occurring.	24 hours

CS6.2 EMBEDDING CLIMATE RISK CONSIDERATIONS INTO THE PROCUREMENT AND CONTRACTS PROCESS – KENT COUNTY COUNCIL, U.K.

Contact: Climate Change Programme Manager at county.hall@kent.gov.uk.

Background: Kent County Council's geographic location and long coastline means that it is likely to suffer from some of the severest impacts of climate change in the UK. As such, the Council has been very proactive in undertaking various studies and developing processes that meaningfully address climate risk. Studies have included a Local Climate Impacts Profile for Kent – which is a summary of impacts from past severe weather events (1996–2010) to understand vulnerability and resilience of the area. 'Rising to the climate change challenge' is one of three high level targets in the Kent Environment Strategy 2011, and a specific Adaptation Action Plan (2011–2013) sits within the Strategy.

As a result of this commitment and action on climate change, Kent County Council has embedded climate risk considerations into its procurement and contracts process.

Process for embedding:

- Suppliers, particularly for larger contracts, are asked for evidence that they have considered the implications of climate change in delivery of the services (Figure 12)
- The tenderer responses to this schedule form part of the tender evaluation process – facilitated by the contract manager but with input from the Sustainable Estates team (Table 4)
- The scoring for climate risk therefore affects the ranking of tenderers. There is however a 'go/no-go' threshold for adequate environmental management measures (Table 5)
- Climate change-related conditions are then incorporated into relevant contracts. This includes a requirement for developing business continuity plans that address disruption in delivering the services including in extreme weather events (Figure 12 includes contract clauses extracted from the Council's standard highways contract).

Further information on the array of Kent County Council's climate resilience initiatives can be found at the following sources:

- Kent County Council n.d., *Kent Preparing for Climate Change: Review of activity 2012*, Kent County Council, <https://shareweb.kent.gov.uk/Documents/environment-and-planning/environment-and-climate-change/kent-preparing-climate-change.pdf>.
- Kent County Council n.d., *Kent's Adaptation Action Plan 2011-2013*, Kent County Council, <https://shareweb.kent.gov.uk/Documents/environment-and-planning/environment-and-climate-change/Kents Adaptation Action Plan 2011-2013 .pdf>.

Schedule: Sustainability & Climate Change

Under the Climate Change Act (2008) the Council has an obligation to cut its carbon emissions resulting from the delivery of services. This obligation applies to organisations delivering services on behalf of the Authority because these services remain part of the Authority's function even if it does not directly provide them. All public sector services in Kent have committed to delivering the Kent Environment Strategy and Climate Local targets which include meeting the UK targets for reducing carbon dioxide emissions. The Council sets its own organisational targets which are published on the Council's website. The Council's Carbon Management Plan outlines how these targets will be achieved.

1. To comply with the requirements of the Climate Change Act (2008), the Contractor will ensure key personnel, in particular managers, are familiar with the requirements of the Act, the Council's targets and requirements as defined within the Council's Environment Policy and Carbon Management Plan and apply the principles to the delivery of services on behalf of the Council.

2. The Contractor will demonstrate reductions in carbon dioxide emissions by ensuring a process and system is in place to measure, monitor and reduce emissions across the organisation. The Contractor will upon request disclose to the Council the Contractor's sustainability performance management data relevant to the services provided

3. The Contractor will demonstrate that the following aspects of their operations have been considered when determining actions to improve sustainability performance and reduce carbon dioxide emissions:

    - Procurement – goods and services purchased
    - Building energy – heating, hot water, electricity consumption and cooling
    - Travel – sustainable modes of travel or smarter working (e.g. conferencing technology)
    - Food – locally produced and in season
    - Water – better use of water
    - Waste – reduce, reuse and recycle

4. The Contractor will ensure a process is in place to actively raise awareness of sustainability and climate change at every level of the organisation and engage staff and subcontractors to take personal action.

5. The Contractor will ensure that the appropriate resilience and business continuity plans are in place for severe weather events and incorporate future climate risk into this process in support of [Council's clause on Business Continuity Management].

Figure 11: Sustainability and Climate Change Schedule

Table 4: Tender evaluation process – procurement staff checklist

H9	Has the company assessed climate risks and the impacts of future climate change on business continuity and business resilience?	Yes / No

Table 5: Environmental management evaluation criteria – included in tender documents

Evaluation Part A – Environmental Management				
A59	**Environmental management** Does your organisation hold a recognised environmental management system such as ISO 14001, EMAS (for businesses and public bodies) or PQASSO (for voluntary organisations) or have a written environmental action plan and is taking measures to reduce their environmental impact?	If **'yes'**, please state the accrediting body, current certificate number, and expiry date. If **'no'**, please provide evidence that you're working towards obtaining accreditation	Pass/Fail	If your organisation does not hold a recognised environmental management system or have a clear environmental action plan and is not working towards one this question will be marked as a fail. If a fail is scored on this question then your tender will no longer be considered.

2.9 Environmental Management and Sustainability

2.9.1 The Provider implements a recognised environmental accreditation (e.g. ISO 14001, EMAS, CEMARS) for environmental management which extends, where practicable, across all services and supply chain partners. The Provider works with the Service Manager and supply chain partners on joint initiatives as appropriate.

2.9.2 The Provider takes into account and assists the Authority in meeting its obligations under the Kent Environment Strategy and the Kent County Council Environment Policy. The Environment Strategy, which is corporate policy, aligns with WRAP and would be the minimum expectation for targets but the Authority may set higher targets in future.

2.9.3 The Provider participates in the Authority's' Steering Group for sustainability and climate change and advises on best practice from other contracts and the wider industry.

2.9.4 The Provider supports the Authority to develop plans for managing biodiversity and Climate Change Adaptation. The Provider has a qualified and competent environment advisor with responsibility for this Contract. The advisor works closely with the Provider's staff and management team in order to resolve environment issues to the satisfaction of the Authority.

2.9.5 The Provider supports the Authority to develop recycling opportunities at its existing facilities as agreed with the Authority.

2.9.6 The Provider will ensure legal compliance in relation to environmental legislation.

2.18 Business Continuity and Emergency Planning

2.18.1 The Provider assists the Authority in responding to large scale emergencies such as major weather events as required by the Service Manager. The role will be to support the wider corporate approach.

2.18.2 The Authority develops business continuity plans for each of its offices.

2.18.3 The Provider develops business continuity plans to align with those of the Authority which include but not are limited to: equipment, staff, information management and communications systems. The Provider also develops business continuity plans for any depots / offices that they operate from in providing the Services. These are submitted to the Service Manager for approval during the Mobilisation Period.

2.18.4 The Provider develops a reduced workforce plan to manage the effects of pandemic and similar events.

Figure 12: Relevant Kent highways contract conditions

CS6.3 UKCIP PROCUREMENT GUIDELINES – U.K.

Contact: UKCIP at enquiries@ukcip.org.uk.

Background: UKCIP developed a number of climate adaptation tools. The most notable are the UKCIP resources: Adaptation Wizard (2010), Adaptme Toolkit (2011), BACLIAT (UKCIP's Business Impacts Assessment Tool) (2012). AdOpt (identifying Adaptation Options), UKCIP Risk, Uncertainty and Decision-making Framework (Willows and Connell, 2003) and Measuring Progress (West and Gawith, 2005), 'Procurement in a Changing Climate – Local Authority Briefing Paper 4' and many more.

The UKCIP Adaptation Wizard is a tool to help organisations adapt to climate change. It takes organisations through a five-step process that will help you to assess an organisation's vulnerability to current climate and future climate change, identify options to address an organisation's key climate risks, and help develop and implement a climate change adaptation strategy. The Wizard, and associated resources on particular topics and aspects of adaptation, is also a guide to the information, tools and resources available from UKCIP to help organisations plan how to adapt.

It is noted however that the actions that need to be taken, and the ways in which they are implemented, will be contingent upon the chosen adaptations and will be strongly influenced by an organisation's existing internal procedures, as well as external influences on its activities (standards, regulations, targets, indicators etc.). The guidance offered in the UKCIP there is therefore necessarily limited to pointing out key factors that should be considered when implementing your actions and is not meant to be prescriptive.

Procurement in a Changing Climate: It is important to consider the impacts of all the projected changes in climate on any goods and services that councils are procuring. This is particularly relevant to procurement decisions with long-term consequences, such as investments in new buildings and infrastructure, refurbishment of existing buildings and long contracts for the supply of services where climate is expected to change significantly over the lifetime of the asset or service agreement.

When undertaking procurement, it is useful to consider the following questions:

- Does the project have a long lifetime? Does the project involve significant investment or long-term commitment?
- Does the project involve decisions with significant irreversible impacts that will be difficult or expensive to alter, such as the location of a building?
- Does the project have significant wider implications for the authorities' objectives, for instance in regard to the local economy?
- Is the project vulnerable to the impacts of current weather and climate and how is this likely to be affected by projected climate changes over its duration?
- Have issues of contingency planning and business continuity been adequately considered?

As an example of the application of the guidelines in UK local government, the Three Counties Alliance Partnership – involving Derbyshire, Leicestershire and Nottinghamshire in the UK – examined the projected impacts and consequences of climate change on highways policy. They identified seven priority areas (such as bridges, resurfacing, and tree and hedge maintenance) and drew up an adaptation action plan. They then collaborated on joint procurement to deliver these actions, resulting in efficiency savings and higher quality outcomes.

The headline messages from Adapting your procurement are:

- The impacts of climate change should be considered for the lifetime of the assets or other goods and services that are being delivered through procurement
- This will help to ensure public services remain fit for purpose and public investment is cost effective in a changing climate
- Increased public sector leadership and demand for well-adapted goods and services can help to incentivise the private sector and encourage the development of new skills and innovative approaches
- It is possible to adapt your procurement within existing frameworks and procurement rules – there is no legal reason not to and it makes sense to reduce longterm risk from climate change to a project
- Adaptation must be incorporated into wider corporate and sustainability objectives so that public procurement remains sustainable.

Figure 13: Headline messages for Adapting your procurement

In line with the UKCIP Guidelines, **the process for embedding** climate adaptation into key stages of the council procurement cycle could include the following:

- Include climate change adaptation in the overarching procurement strategy and decision-making practice – this will mandate the integration of climate change adaptation into standard procurement guidance and ultimately into individual procurement decisions.
- Embed consideration of climate change resilience into every project scoping process.
- Ensure budget allocation for adaptation options.
- Include adaptation options in project specifications.
- Assess costs of adaptation options throughout the whole of their lifetime.
- Attract most suitable suppliers by explicitly stating in the Project's terms of reference that their tender will need to provide an assessment of current and future climate risks, how the project will perform and deliver against objectives over time given the risks, recommended resilience measures, and life cycle capital and operational costs.

- Make sure that evaluation process includes adaptation responses to identified climate risks as a selection criterion.
- Allow for fair weighting of the adaptation criterion.
- Allocate anticipated climate risks between the procuring organisation and the contractor. Use warranties, penalty clauses and insurance to manage the risks.
- Consider performance-based contracts where payments are made for measured outputs as opposed to payment for inputs. Use project specifications to define the desired outputs that satisfy functional need in terms of quality, quantity and reliability and how they will be measured.
- Monitor and assess the performance of the project with respect to changing climate conditions.
- From successes and mistakes, learn how to better address climate change risks in the next procurement cycle.

An essential component of adaptation according to the UKCIP is a detailed Implementation Plan; this should be completed as early as possible in the process and updated regularly. It should:

- have clearly identified roles and responsibility for the individuals involved
- describe how preferred adaptations should be implemented (e.g. through new or existing management systems)
- identify opportunities that could be exploited to synergise climate adaptation with other planning and development activities
- indicate what resources (staff, facilities, capital) will be required to implement the adaptations and monitor their effectiveness
- note what institutional and community support will be required to implement the adaptations
- contain an effective communication strategy
- identify potential barriers to action and mechanisms to overcome these
- identify mechanisms for evaluating the performance of the strategy, and the actions within it
- include a detailed timetable for action.

The London Climate Change Partnership also produced a guide on the role of public procurement in adapting to climate change in September 2009. This covers contractors and industry as well as public authority leadership roles.

Sources:

- *UKCIP*, <http://www.ukcip.org.uk>.
- UKCIP, *Procurement in a changing climate*, Local authority briefing paper 4, UKCIP, <http://www.ukcip.org.uk/wordpress/wp-content/LA_briefings/LA-briefing-Procurement.pdf>.

CS7.1 RESISTANCE TO RESILIENCE – A COLLABORATIVE MODEL FOR INTEGRATING AND ADDRESSING CLIMATE CHANGE – CITY OF TOWNSVILLE, QLD

Contact: Executive Manager, Integrated Sustainability Services Department at enquiries@townsville.qld.gov.au.

Background: The City of Townsville acknowledges that in addition to addressing the rising costs of maintaining existing infrastructure and installing new facilities, climate change poses an additional risk burden to the City. The City has also identified that there is a perfect synergy between implementing city-wide energy efficiency, demand management and the use of renewable energy to reduce overall costs to the City, while at the same time decreasing increased heat loads on buildings and facilities as a result of climate change. As an added benefit, indoor environmental health and carbon reductions can be achieved.

The City of Townsville has developed a city-wide and transformative capacity-building method to help the City move 'from resistance to resilience' – a collaborative model of sustainability in action. The term is taken from the Bernd Gundermann booklet *From Resistance to Resilience* (published by Stephenson & Turner, Auckland). The approach is designed to accelerate thinking and action on climate change adaptation and to foster city-wide resilience. In 2013 the City of Townsville won two key national awards for projects that involved the use of an action-based complementary method to planning and strategy approaches – the 'Design System for Action'.

Process for embedding: The approach used in Townsville City Council is built on the idea that there are no 'silver bullets' for resourcing and supporting adaptation activities – that adaptation is typically costly and even unaffordable under current practices and thinking. According to the Australian Government's Ernst and Young report – *Financing Local Government Infrastructure* (June 2012), there is unlikely to be more money for large scale infrastructure projects at local, state or national levels and pathways are needed to overcome barriers for scaling models of adaptation and bringing it to a transformative level within communities. Townsville City Council recognised that an approach is needed that delivers affordable and socially acceptable solutions to enable business and governments to respond and act to climate change.

In essence, the approach is built on the emerging fundaments of cognitive psychology and systems thinking where sustainability and resilience are intertwined – as described by Dr Joseph Fiksel at the South East Asia Climate Adaptation Leadership Summit in Jakarta in October 2013. In other words, it involves creating and building interactive systems that are meaningful for people to 'buy into' and engage in – thereby enabling transformation.

The process was such that anyone in the community or business who wanted to be involved could be involved. In turn, these individuals could support others (colleagues, family members etc.). Therefore, the process was 'bottom up'.

Council undertook the following broad steps in developing the approach:

1. Completed projects and developed frameworks to match collaborative, smart technology and demonstration project synergy (see below).

2. Endorsed the Townsville (CBD) Smart Infrastructure and Sustainable Energy Framework (taken to Council in March 2013, endorsed by Council and updated in December 2013).

The specific projects involved (see Step 1 above) included:

- Commencing with individual sustainable projects, integrating them and running some initial collaboration workshops. Also commenced a first step transformative, deep conversation about the Sustainable Townsville Project in 2002–2005.
- In 2006 Council conducted a Collective Social Learning (CSL) workshop to activate a wider change and foster a number of projects across the community, this was followed by at least 20 other collective learning collaboration and activation workshops between 2010 and 2013.
- Developing and implementing the Townsville Solar City project (Ergon Energy and Townsville City Council partnership).
- Developing and implementing the Townsville Network (Energy) Demand Management (NDM) Pilot to build on solar city concepts and reduce peak load in new and existing developments (another Ergon Energy collaboration with Council and other stakeholders – including the then State Government's Office of Clean Energy).
- Developing and implementing the Townsville Energy Sense Community (a suite of integrated trials from electric vehicles to battery storage with Ergon Energy and developers building on successes of NDM and Solar City).
- Developing an emergent model of Smart Infrastructure and Sustainable Energy for resilience, climate adaptation and disaster management.

Many of these projects involved piloting, researching and trialling action-based energy demonstration projects that work synergistically to uncover new models for financial management and funding of multidimensional retrofits. They provided key lessons on how communities can work together to reduce stress on energy infrastructure and defer capital upgrade costs across the whole community. The projects demonstrated that innovative partnerships and open networks bring solutions to managing assets which can subsequently align with the City's urban plans and asset management.

In addition, community collaboration between business, industry and residents has been promoted through a number of events and activities including:

- 20 collaboration workshops with IBM, Ergon Energy and other stakeholders including community members
- four Smart Lifestyle and Expos displaying range of environmental products and services were attended by 40,000 people
- a local sustainability centre (at Rowes Bay) was established with demonstrations of sustainable home/house and office retrofits, a water demonstration garden and visits by school students

- information on Townsville Solar City website at <http://www.townsvillesolarcity.com.au> was updated
- Ergon Energy Demand Management Report 12-13 was produced highlighting much of the partnership work with Townsville City in energy efficiency, solar city and energy demand management
    - <https://www.ergon.com.au/__data/assets/pdf_file/0005/167756/EE.DMP-Outcomes-2012-13-finalv4.pdf>
    - <https://www.ergon.com.au/energy-conservation/demand-management>.

Specific communication tools and methods utilised included:

- collective social learning
- thematic communication
- community based social marketing
- systems thinking-based approaches
- events, social networks and activities
- fostering environmental product and service networks
- smarter city technology integration – big data and building a culture of analytics.

Further information on these approaches can be obtained by contacting Townsville City Council (see above).

Overall, the process was iterative (in regard to all the above communication processes), dynamic, interconnecting and trans-disciplinary. Each element was designed to feed off one another, through people, technology demonstrations and commitments.

The outcome of this process has been the creation of a 'Framework for Action' and 'Design System for Change' in energy demand management, energy efficiency and renewable energy of buildings and premises across the City – supporting both residents and business. The City achieved 30MW demand reduction thanks to the collaborative efforts of businesses and government – and the work of key individuals from Ergon Energy over the life of the project. In addition Townsville has the highest number of solar PV systems installed on roofs in regional Queensland – almost 12,600 residential customers or 17% of the 75,200 customers had solar panels installed as at December 2013 (Ergon Energy).

A specific outcome uncovered through the projects and processes was identifying an 'action based' unit for Townsville to measure sustainability which provides a return on investment over multiple dimensions. It works both at the residential and commercial/government levels e.g. for a white reflective roof; a solar power/battery system, HVAC (Heating, Ventilation and Air Conditioning) and LED lighting. The multiple dimensions for this 'action based' unit of measure of sustainability includes less air conditioning needs be utilised and there have been significant energy demand reduction and energy efficiency outcomes.

Townsville is now nationally and internationally recognised as a Centre of Excellence in Tropical Design (CETD) for trialling innovative energy management and renewables through community, business and government collaboration.

Lessons learnt:

- Due to the 'open door' and flexible approach to involvement, people involved themselves, became committed and did what interested them – collaborating and expanding their interests as they gained confidence and motivation.
- Having a flexible and 'bottom up' approach is advantageous as once commenced and resourced, it just requires patience and a willingness to stand back, and see the results materialise.
- People can shift from inaction to action, and can create their own knowledge and capacity to act and build a community of sustainable action across fields, disciplines and roles.
- Socially cognitive engagement, systems approaches and capacity building across networks are effective in building environmental communication capacity, involving people, and building their capacity to think and act for themselves.
- Smart technology integration, innovative financing and sustainable infrastructure business models can be informed by city-wide 'integrative demonstrators' of applied building/facility retrofit and sustainability (e.g. 'blue buildings' – a term used to describe buildings that are affordable and socially acceptable, as well as environmentally responsible).
- Celebrate successes continuously and use as opportunity to encourage further progress.
- Implementing systems thinking processes can inform resiliency planning and adaptation.

CS7.2 STAFF ENGAGEMENT IN CLIMATE ADAPTATION AND CORPORATE RESPONSIBILITY TRAINING – SHOALHAVEN CITY COUNCIL, NSW

Contact: Senior Environmental Planner at council@shoalhaven.nsw.gov.au.

Background: Shoalhaven City Council cares for over 165km of the southern NSW coast, is surrounded by estuaries, floodplains and 49 low-lying coastal villages. The area is a retiree mecca and 34% of residents live below the poverty line. These demographics result in an increasingly vulnerable community with low resilience to extreme weather events. These factors were Council's driver to take action and complete a Climate Adaptation Plan to build resilience into the community.

For the plan to be a success Council knew it needed to be progressively embedded into all key strategies and plans, that adaptive management needed to be a standard way of operating, and that this would require a cultural change across the organisation.

Process for embedding:

- Council identified early that cultural change is developed through ongoing staff engagement and support. Embedding climate adaptation into Council started when staff were engaged in the development of the Climate Risk Assessment and an Adaptation Plan.
- A lengthy engagement process was undertaken to determine where adaptive actions had already occurred, thereby demonstrating to staff that adaptive behaviour wasn't something new. To some extent the culture had an inbuilt adaptive capacity, but in many cases it simply was not being documented. Through the inclusive engagement process, staff ownership of adaptation was built – particularly with staff outside of the planning and natural environment team.
- Mainstreaming climate adaptation into the culture required increasing staff capacity. Council has a strong commitment to staff organisational development and runs compulsory annual corporate responsibilities training for staff in supervisory roles. With the support of the general manager the training was expanded to include climate change awareness, adaptive management and resilience planning. The training encouraged staff to have conversations around climate adaptation opportunities and link it to their work. As staff deal with many competing priorities and documents, this biannual training reminds managers of the issues and the existence of the Adaptation Plan as a guide.
- In parallel, a capacity building module using scenario-based planning was developed for senior managers. It was run through a partnership with Griffith University and the highly respected Professor Darryl Low-Choy. The training was key to cultural change.

Using the post-disaster recovery work of the Cardwell community from cyclone Yasi as the scenario, the training helped staff rethink their decision-making process, and identify documents and processes that needed updating. A key lesson is that not everything needs to be known or understood for all climate variables for decisions that increase adaptability to be made. Rather, spending time on working through

climate options with the involvement of many stakeholders was most important. By understanding how to work with uncertainty Council is now not afraid to say 'we don't know yet'. This openness and honesty has helped Council build trust and encourage partnerships.

The following scenario planning decision-making questions were used to discuss adaptation responses:

- Is your proposed solution flexible? Can it respond to changing future conditions?
- Is it equitable? Is anyone disadvantaged?
- Is it a robust option? Can it operate if variables change?
- Is it cost-effective?
- Does it align with Council goals? Is it consistent with adopted strategies?
- Does it avoid maladaptation?

Other government agencies and neighbouring councils were invited to participate in the training. Professor Low-Choy also ran climate change information briefings for Councillors and floodplain committees focused on 'the business case for adapting'. The training demonstrated to the community the wide range of adaptive measures we already have in place.

The change in culture is evidenced by the incorporation of adaptation strategies into key documents. For example, two of the core objectives in Council's Community Strategic Plan (CSP) are:

a. Reduced global warming impacts and increased resilience to the effects and impacts of climate change; and

b. Settlements are resilient to the unexpected impacts of natural hazards.

Council has a strategy in its CSP, which specifies that Council will: 'Develop management and adaptation plans to mitigate and manage community exposure to coastal processes, natural hazards, climate change and resulting risks'.

These guiding statements will ensure that climate adaptation measures are built into Council's delivery program.

Key lessons learnt in changing culture and building capacity of staff:

- Embedding requires building support and understanding early, not after the development of the Adaptation Plan.
- Don't start fresh – seek out the good things already happening in your delivery program and start to document them in templates etc.
- Seek high-level support (e/g/ from the General Manager and Assistant General Manager) to motivate staff.

- Recognise stars – there will be staff who are particularly innovative and will respond to encouragement and support by embedding adaptation actions into their documents.
- Be transparent with the community – Shoalhaven's Adaptation Plan demonstrated to the community that Council is being proactive and responsible, and shows that Council are in a good position to continue to provide all the services the community needs in the long term.
- Confess to not knowing everything – this gives your community a chance to have input. It also reinforces the scale of the problem. If you think you have all the answers you are missing the big picture. The community needs to be encouraged to take responsibility – if you have 'all the answers' they cannot.
- Nothing beats one-on-one discussions – engage technical staff to gather valuable ideas about practical options or obstacles for embedding actions.
- Good decisions do not happen quickly – it is important to involve all the key stakeholders and think through the different possible outcomes.
- Ongoing training is critically important. In light of staff changes, engaging in-house training coordinators to ensure that time is scheduled for climate change-related training can be effective in mainstreaming the issue. Council's biannual training encourages managers to revisit and use the Adaptation Plan as a risk management tool when doing budgets and project planning.
- Inviting experts from tertiary institutions can be a valuable way to gain capacity and information, as well as increase staff attendance numbers.
- Engineers are crucial to adaptation; they need to be engaged and aware. It is easier to get technical staff to engage in training which focuses on risks to infrastructure from natural hazards than on a natural area issue such as beach erosion.

Lessons learnt: In a relatively short amount of time, Shoalhaven has evolved from a council that struggled to accept climate change to one that has developed a comprehensive framework to adapt to climate change impacts. Change and acceptance takes time and Council's journey is about five years in. Council is a difficult space to work, as the leaders change every four years so staff are 'stuck' in a cycle of constantly explaining and retraining. Adaptive management requires the constant updating of information and plans. The key is to get adaptive management into Council's integrated planning and reporting framework. This then sets the scene for change.

CS8.1 STAFF INCLUDING COASTAL PLANNERS TRAINING KING COUNTY, U.S.

One of King County's Climate Change Initiatives involves conducting staff training on local impacts of climate change and how they relate to County priorities, whilst developing skills and expertise related to preparing for climate change impacts. Indeed, King County and Padilla Bay and the National Estuarine Research Reserve's Coastal Training Program collaborated to create a training curriculum for coastal planners in 2009. The workshop is entitled 'Planning for Climate Change', and can be taken by coastal managers and planners in varied geographic circumstances. The training covers current climate change research findings and anticipated impacts and primarily focuses on actions that can be taken to prepare and adapt to the anticipated impacts.

Sources:

- **Workshop description:** NOAA Office of Ocean and Coastal Resource Management 2010, *Final Evaluation Findings: Padilla Bay National Estuarine Research Reserve*, NOAA Office of Ocean and Coastal Resource Management, <http://coastalmanagement.noaa.gov/mystate/docs/pbnerr2010.pdf>.
- **Workshop guidebook:** *Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments*, <http://cses.washington.edu/cig/fpt/guidebook.shtml>.

CS8.2 GREEN DEVELOPMENT STANDARD TRAINING – CITY OF TORONTO, CANADA

Following the development of the *Toronto Climate Adaptation Strategy*, The City of Toronto adopted the Green Roof Bylaw requiring the construction of green roofs on new developments with a gross floor area of over 2,000 square meters (with the green roof coverage graduated with the size of the building). All staff potentially involved in the various stages of green roof development received training on the City's Green Roof Policy. Furthermore, a course aimed at developing staff capacity in understanding sustainable development as defined in the Toronto Green Standard (TGS) was created within the organisation, with the intent of shifting the existing corporate culture around climate change.

Sources:

- **Tool:** *Toronto Green Standard*, <http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=f85552cc66061410VgnVCM10000071d60f89RCRD>.
- Welsh, J. et al. 2008, *The Toronto Green Development Standard*, Clean Air Partnership, <http://www.cleanairpartnership.org/practices/Jane Welsh Toronto GDS.pdf>.
- Mitrovic, S. 2010, 'Action Plan for Sustainable City of Toronto: Case study of green roofs', *46th ISOCARP Congress*, <http://www.isocarp.net/data/case_studies/1825.pdf>.

CS8.3 EDUCATION FOR ELECTED MEMBERS – ONKAPARINGA CITY COUNCIL, SA

During the development of Onkapringa's Climate Change Strategy, an education program was delivered to ensure that key staff and elected members were well informed in relation to climate change issues, and to facilitate strategic and operational decision-making relevant to climate change.

For more information on Onkaparinga's Climate Change Strategy and accompanying resource adaptation case study:
<http://www.nccarf.edu.au/localgov/sites/nccarf.edu.au.localgov/files/casestudies/pdf/Onkaparinga_CC%20Strategy_2008-2013.pdf>.

CS8.4 PRACTICAL STEPS FOR ENGAGING ENGINEERS ON ISSUES OF CLIMATE CHANGE – CITY OF CANADA BAY, NSW

Contact: Technical Services and Operations (TS&O) at council@canadabay.nsw.gov.au.

Background: The effects of a changing climate are a recent memory for many Australian's with floods, storms, bushfires and cyclones leaving trails of destruction across all Australian regions. These events have clearly demonstrated our nation's vulnerability to climate hazards, and the need for all communities to continuously adapt to increase resilience to potential climate change impacts.

Local government plays a central role in ensuring that communities continuously adapt to external environmental changes, building resilience and allowing for continued social, economic and environmental sustainability. Whilst the services provided by these organisations are wide-ranging and dependent on both social and geographic factors, a fundamental service provided by all councils is the **development, maintenance and renewal of critical infrastructure** that local communities so heavily rely on.

This case study highlights a sample of the key management considerations employed by The City of Canada Bay, to effectively engage and disseminate climate change risks to council engineers and technical specialists, who typically manage the organisation's entire portfolio of built and natural assets.

The case study initially identifies the importance of integrating climate change objectives into an organisation's overall strategy, and then moves on to discuss the communication framework employed by Council in developing a strategy that targets council engineers as a specific audience.

Integrating Climate Risks into Canada Bay's corporate strategy

Typically crafted by the highest level of management, the establishment of an organisation's overall strategic direction, and the subsequent development of corporate-level strategy, is essential for both informing and driving operational activities throughout an entire organisation. It is therefore imperative that climate change considerations are integrated into an organisation's strategic planning framework, to ensure that climate risks are appropriately addressed and communicated with all key stakeholders.

Within the context of Canada Bay, extensive consultation between executive management, councillors and community stakeholders has identified the need for Council's long term strategic framework to consider the impacts of a changing climate across the entire local government area. Indeed, the decision made by the community to include climate change considerations in Council's overarching corporate strategy, which has subsequently been adopted by the organisation's strategic apex, has resulted in climate change objectives cascading down into lower levels of strategy within Council's organisational structure. Figure 14 below illustrates the three levels of organisational strategy within The City of Canada Bay Council that are informed by the organisation's strategic vision and mission, and which drive both strategic and operational activities.

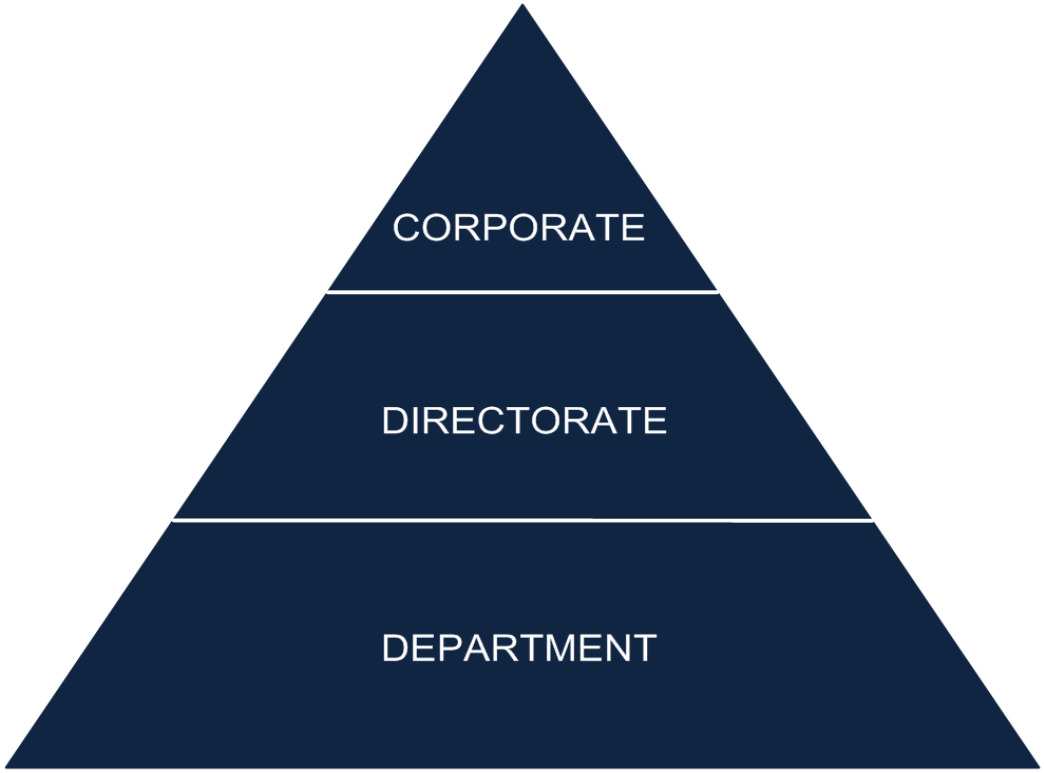


Figure 14: The three levels of organisational strategy that inform Council's operational objectives and activities

The above model illustrates the notion that integrating climate objectives into an organisation's highest level of strategic documentation engenders significant support from the organisation's strategic apex, and subsequently allows for the allocation of appropriate resources, needed to drive and communicate the climate change agenda across all functional levels, and stakeholders within the organisation.

Developing an Effective Communication Strategy

To effectively engage and disseminate climate change risks to technical specialists and council engineers, the City of Canada Bay adopted *Munter's Communication Framework*, which has been specifically designed to assist organisations in developing communication strategies that address complex organisational issues (GBAT9104, 2012, Unit 5, p.20).

Figure 15 below identifies the seven critical elements that comprise the framework. All of them need to be considered to ensure the development of an effective communication strategy.

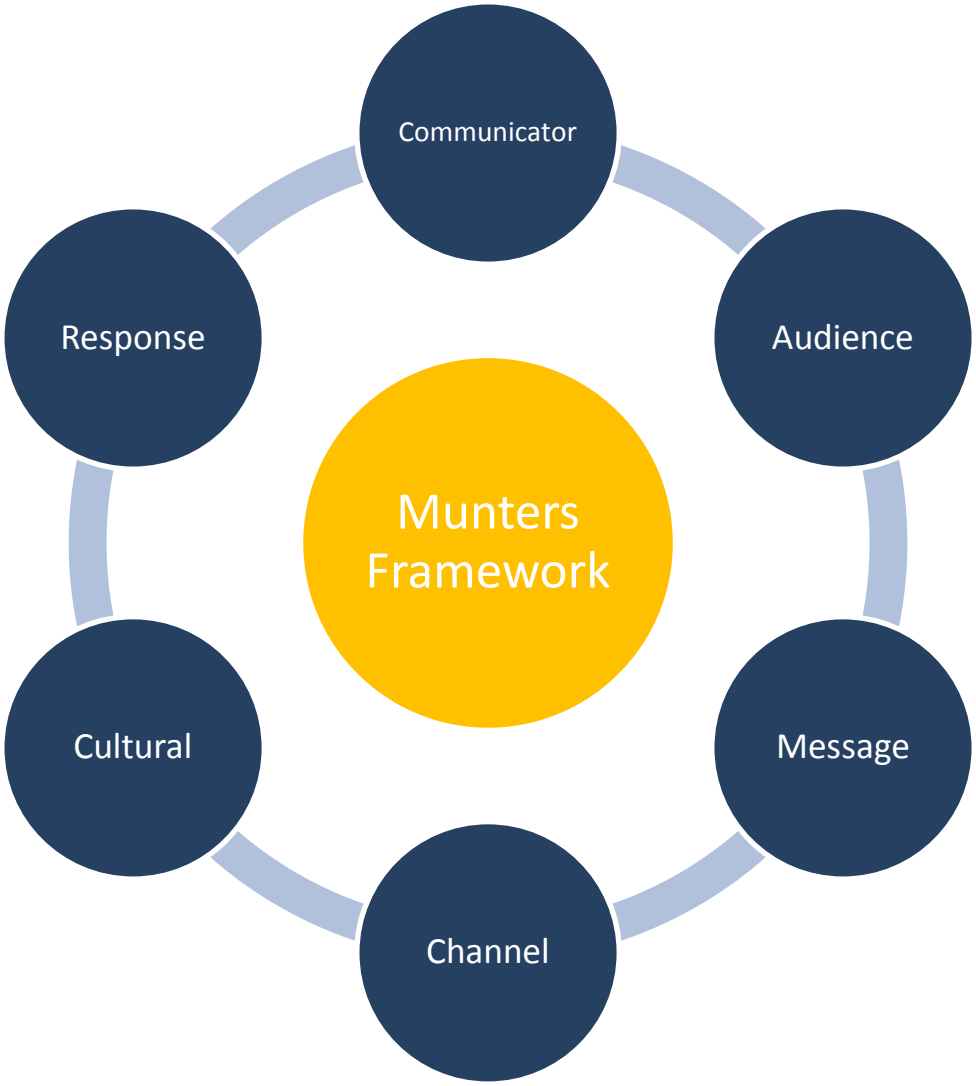


Figure 15: Critical elements that comprise Munter's Communication Framework

Central to Munter's Framework is the notion that communication is a dynamic and interactive process, and as people respond to and interpret messages, they not only use their intellect to attach meaning and structure to the variety of messages received, but they also respond emotionally and use their perceptual skills in interactions (GBAT9104, 2012, Unit 5, p.20).

Table 6 below explains each of the critical elements that comprise this framework, and is followed by a mind map that provides a sample of the considerations made by Council when addressing each element within the framework, to ensure the development of an effective and robust communication strategy.

Table 6: Critical criteria informing Munter's Communication Framework (Munter & Hamilton, 2014)

CRITICAL CRITERIA IN DEVELOPING A COMMUNICATION STRATEGY	
COMMUNICATOR STRATEGY	The aim of the Communicator Strategy is to identify the key objectives that are intended to be communicated and/or achieved when disseminating information to a particular audience. The key to developing this strategy requires that the communicator: • Identify key objectives that need to be conveyed, and to then determine the most appropriate communication style that may be implemented to best achieve those objectives • Determine the communicator's own level of credibility in relation to a specific audience.
AUDIENCE STRATEGY	The outcome of the Audience Strategy is to align the communicator's message with the needs and interests of a particular audience. Identified as perhaps the most important aspect of the overall communication strategy, fundamental to this strategy is the notion that the more the communicator learns about an audience, the more likely it is for them to achieve their desired outcome. Key questions that should be considered when developing this strategy include: • Who is the intended audience? • What do they know and expect? • What do they feel about a particular topic or concept? • What information or tools may be utilised to persuade the audience?
MESSAGE STRATEGY	The third element in Munter's Framework is the Message Strategy which aims at structuring the communicator's message to facilitate the achievement of overall communication goals and objectives. In developing the Message Strategy, key points of consideration include: • How may a communicator emphasise key points in order to increase the likelihood of messages being remembered? • What is the best way to structure and organise a message (common approaches include highlighting key points, asking key questions, and using a step process to incrementally introduce ideas) • Consider the possibility of connecting to an audience through the use of narratives of previous experiences, and previous lessons learnt.

CHANNEL CHOICE STRATEGY	It is imperative that a communicator think strategically about the channel (also referred to as 'medium') through which they intend to disseminate their message. Strategic Channel Choice requires a communicator to choose a channel consciously, thoughtfully and carefully in view of the overall objective they want to communicate. To effectively develop this strategy, the key points to consider include: • Which type of medium will most effectively resonate with the intended audience • Whether to communicate to an intended audience collectively or one-on-one • The desired level of audience interaction sought out by the communicator • The potential message that a particular choice of medium may convey.
CULTURAL STRATEGY	Every aspect of a communication strategy is greatly influenced by the cultural context of the audience, and therefore different communication styles tend to work better in different cultural settings. To this extent, different persuasion techniques, message structures, non-verbal behaviour and channel choices may need to be used to ensure that the communicator's message resonates with a particular audience.
RESPONSE STRATEGY	The Response Strategy is the final element of the Munter Framework, and requires the communicator to reflect on the response that they wish to provoke from their audience. This may assist the communicator in refocusing on the rest of the elements that comprise the Munter Framework.

Engaging engineers on issues of climate change

Following Council's support of the *Climate Change Adaptation Strategy* in 2010, Canada Bay's Technical Services and Operations (TS&O) directorate identified the need to begin engaging with and educating internal engineers and technical specialists in relation to potential climate change effects impacting the local government area in future years.

The mind map below provides a sample of the key factors that were considered, both by Council's TS&O Director and the Climate Change Project Manager, when using Munter's Communication Framework to develop a strategy to engage internal engineers on the effects of climate change.

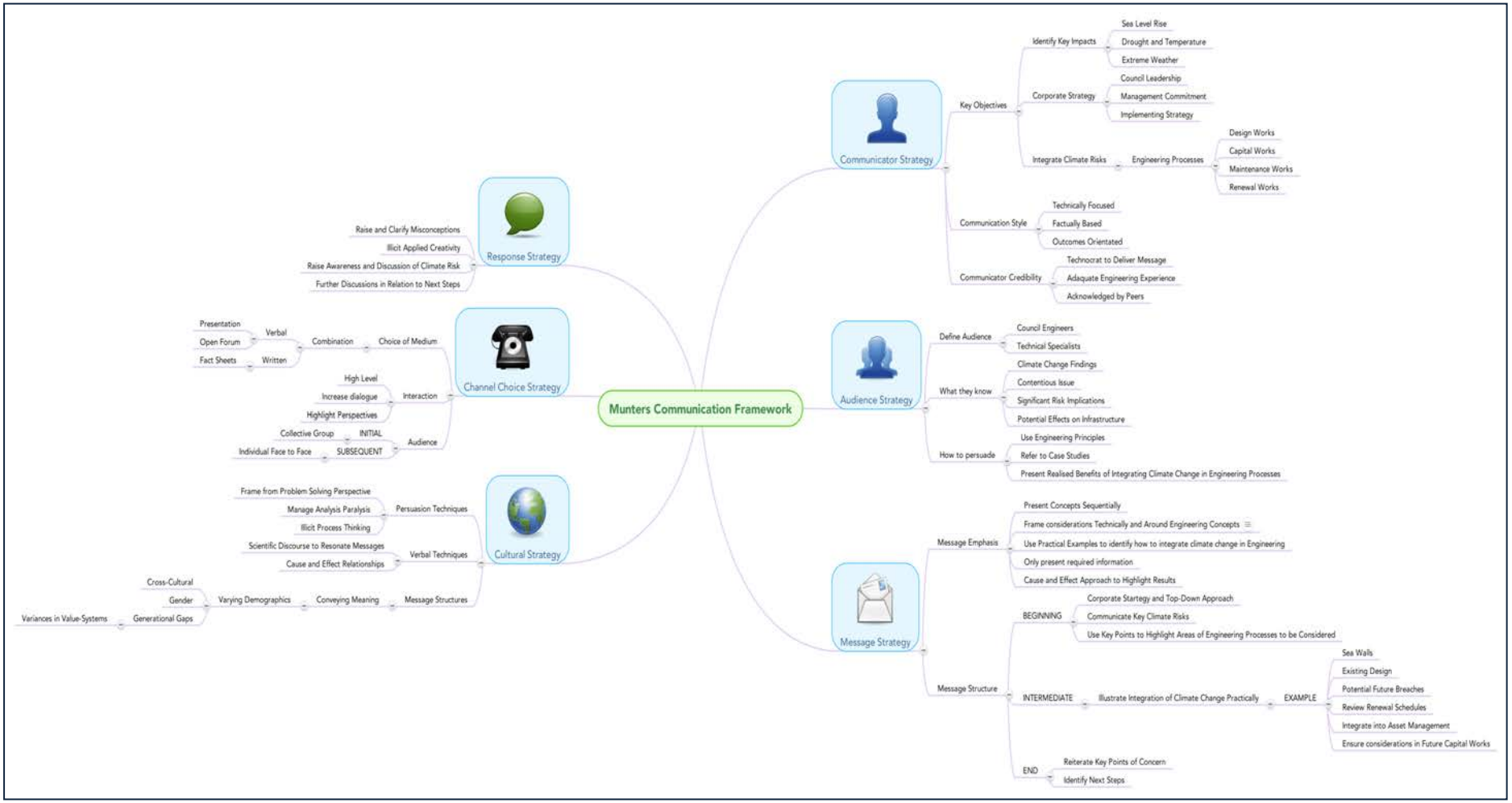


Figure 16: Mind Map illustrating a sample of the considerations made by Council, when using Munter's Communication Framework to engage internal engineers on issues relating to climate change. For further information, including how the mind map was transformed into a communications package, please contact Canada Bay's Technical Services and Operations Directorate.

Communicating to Climate Change Sceptics

A common misconception amongst a number of climate change practitioners is the belief that many technocratic professionals, including engineers, are sceptical of scientific findings relating to climate change.

Whilst it is acknowledged that quantitative research findings and associated predictions relating to climate change vary, the perception that variations in scientific literature translate to widespread scepticism within the technical arena is unfounded. Evidence indicates that climate change issues have been raised and considered in technical forums around Australia since the early 1990s (Engineers Australia, 2004).

Indeed, in 2007 Engineers Australia released a Climate Change and Energy Policy Document which stated:

> *Engineers Australia believes that Australia must act swiftly and proactively in line with global expectations to address climate change as an economic, social and environmental risk. Our role has been, and will continue to be, in leading capacity building to innovate for more sustainable, eco-efficient and less polluting outcomes in engineering practice. We believe that addressing the costs of atmospheric emissions will lead to increasing our competitive advantage by minimising risks and creating new economic opportunities.* (Engineers Australia, 2007).

To communicate the issues of climate change to sceptics, The City of Canada Bay Council has developed a communication framework that reframes climate impacts from the perspective of risk management, and highlights Council's legal obligation to exercise due diligence to address potential climate impacts that may directly impact the community.

This communication framework acknowledges that whilst a number of differing theories and predictions relating to climate change exist, the effects of recent global climatic disasters including Hurricane Katrina in 2005, and the Queensland floods in 2012, demonstrate the incontrovertible need for Councils and communities to work collaboratively to increase their resilience to adequately prepare for potentially harmful climate risks.

Figures Figure 18 and Figure 19 below provide a sample of the risk communication framework and channels developed and used by Council to address and communicate the potential impacts of climate change to sceptics.

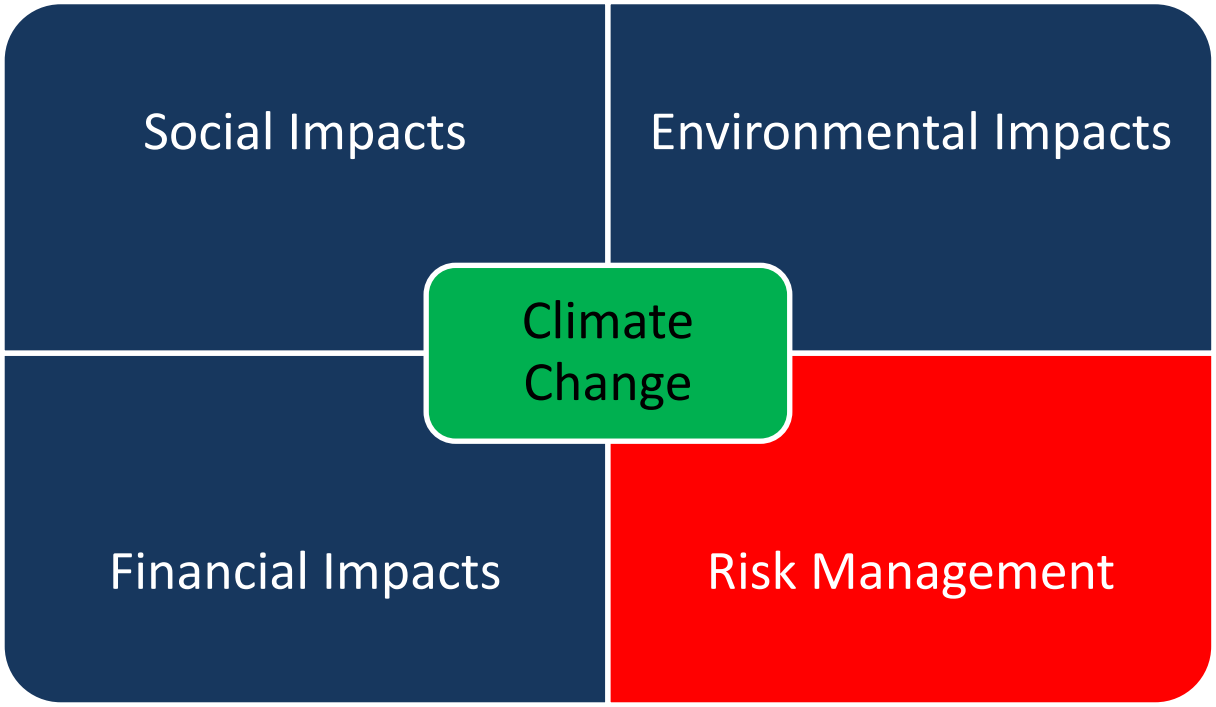


Figure 17: The Power of the reframe – the above matrix summarises the approach adopted by The City of Canada Bay in addressing climate change, reframing the contentious issue from the perspective of risk

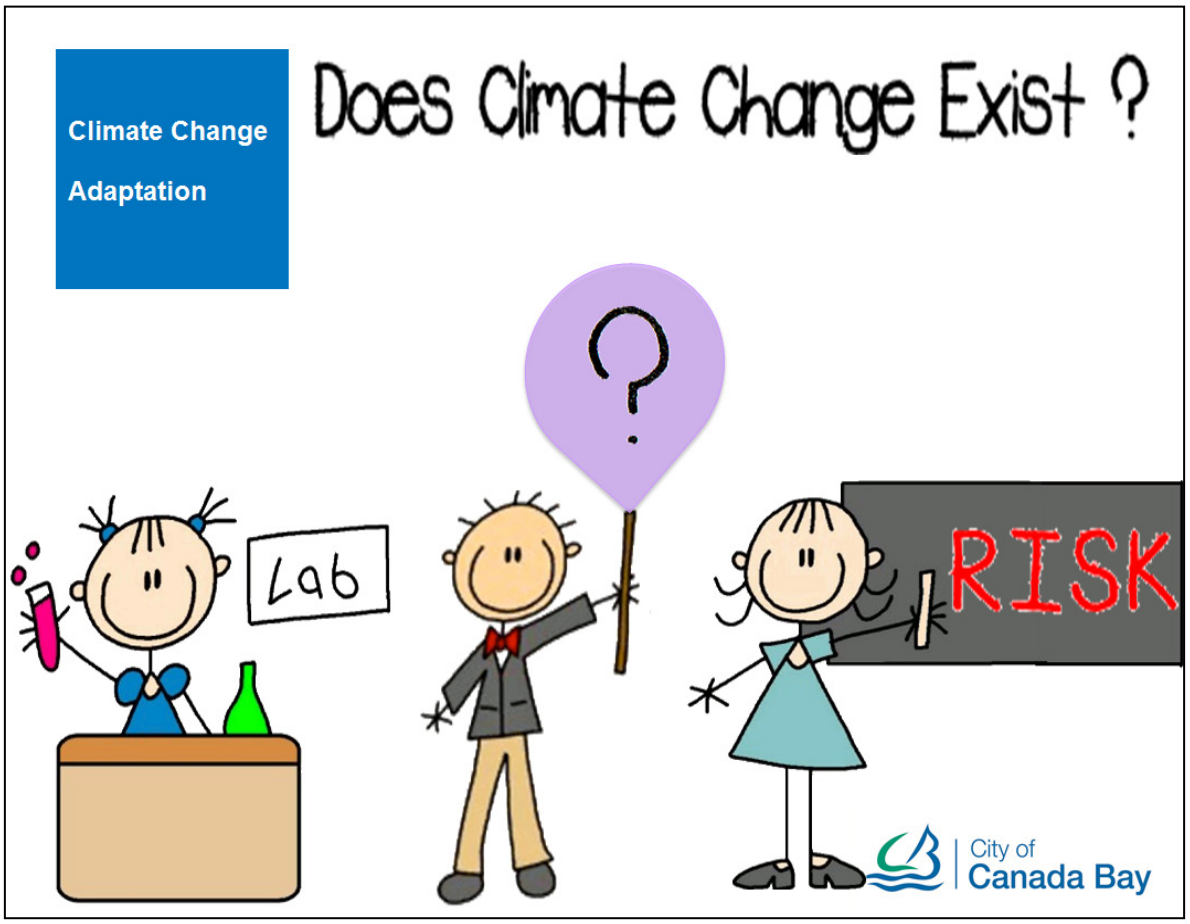


Figure 18: A sample slide used to illustrate the notion that despite the differing views on climate change, Council has a responsibility to manage all potential risks that may affect the local government area. (Excerpt from a PowerPoint Presentation developed by the City of Canada Bay.)

Sources:

- *Engineers Australia Climate Change and Energy Policy Document*, <http://www.engineersaustralia.org.au/sites/default/files/shado/Representation/Policy_Statements/policy_statement_-climate_change_and_energy_feb_2008.pdf>.
- Engineers Australia, The National Committee on Coastal and Ocean Engineering 2004, *Guidelines for Responding to the Effects of Climate Change in Coastal and Ocean Engineering*, Engineers Australia, Canberra.
- Munter, M. & Hamilton, L. 2014, *Guide to Managerial Communication,* 10th edn, Prentice Hall, New Jersey.
- *Managing Innovation and Technical Change*, <http://www.student.mbt.unsw.edu.au/Courses/Management_of_innovation.htm>.

CS8.5 STAFF TRAINING IN MANAGING CLIMATE RISK – KENT COUNTY COUNCIL, U.K.

Kent County Council has established a two to three day climate adaptation-training action pack called *Managing Climate Risk*. Designed to enable council teams to carry out a self-facilitated workshop with their colleagues, the output is a plan that details how council may decrease the vulnerability of key services in relation to climate impacts. Central to the adaptation training is the following step-by-step process:

1. Hold a meeting with individual teams to identify the impacts of climate change and severe weather on key service that is delivered by Council

2. Hold a second one-hour meeting with an individual team to assess and prioritise the risks of the key service in question, and identify key actions that may be taken

2. Complete adaptation action plan and send a copy to the Sustainability & Climate Change Team mailbox to ensure that potential actions do not cross over with other teams

3. Discuss the risks, and the actions taken to manage these risks with the relevant management team, where high level risks are escalated to the next level of management for review and action.

4. Embed adaptation action plan within existing business processes.

To access the Climate Change Action Pack:

- Kent County Council n.d., *Kent Preparing for Climate Change: Review of activity 2012*, Kent County Council, <https://shareweb.kent.gov.uk/Documents/environment-and-planning/environment-and-climate-change/kent-preparing-climate-change.pdf>.
- Kent County Council n.d., *Kent's Adaptation Action Plan 2011-2013*, Kent County Council, <https://shareweb.kent.gov.uk/Documents/environment-and-planning/environment-and-climate-change/Kents Adaptation Action Plan 2011-2013 .pdf>.

LP1 GREEN ROOF BYLAW – CITY OF TORONTO, CANADA

Following the development of the *Toronto Climate Adaptation Strategy*, The City of Toronto adopted the Green Roof Bylaw requiring the construction of green roofs on new developments with a gross floor area of over 2,000 square meters (with the green roof coverage graduated with the size of the building). Toronto City Council also developed a tool to assist developers in quickly determining whether they would be required to build a green roof, together with a Green Roof Statistics template to facilitate compliance with the Bylaw at the time of the Building Permit Application.

The tool may be accessed via the following hyperlink: <http://www.toronto.ca/greenroofs/overview.htm>.

Sources:

- *Toronto Green Roof Bylaw*, <http://bit.ly/MMjNAr>.

LP2 THE TORONTO GREEN STANDARD – CITY OF TORONTO, CANADA

As part of the *Toronto Climate Adaptation Strategy*, The City of Toronto developed the Toronto Green Standard (TGS). This two-tier set of environmental performance measures promotes more sustainable new development in Toronto. In particular, Tier 1 is the minimum level of environmental performance required for new development, and is implemented through Council's Site Plan Approval authority and other planning tools, whilst Tier 2 is a higher level of performance that is voluntary but offers a development charge refund as an incentive. The TGS is an important performance management tool for new development, and is aimed at lessening future infrastructure demands and environmental impacts. TGS integrates environmental performance requirements established through City Policy, Guidelines and Regulations, and implements these through established land use planning processes. The TGS has streamlined environmental performance related requirements into one package, and since its implementation in 2010 has made a significant impact on the way buildings are designed and constructed in the City

Tool:

- *Toronto Green Standard*, <http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=f85552cc66061410VgnVCM10000071d60f89RCRD>.

LP3 SURGING SEA RISK FINDER – NEW YORK CITY, U.S.

Title: New York, Florida, and New Jersey local councils

Contact: Climate Central Sea Level Rise Program: <http://sealevel.climatecentral.org/about/contact>.

Background: Every coastal flood is already wider, deeper and more damaging because of the roughly eight inches of warming-driven global sea level rise since 1900. The potential damage from the rising water to people, property and infrastructure across coastal communities in New York and New Jersey drove the non-profit climate research organisation Climate Central to create this online sea level risk tool. The Program on Sea Level Rise at Climate Central is funded by the Island Foundation, Rockefeller Brothers Fund, The Robert & Ellen Gutenstein Foundation, The Schmidt Family Foundation and The Winslow Foundation.

New York Surging Seas Risk Finder online tool

This tool provides local regions of New York, Florida and New Jersey and their policy makers with tailored local information that they need to understand and respond to the risks of sea level rise and coastal flooding. This tool contains major updates to analyses of sea level impacts. The tool will be spread on a state-by-state basis for all U.S. coastal states throughout 2014. The tool includes:

- interactive local projections of sea level rise and increasing coastal flood risk to over 100 infrastructure, population and property variables from 1-10 feet above the high tideline by decade
- a zooming, zip code-searchable map of low-lying areas threatened by sea level rise, plus layers showing social vulnerability and population density
- detailed assessments of populations, properties, infrastructures and contamination sources exposed to the rising sea level, for each implicated county, city, town, zip code and congressional district
- state- and county-wide heat maps facilitating high-level vulnerability comparisons.

Sources:

- **Tool:** *Surging Seas*, <http://sealevel.climatecentral.org/>.
- Strauss, B. et al. 2013, *New Jersey and the Surging Sea: A Vulnerability Assessment With Projections for Sea Level Rise and Coastal Flood Risk*, Climate Central, <http://sealevel.climatecentral.org/uploads/ssrf/NY-Report.pdf>.

LP4 LAND USE PLANNING CLIMATE GAME – CITY OF ROTTERDAM, NETHERLANDS

The City of Rotterdam sponsored the development of the *Rotterdam Climate Game*, which is an interactive computer game that facilitates stakeholders and planners to clarify issues associated with climate adaptation. The game comprises a number of exercises, some of which are highlighted below:

- Five stakeholders play with the same challenge: to create a climate proof city.
- Players are presented with issues such as budget, grants, flood risk, and liveability.
- Using scientifically recognised calculation models, the game teaches players the dilemmas involved in climate-proof construction/restructuring and spatial developments.
- Includes influence from many parties involved with local area development projects, such as the municipality, housing associations, the Water Board and project developers.
- Allows planners to experiment in a realistic, 3D representation of the Rotterdam Feijenoord district.
- Possible measure to be taken can be weighed against one another, and tested for feasibility.
- Provides insight into potential conflicts of interest between stakeholders.
- Teaches planners to understand multilayer safety.
    - Flood prevention (water defence structures).
    - Sustainable, water proof, spatial planning.
    - Crisis management in case of flooding.
- Facilitators reflect on choices the players make to teach lessons about climate adaptation planning.

Sources:

- *Member in the Spotlight: Rotterdam, the Netherlands*, <http://www.iclei-europe.org/members/member-in-the-spotlight/archive/rotterdam/>.
- *Rotterdam Climate Change Adaptation Strategy*, <http://www.deltacities.com/cities/rotterdam/climate-change-adaptation>.
- *Architecture students play 'Climate Game'*, <http://www.bk.tudelft.nl/en/current/latest-news/article/detail/bk-studenten-spelen-climate-game/>.

- Rotterdam Climate Initiative n.d., *Rotterdam Climate Proof Adaptation Programme*, Rotterdam Climate Initiative, <http://www.rotterdamclimateinitiative.nl/documents/Documenten/ROTTERDAM%20CLIMATE%20PROOF%20ADAPTATION%20PROGRAMME%202013.pdf>.
- Rotterdam Climate Initiative 2012, *Investing in Sustainable Growth*, Rotterdam Climate Initiative, <http://www.rotterdamclimateinitiative.nl/documents/Documenten/RCI_Duurzsmonitor_UK_2012 voor website.pdf>.
- *We streamline planning for urban projects*, <http://www.tygron.com/news/rotterdam_climategame_film>.

LP5 COASTAL EROSION HAZARD OVERLAY FOR DEVELOPMENT APPLICATION ASSESSMENTS – CLARENCE CITY COUNCIL, TAS

Contact: Manager Environment and Sustainability, Clarence City Council at clarence@ccc.tas.gov.au.

Background: Clarence City Council has developed a framework within its planning scheme for assessing development applications in the face of current and future coastal climate change impacts. The framework has been developed in response to:

- community concerns about the impacts of storm events and sea level rise
- developer requests for a framework to guide their proposals for assessment
- Council concerns over potential litigation as a consequence of poor planning decisions within vulnerable areas
- the availability of coastal hazard mapping derived from a comprehensive vulnerability assessment along Clarence coasts.

Process for developing the framework:

- Council received support funding from the Australian Department of Climate Change and the Tasmanian State Emergency Service to undertake an integrated coastal vulnerability assessment of 18 localities and infrastructure within Clarence City which may be subject to coastal erosion and recession, coastal inundation and sea level rise under present day, 2050 and 2100 scenarios.
- The resulting scientific report, 'Climate Change Impacts on Clarence Coastal Areas 2008' by Water Research Laboratory UNSW produced erosion hazard lines and inundation maps, and provided adaptation options for managing coastal vulnerability.
- Extensive consultation was undertaken in relation to the research and climate scenario modelling. Community buy-in was strong due to climate change impacts being witnessed along coastal areas and the community appetite for credible knowledge on the projected future coastal impacts on or near their properties.
- The consultation process was initiated by seeking approval from federal and state Ministers for Climate Change and Clarence City Council for the release of the report. This was followed by a press conference with national exposure, letters to all residents in the vulnerable areas inviting their comments, attendance at two specially convened public forums, an issue-specific newsletter to all residents, and a new Council web page which released the report, with supporting information and FAQs.
- This report, in conjunction with the mapping extracted from Indicative Mapping of Tasmanian Coastal Vulnerability (2006) by Chris Sharples (Senior Research Fellow, School of Geography and

Environmental Studies, University of Tasmania), was used to cover all coastal areas in Clarence, in order to draft maps for the new planning scheme overlays.

- The General Manager provided strong leadership in gaining support from across Council to adopt the new framework.

Following a report to Council, an endorsement was gained for the need to amend the Planning Scheme based on the four drivers (see above). The **steps taken to update the Planning Scheme** were:

- Coastal erosion hazard lines and inundation maps for the 18 vulnerable sites and the indicative mapping from Chris Sharples (Report 2006) were collated, and a detailed hazard zone map for the entire coastline of Clarence was subsequently drawn up.
- A set of guiding principles (Table 7), developed with the support of the company SGS Economics and Planning were drafted to form the basis of the new Coastal Erosion Hazard overlay (Figure 19) and the required amendments to cover coastal inundation in the existing inundation overlay.
- The existing coastal management overlay, whose primary function is to enact the Tasmania Coastal Policy, was also reviewed for consistency with these new climate change overlays. It is noted that this review did not resolve the current contentious issue involving the definition of 'frontal dune'.
- Once these new overlays were approved by Council, extensive community consultation was carried out. The final versions of these overlays were then sent to the Tasmanian Planning Commission and subsequently endorsed by the Commission.
- A summary of the guiding principles for development applications in hazard zones is presented in Table 7 below.

Table 7: Guiding principles for development applications

Guiding principle	Intent
Development Applications to be assessed as 'discretionary'	The intent is not to sterilise coastal development
Performance-based assessment for the life of the structure	Whole-of-life assessment of the proposed structure under climate change scenarios is necessary for defendable planning decisions.
Assessments at the cost of the developer by suitably qualified engineer	Those who benefit from the coastal lifestyle should not be subsidised
Acceptable levels of risk based on design, technical feasibility and certification	Technical solutions to adaption challenges are available at a cost to the developer

Guiding principle	Intent
Ensure access to and from the coast	Recreational and amenity values of the coast are not compromised by development
Ensure no off-site built and environmental impacts	Coastal values, processes and ecological services are not impacted by development
Adopting minimum floor levels	Floor height will be higher than a projected 1:100 year event under 2100 inundation scenario
Erosion setback distances	Set back is sufficient to withstand a storm bite from a projected 1:100 year event under 2100 inundation scenario
Erosion risk management plan	A detailed coastal vulnerability assessment of the site and the potential adaptation responses for the development further assist in providing a defendable planning decision
Indemnity by developer*	Council is not exposed to litigation as a consequence of endorsed planning decision.

**The principle of requiring the developer to indemnify Council was successfully challenged in the Tasmanian Planning Tribunal and as a result this principle was removed from the Planning Scheme.*

Lessons learnt:

One key area of contention has been defining the 'frontal dune' (the area where erosion occurs as a result of storm events and accretion of sand from wave and wind activity). Both the Council's coastal management overlay and the Tasmanian Coastal Policy prohibit all development within the frontal dune system, with the exception of rehabilitation and conservation works. The issue arises of the physical definition of where the 'frontal dune' commences and ends. Developers frequently challenge the weak definition of 'frontal dune' in the state policy to gain development opportunities within dynamic dune systems irrespective of the Council's coastal management overlay, as the Tasmanian Coastal Policy takes precedence. Leadership is being sought from the state government to better define this aspect.

A community- and Council-endorsed strategic adaptation pathway (e.g. retreat, accommodate and protect) is considered as a necessary condition for the new overlays to be successful. This strategic

approach is currently being developed for implementation alongside the planning scheme principles when Council considers adaptive projects and coastal zone development applications. This pathway will ensure that future coastal adaptation projects are not hindered by a pro-development lobby.

Mainstreaming of climate change in the organisation and continuous engagement/education of staff in the adaptation arena are considered necessary in order to apply the latest research and knowledge to Council's decision-making process.

Outside of Council's control but instrumental for all Tasmanian councils is the need for decisive leadership from the Tasmanian State Government to enact legislative structures such as:

- a comprehensive and current state coastal policy that guides planning decisions within the coastal zone
- state legislation that indemnifies Councils against litigation for decisions that are based on professional advice in the event of future causes leading to problems.

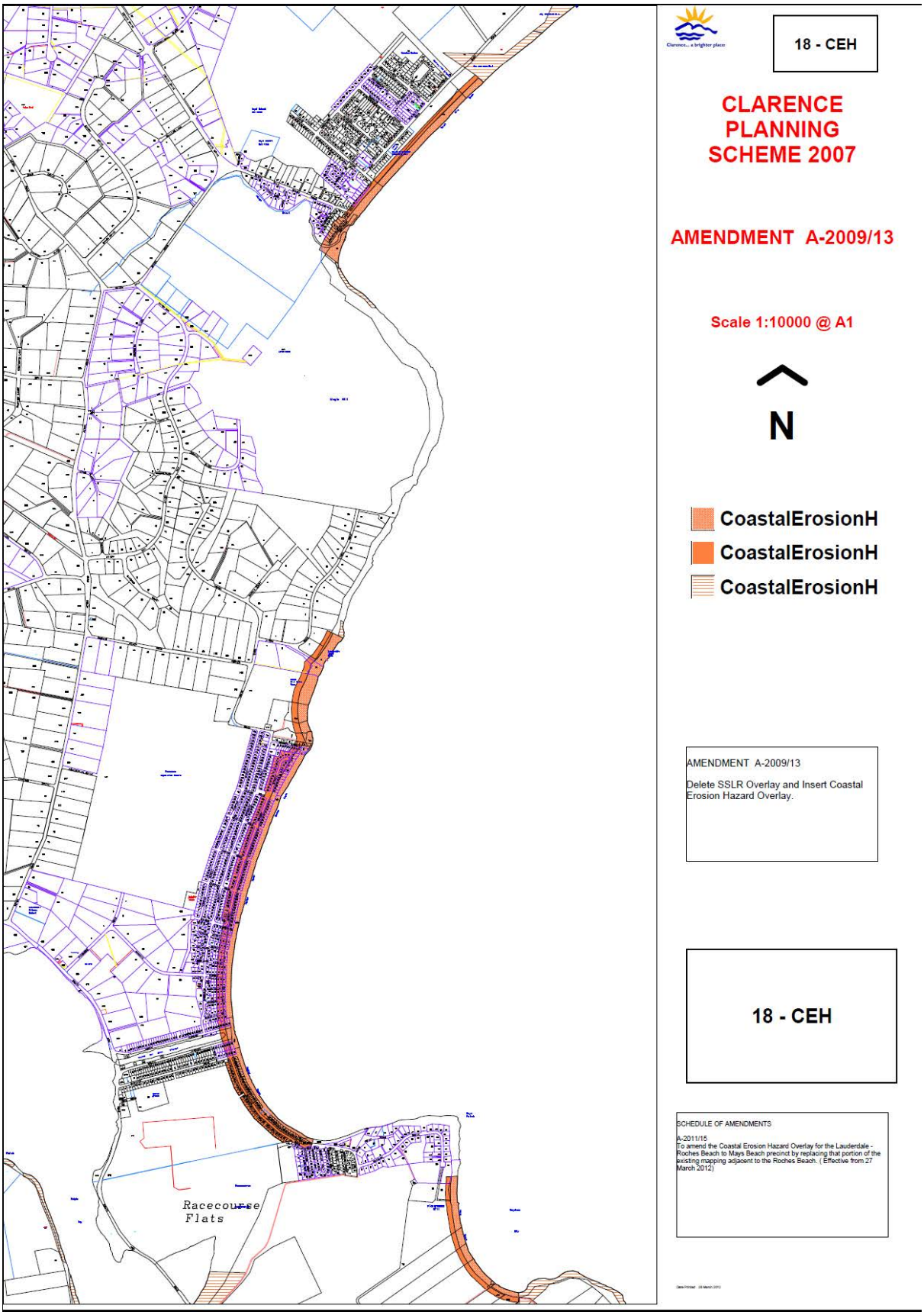


Figure 19: Coastal Erosion Hazard Overlay (see supporting text below)

Coastal Erosion Hazard Overlay

Application Requirements

In addition to the application requirements under Clause 3.2.1, an application for use or development under this overlay must be accompanied by a report from an engineer with suitable experience in coastal, civil and/or hydraulic engineering demonstrating that the Specific Decisions Requirements of this overlay have been satisfied.

Specific Decision Requirements

(a) Suitable mitigation measures are to be used depending upon the nature and assessable risk of the hazard.

(b) Applications for all development within the areas shown as CEH (SLSS) must demonstrate:

(i) That any hazard risk can be mitigated through an identification of structural or siting methods to be used to avoid damage to or loss of buildings and other works.

(ii) That the development will not increase the level of risk of hazard for adjoining or nearby properties or public infrastructure.

(iii) That the risk of water pollution from storage or processing of effluent, dangerous goods and substances on the site can be mitigated.

(iv) The need for future remediation works is minimised.

(v) Important natural features are adequately protected.

(vi) That the hazard risk can be mitigated through identification of measures to be used to modify the hazard.

(vii) The health and safety of individuals is not placed at risk.

(viii) That the development should not prevent public access to the coast, where it is currently available.

(c) Within areas shown as CEH(2050) or CEH(2100), except for additions less than 20% of existing floor area at Scheme Date, use or development of habitable rooms of developments must demonstrate;

(i) That risks arising from erosion hazards can be mitigated through an identification of structural or siting methods to be used to avoid damage to or loss of buildings and other works. This may include piling or other robust foundation construction, ability to move the structure in the event that is no longer within the stable foundation zone or other means.

(ii) That the development will not increase the level of risk to the life of the users of the site or of hazard for adjoining or nearby properties or public infrastructure.

(iii) That risks arising from wave run-up, including impact and material suitability can be mitigated through an identification of structural or design methods to be used to avoid damage to or loss of buildings and other works.

(iv) That the need for future remediation works is minimised.

(v) That important natural features are adequately protected.

(vi) That public foreshore access is maintained.

(vii) That access to the site will not be lost or substantially compromised by expected future erosion whether on the proposed site or off-site.

(viii) That the hazard risk can be mitigated through identification of measures to be used to modify the hazard where these measures are designed and certified by an engineer with suitable experience in coastal, civil and/or hydraulic engineering.

(ix) That the health and safety of individuals is not placed at risk.

(d) Within areas shown as CEH(2050) development for ancillary structures including outbuildings, garages, boat sheds, carports, pergolas and the like, or extensions to existing development less than 20% of the floor area of the building at Scheme Date must demonstrate:

(i) That the risks arising from erosion hazards can be mitigated through an identification of structural or siting methods to be used to avoid damage to or loss of buildings and other works.

(ii) That risks arising from wave run-up, including impact and material suitability can be mitigated through an identification of structural or design methods to be used to avoid damage to or loss of buildings and other works.

(iii) That the development will not increase the level of risk to the life of the users of the site or of hazard for adjoining or nearby properties or public infrastructure.

(iv) The need for future remediation works is minimized.

(v) That important natural features are adequately protected.

(vi) That where public access to the foreshore is currently available that it will be maintained.

(vii) That access to the site will not be lost or substantially compromised by expected future erosion whether on the proposed site or off-site.

(viii) That the hazard risk can be mitigated through identification of measures to be used to modify the hazard where these measures are designed and certified by an engineer with suitable experience in coastal, civil and/or hydraulic engineering.

(ix) That the health and safety of individuals is not placed at risk. (e) The requirements under (c) & (d) may be waived or modified where:

An Erosion Risk Management Plan (ERMP) has been developed by a suitably qualified person covering an area encompassing the subject site; and

The ERMP has been endorsed by Council; and

The implementation of the ERMP substantially improves the hazard exposure of the site; and

The ERMP has been implemented. Any applicable ERMP must:

(i) Demonstrably reduce risk to defined acceptable levels for an estimated time period.

(ii) Be designed to be durable and effective for the estimated time period and/or have reasonably well known maintenance and operating costs for the design period.

(iii) Indicate the expected response at the end of the estimated extended period when risks again approach unacceptable levels.

(iv) In normal operation or in the event of failure, not adversely affect other properties, including integrity of property, continued beneficial use and cause no adverse health or safety risks to residents or users of other properties.

(v) Allow practical emergency response to events that exceed design risk.

(vi) Identify the financial and operational capacity to meet any ongoing maintenance or operating costs.

(vii) Allow for the continued viability of valued coastal ecosystems where these have been identified and continued viability is achievable at a cost acceptable to the wider community.

(viii) Define the agreed trigger for follow up responses in the event of continued change (extreme erosion events or higher than anticipated sea level rise).

(f) Should the assessment of risk indicate that the development is within an area with a hazard from coastal erosion risks the permit may be subject to conditions requiring a developer contribution for required mitigation works consistent with any adopted Council Policy.

LP6 EMBEDDING SEA LEVEL RISE ADAPTATION INTO LAND-USE POLICIES AND PROCEDURES – LAKE MACQUARIE CITY COUNCIL, NSW

Contact: Sea Level Rise Project Officer at council@lakemac.nsw.gov.au.

Background: Council is regularly faced with the need to make planning decisions that will lead to the construction of new assets, buildings and infrastructure that will exist for many decades. With mean sea levels projected to rise, proposals such as new developments, assets or subdivisions must consider future flood levels.

At the heart of the Lake Macquarie City Council (LMCC) area is a large lake with over 175km of foreshore. Much of the foreshore area around the lake, particularly the sandy barrier that separates the lake from the ocean, is low-lying. There are close to 4000 hectares of land below 3m AHD (Australian Height Datum), and over 10,000 properties.

Lake Macquarie City Council (LMCC) was one of the first Australian councils to adopt a Sea-level Rise Adaptation and Preparedness Policy in 2008, adopting a projected rise in sea levels of 0.91m by 2011 on 1990 levels. LMCC is taking proactive steps to ensure planning decisions are made to reduce flood risk into the future. These include:

- incorporating sea level rise into the Lake Macquarie Floodplain Management Plan
- undertaking flood study consultation
- developing the Lake Macquarie Waterway Flooding and Tidal Inundation Policy
- incorporating sea level rise into the Local Environment Plan (LEP) and Development Control Plan (DCP).

Process for incorporating sea level rise into the Floodplain Management Plan: In 2012, LMCC updated the Lake Macquarie Waterway Flood Study and Floodplain Management Plan, using the NSW State Government Benchmarks for Sea Level Rise, for the year 2050 (0.4m) and 2100 (0.9m), which were current at the time. Table 8 shows the flood levels that came from the revision. Three 'hazard' areas were identified; high lake hazard, high flood hazard and low flood hazard.

Table 8: Hazard levels for Lake Macquarie City Council

Hazard Area	Level (m AHD)	Measure	Comments
High lake hazard	0.10	2011 lake mean still water level	Due to a narrow channel, Lake Macquarie is 'pumped' up by 0.1m above mean ocean levels.
	< 1.00	Below 2100 lake mean still water level	This combines the mean still water level with a 2100 sea level rise benchmark of 0.9m on 1990 levels.
High flood hazard	1.23	2011 5% AEP flood	This is the modelled 2011 5% AEP flood
	< 1.50	2011 1% AEP flood	This is the modelled 2011 1% AEP flood*
Low flood hazard	1.61	2050 5% AEP flood level	This is the modelled 2050 5% AEP flood**
	1.86	2050 1% AEP flood level	This is the modelled 2050 1% AEP flood**
	2.32	2100 1% AEP flood level	This is the modelled 2100 1% AEP flood**
	2.10	2100 5% AEP flood level	This is the modelled 2100 5% AEP flood**

*** The 1:100 year flood event includes a 1:5 storm surge to catchment event and 1:5 catchment to storm surge event.**

**** Projected future flood levels do not include consideration of any change in the frequency or intensity of rainfall.**

Council's flood studies are available at: <http://www.lakemac.com.au/environment/natural-disaster/flooding>.

Process for undertaking flood study consultation: LMCC engaged a consultant to help with the public exhibition of the draft Flood Study and Management Plan. Over 700 people participated in the consultation process, which included:

- six community workshops with potentially flood-affected residents, held in six locations around the lake
- a survey of residents' views relating to the attributes of Lake Macquarie
- a survey that gauged residents' views on proposed flood risk management options
- information on Council's website, providing links to the draft Flood Study and Plan, and providing opportunities for people to comment using the surveys and/or written submissions.

The first survey asked respondents to rank a list of eight criteria that might be considered by Council when making decisions to manage the effect of floods and sea level rise (see Figure 20).

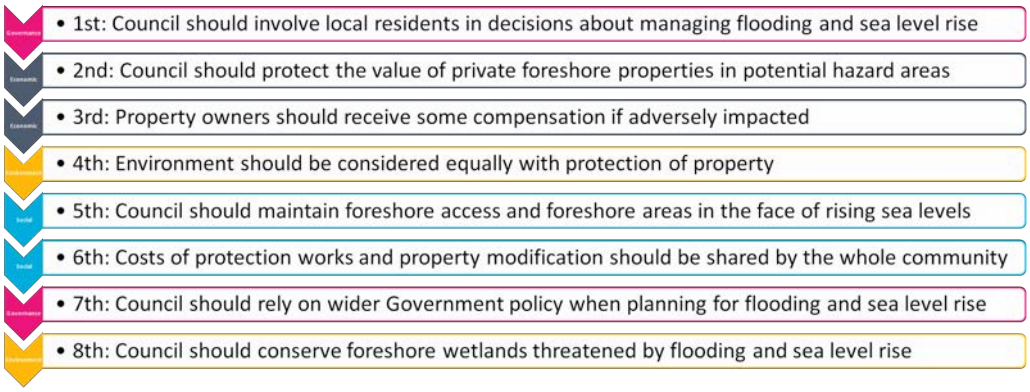


Figure 20: Survey results from asking residents to rank a list of criteria Council should consider when making decisions on changing sea levels

The second survey involved respondents using a Likert scale to review a list of 16 possible management measures that could be used by government, Council, businesses, residents and property owners to reduce the risks from lake flooding and permanent inundation (Figure 21).

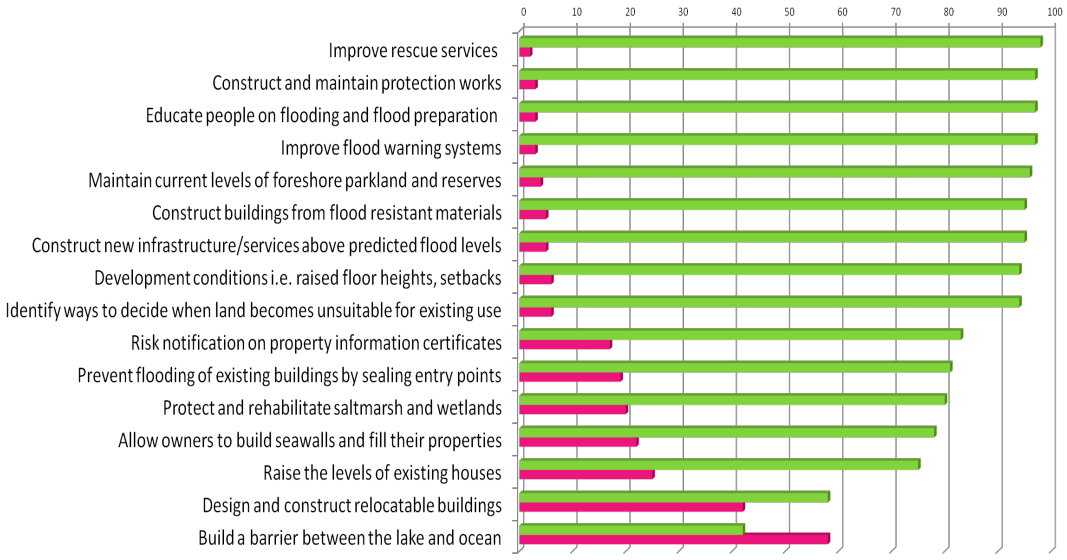


Figure 21: Survey results from residents on per cent agree (green) / disagree (red) on management options for changing sea levels

As well as the surveys, qualitative data was collected from residents through discussions, and from online and written submissions to the flood study. A range of issues were raised including issues in relation to climate change uncertainty, impacts on property costs and values, and gaps in information.

The community consultation undertaken for the flood study allowed Council to better inform the community about future flood risk, and allowed the community to have input on issues that needed to be addressed in the short, medium and long term. As a result, LMCC has commenced developing local

adaptation plans, on a place-by-place basis, to address the risks and opportunities from sea level rise. More information about local adaptation plans can be found at <http://www.lakemac.nsw.gov.au/planning-for-future-flood-risks>.

Process for developing Lake Macquarie Waterway Flooding and Tidal Inundation Policy: The flood planning levels took into consideration the asset life of a building by applying either the 2050 sea level rise benchmark, or the 2100 benchmark. The Flood Planning levels include the 0.5m 'freeboard' recommended in the NSW Floodplain Development Manual. The flood levels from the revised Flood Study have been used to set revised flood planning levels, as shown in Table 9 and schematically in Figure 22.

Table 9: Flood levels for the Lake Macquarie region, based on flood figures from the Floodplain Management Study

PLANNING AREA	LEVEL (M AHD)	COMMENTS
Flood planning level: Low density residential and commercial developments	2.36	The modelled 1 in 100 year flood event with a 2050 sea level rise benchmark of 0.4m and a 0.5m freeboard*
Flood planning level: Medium density residential and mixed use developments	2.82	The modelled 1 in 100 year flood event with a 2100 sea level rise benchmark of 0.9m and a 0.5m freeboard.
Probable maximum floods (PMF)	2.81	The modelled probable maximum flood (PMF) for the year 2050
	3.27 m	This is the modelled PMF for the year 2100.

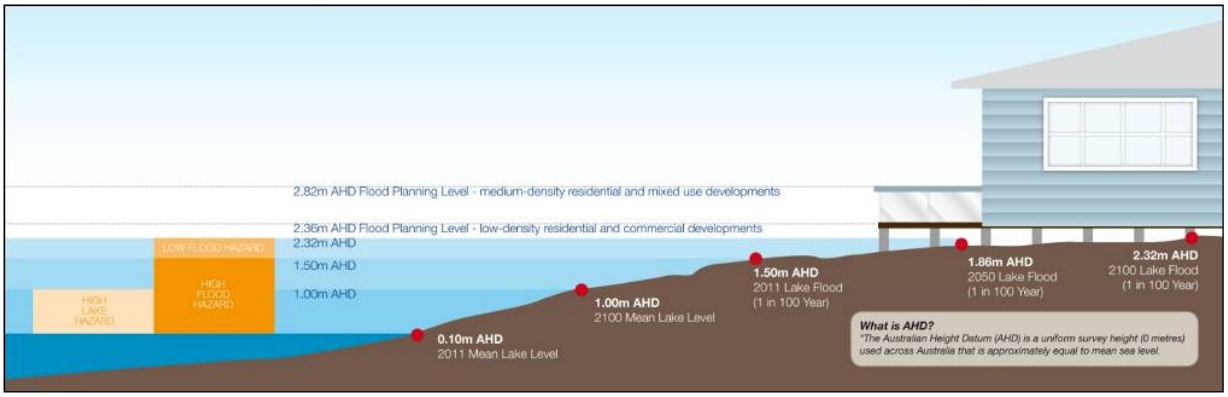


Figure 22: Schematic representation of LMCC's flood planning levels

These flood-planning levels were incorporated into the Lake Macquarie Waterway Flooding and Tidal Inundation Policy, which was formally adopted by Council.

Process for incorporating sea level rise into Section 149 Certificates: For every property within the Lake Floodplain that is below 3m AHD, a notation on the 149 Certificate is applied. Figure 23 shows an excerpt from the LMCC 149(2) Certificate.

7A Flood related development controls information

(2) Whether or not development on that land or part of the land for any other purpose is subject to flood related development controls

Yes.

ADVICE: Further information on the development restriction mentioned, may be obtained from Council upon application for a 'Flood Certificate' or 'Flood/Tidal Inundation Certificate'.

Figure 23: Excerpt from the Lake Macquarie Waterway Flooding and Tidal Inundation Policy

A Flood / Tidal Inundation Certificate provides flood and tidal inundation risk information for a land parcel, as well as properties affected by creek flooding. The certificate may provide information on a range of usual flood details, but also what flood hazard zone the property is in and policies for constructing new buildings and for extensions to existing buildings. The floor heights are as nominated in the Lake Macquarie Waterway Flooding and Tidal Inundation Policy.

Process for incorporating sea level rise into the LEP and DCP: Following on from the Flood Study, the two key statutory land use planning instruments, the LEP (draft) and the DCP were also updated.

- Draft Lake Macquarie Local Environment Plan 2013

Council has recently prepared a new city-wide Local Environment Plan (LEP) to comply with the format of the new Standard Instrument adopted by the NSW Government. The Draft LMLEP 2013 has the following wording relating to sea level rise:

7.5 Flood planning

(4) Subclause (5) applies to:

(a) land shown as 'projected 2100 flood planning area' on the Flood Planning Map; and to

(b) other land below the projected 2100 flood planning level as a consequence of projected sea level rise.

5.5 Development within the Coastal Zone

(iv) recognise and accommodate coastal processes and climate change

7.2 Foreshore Building line

3 (h) sea level rise or change of flooding patterns as a result of climate change have been considered.

7.6 Coastal Risk area.

1(a) To maintain existing coastal processes and to avoid significant adverse impacts on development from those coastal processes;

Figure 24: Excerpts from the Draft Standard LEP (please refer to the LEP for the full clause)

The draft LEP is available at: <http://www.lakemac.com.au/development/planning-2012/draft-lake-macquarie-lep-2012>.

Council's Lake Macquarie Waterway Flooding and Tidal Inundation Policy can be downloaded at <http://www.lakemac.com.au/page.aspx?pid=844>.

- Development Control Plan (DCP)

The DCP has two key areas relating to sea level rise adaptation: i) a limitation on subdivision in at-risk areas and ii) implementation of flood floor heights as a 'deemed to comply' way to address flooding into the future because of sea level rise.

The DCP recognises that achievement of the nominated flood floor heights may not be practical or desirable in all instances. A merit assessment determines if the use of other measures will produce an acceptable result. The DCP provides advice to proponents on the additional information that is required to be provided to justify a variation from the flood floor heights. Council has also recently exhibited guidelines 'Development Guidelines for Resilient Housing for Lake Macquarie'.[1]

The DCP clause on subdivision is a guide for assessments only and each development application is assessed on a case-by-case basis. It is expected that Council will adopt a more formal policy about future

[1] Available at <http://www.lakemac.com.au/downloads/D84BA57B88059A1FA9712C628F78EBC1AAB89F07.PDF>.

land use planning in each location vulnerable to sea level rise, after an adaptation plan has been prepared. This will result in further changes to the planning instruments.

Despite the innovative responses that are possible, anecdotal information suggests that for lake foreshore properties, the cheapest and easiest way to address future flood risk will be with a post and beam style of construction to achieve the nominated flood floor height.[2]

Adaptation planning to drive further policy and planning instrument changes: Council has commenced the preparation of adaption plans for areas vulnerable to the impacts of sea level rise. The process will be collaborative, involving those who are both directly and indirectly impacted, as well as government agencies and infrastructure/service providers. The adaptation plans will provide an indication of the specific risks and responses best suited to addressing the challenges of future flooding in particular locations, and the triggers and thresholds that will prompt the adopted protect/adapt/retreat responses.

A local adaptation plan:

- acknowledges that risks are location specific and are best addressed at the local level
- recognises that being prepared requires input from landowners, business owners, residents, special interest groups and organisations, Council and state government agencies
- is timed so the actions are implemented to accommodate increases in risk, as they are required
- provide a level of certainty for decision-making by the public, Council and others, yet are flexible enough to change with changing information.

A community portal on the pilot Adaptation Plan for Marks Point / Belmont South is available from <http://www.haveyoursaylakemac.com.au/future-flood-planning>. This site includes maps, information sheets, newsletters, videos, surveys and FAQs.

[2] The full DCP is available at <http://www.lakemac.com.au/page.aspx?pid=1460&vid=10>.

LP7 SMALL SECONDARY DWELLING PLANNING AS A CLIMATE ADAPTATION MEASURE – CITY OF FREMANTLE, WA

Contact: Sustainability (Strategic) Officer, City of Fremantle at info@fremantle.wa.gov.au.

Background: When dealing with the issue of sea level rise, every planning innovation that avoids new coastal development is a step in the right direction. While many climate adaptation practitioners concern themselves with how to adapt to sea level rise, or create policy that addresses retreat and / or protection issues, the simple, often ignored solution is to give people an alternative to new developments by offering them more planning flexibility within their own property.

With population on the rise and affordable housing at crisis level in some areas, the City of Fremantle's 'Small Secondary Dwelling' planning scheme amendment was a ground-breaking planning outcome, which allowed property owners to build 'granny flats' – effectively changing occupancy restrictions and expanding the capacity of properties.

This amendment has allowed for the deferral of new coastal developments as it provides a solution to population and housing affordability issues. It also gives governments (state and local) more time to address climate change policy issues in a less reactive manner. As such, this is a surprising adaptation benefit which arises from ensuring that the community of Fremantle has access to affordable housing and increased density.

Process for developing the amendment:

1. Prompted by the release of the state government's document 'Directions 2031' and sub-regional strategy that emphasised infill and raised the prospect of removing the occupancy restriction that applied to ancillary accommodation ('granny flats'), staff undertook research and made observations of community needs. This led to:

    - identification of a growing demand for smaller housing types in an environment of declining levels of housing affordability
    - a review of small dwellings planning provisions found in NSW legislation as a 'benchmark' (i.e. the Affordable Renting Housing State Environmental Planning Policy)
    - a commitment to providing affordable and diverse housing options as a key outcome of the City's strategic plan.

2. This in turn prompted an examination of the impacts that removing this restriction might have on the current Fremantle planning system and key principles. This led to:

    - the consideration of introducing a new land use that was essentially ancillary accommodation without the occupancy restrictions – Small Secondary Dwellings (SSDs)

- an objective to provide a clear 'as of right' statutory framework – involving criteria where planning approval for an SSD would not be required
- built form planning provisions that cannot be varied to ensure certainty for the community and protection of amenity
- suspension of non-essential standard planning provisions to further 'free up' development of SSDs (open space, car parking).

3. Then the City embarked on a rigorous consultation and engagement process, which involved working with the many stakeholders, both internal and external to the local government, to ensure community support for the amendment. The process included:

   - initial principles discussed with Elected Members
   - City of Fremantle staff discussions with Department of Planning hierarchy for preliminary support
   - initiation of amendment development
   - discussions with key industry groups including the Housing Industry Association, the Government Architect and the Urban Development Industry Association
   - consultation with government including the Department of Health and Water Corp.
   - consultation with community including via a Frequently Asked Questions flyer available online, and review and response to submissions received.

4. On finalisation of the consultation process the City found that only minor adjustments were required to ensure that all issues were addressed, including changes in relation to heritage properties.

5. The amendment then went through an internal and external approval process via Council and the Western Australian Planning Committee. This involved i) adoption by Council incorporating minor modifications resulting from consultation, ii) deputation by City staff at the WAPC Statutory Planning Committee, and iii) approval by the Minister for Planning.

6. As an innovator in the WA Planning Space – the City was rewarded with a range of awards:

   - Planning Institute of Australia (PIA) – Best Planning Ideas Awards – Large Idea 2012
   - PIA – Presidents Award – 2012
   - Local Government Planning Association – Local Government Planner of the Year – Phil St John.

Sources:

- *City of Fremantle - Small affordable housing planning scheme amendment: Small secondary dwellings Fremantle, Western Australia*, <http://www.acelg.org.au/sites/default/files/CC-toolkit/LP7_PIA-Poster-Flowchart.pdf>

LP8 EMBEDDING CLIMATE CHANGE INTO FLOODPLAIN RISK MANAGEMENT PLAN DEVELOPMENT – RANDWICK CITY COUNCIL, NSW

Contact: Manager Sustainability and Strategic Waste at council@randwick.nsw.gov.au.

Background: Randwick City recognises that a key risk arises from increased storm surges or increased frequency of significant storm events predicted as a long term outcome of climate change. These significant storm events lead to increased flooding and additional pressure on urban drainage infrastructure servicing low-lying or flood prone areas within the City. While Council's responses to climate change are not specifically driven by a risk of sea-level rise and coastal damage or loss (with limited development close to low-lying beach areas), there is a recognition and response based around the need for sound long term drainage asset management and floodplain management.

Council is investigating and developing comprehensive floodplain risk management plans for major catchment areas throughout the City. The flood studies that are carried out as an integral step in the final risk management plans incorporate sea level rise estimates into the flood modelling. Important drivers for this integration include:

- being part of the Sydney Coastal Councils Group – supporting its research into local coastal issues which helps inform and influence Council's own urban and coastal planning and response
- Council's Climate Change Risk Mitigation and Adaptation Plan which is currently under review to integrate with and assist future decisions made by Council.

Process for embedding: The preparation of each Floodplain Risk Management Plan follows a specific sequence of investigation and data collection, analysis, stakeholder consultation, finalisation and adoption. The stages up to the commencement of an action plan usually occur over a period of 24 months resulting in a rigorous and robust approach that is well communicated, agreed to and understood by all stakeholders including the community, Council staff and councillors.

Key outcomes in the floodplain planning process include the modelling work for the flood studies which feed into and inform the wider Floodplain Risk Management Study and Plan, and subsequently the implementation plan. The Floodplain Risk Management Plan prioritises specific actions and controls to be implemented to mitigate flood risks. These key outcomes adhere to the NSW Government floodplain management framework set out for local government across the state. More specifically:

- The initial **flood study** is undertaken by specialist consultants as it involves comprehensive technical investigation of actual and potential flood behaviours within each catchment. Sea level modelling is included in the scope of data collection. Consideration of other data including social and economic characteristics, land-use, and ecological and cultural information may be used as necessary for each catchment.

- The **Floodplain Risk Management Study** incorporates the flood study information to investigate and assess various risk management options and opportunities so the appropriate measures can be recommended and ultimately adopted for implementation via the risk management plan.
- The **Floodplain Risk Management Plan** for the catchment sets out the approach to be taken to manage flood-prone land and identify suitable uses for these areas which include considerations for sound management of urban and community infrastructure as well as minimising potential flooding impacts. This approach generally involves new planning controls and/or upgrade of drainage infrastructure.

The floodplain planning process is managed primarily by engineering staff from within the Technical Services Department, supported by community engagement staff in the Communications team. Governance is via separate floodplain management committees comprising numerous stakeholders. The committees are established for each catchment and have terms of reference to ensure agreement on the level of involvement in the various stages of the floodplain management process. The committee stakeholders bring current knowledge and expertise to the process and contribute substantially to the priorities and relevance of local issues. The committees take ownership of the various study outputs including recommending them for public exhibition and adoption.

Data and recommendations from the ongoing program of flood studies and plans is taken into account in considering changes to controls (or developing new controls) over existing or future development. The key objective is to minimise risk to life and property which may arise from significant storm events and flooding. These controls or changes influence development and planning for major infrastructure including buildings, roads, play areas, drainage networks etc. A realistic 20-year timeframe has been allowed for the completion of these various studies and plans.

Council has developed the Flooding Advice and Flood Related Development Controls Policy to disseminate information or set controls in the period from when reliable information is obtained (adoption of the flood study) to when the Floodplain Risk Management Plan is adopted.

The status of various studies and Floodplain Risk Management Plans within Randwick City are shown in Table 10 below.

Table 10: Status of Floodplain Risk Management Plans

Catchment	Flood study	Floodplain Risk Management Study	Floodplain Risk Management Plan
Green Square – West Kensington	completed	completed	completed
Coogee Bay	completed	in progress	in progress
Maroubra Bay	completed	in progress	in progress
Kensington – Centennial Park	completed	in progress	in progress

Lessons learnt: There are practical realities in carrying out the associated level of detail and planning related to these flood studies and floodplain risk management planning. It is important to provide sufficient time for data collection and analysis, stakeholder understanding and review, and proper approvals by decision-makers at each level of participation. The framework adopted for carrying out these studies and preparing these plans is one of the key reasons why it works well.

Important next steps include budgeting for the implementation of recommendations and actions identified in those plans.

LP9 POLICY ON SEA LEVEL RISE – EUROBODULLA SHIRE COUNCIL, NSW

Eurobodalla Shire Council adopted its Interim Sea Level Rise (SLR) Adaptation Policy on 27 July 2010, which recognised the need to plan for sea level rise and identifies '*potentially at risk sites*' within the LGA as Investigation Areas. The purpose of this policy is to ensure that properties located within Investigation Areas provide Council with additional information relating to coastal hazards and/or flooding when lodging a development application for approval. Indeed, before lodging a development application a Statement of Environmental Effects (SEE) must be completed and as a minimum the assessment of the following coastal hazards must be made (as relevant to each site):

- increasing sea level and tidal range
- soft coast erosion
- coastal flooding
- entrance behaviour
- reconfiguration of ICOLLs (Intermittently Closed & Opening Lakes & Lagoons)
- cliff and slope stability
- wetland migration
- groundwater elevation and or salinisation.

Sources:

- *Sea level rise: fact sheet*, <http://www.esc.nsw.gov.au/development-and-planning/considerations/environmental-considerations/coastal-and-flood-management/Factsheet_-_Sea_Level_Rise.pdf>.
- *Development Assessment process - Sea Level Rise*, <http://www.esc.nsw.gov.au/development-and-planning/considerations/coastal-and-flooding-considerations/coastal-and-flood-management/interim-sea-level-rise-policy/fact-sheet-sea-level>.
- *Sea level rise background information*, <http://www.esc.nsw.gov.au/development-and-planning/considerations/coastal-and-flooding-considerations/coastal-projects/sea-level-rise/sea-level-rise-background-information>.

LP10 DECISION SUPPORT FOR ADAPTATION: THE HANDBOOK – HUNTER HCCREMS

Seven coastal councils of the Hunter, Central and Lower North Coast region of New South Wales identified the need to develop a consistent and transparent decision-making process to address existing coastal hazards and those projected to worsen due to climate change. Following a number of consultation sessions, the partnership developed a handbook and supporting workbook, containing a series of tools to assist decision-makers in determining the appropriate management strategies associated with addressing coastal hazards. Additionally, this project provides a leadership model to coordinate regional coastal adaptation decisions across council boundaries and across a range of stakeholders. The outcomes of the project included a handbook and supporting workbook to guide decisions on managing existing coastal hazards and potentially a broader range of hazards (e.g. extreme heat events and catchment flooding) projected to worsen due to climate change.

Sources:

- *Decision Support for Adaptation: The Handbook*, <http://www.hccrems.com.au/RESOURCES/Library/ClimateChange/HCCREMS_Decision-Support-for-Adaptation-the-Handbo.aspx>.

W1 HOLISTIC INUNDATION MODELLING AND INTEGRATED CLIMATE ADAPTATION PLANNING – CITY OF PORT PHILLIP, VIC

Contact: Senior Project Manager Sustainability, Sustainability Department at assist@portphillip.vic.gov.au.

Background: The City of Port Phillip is built on reclaimed swampland which is very low-lying and densely settled. The City is a receiver of upstream stormwater, making it particularly vulnerable to flash flooding. The City of Port Phillip's climate risk assessment in 2006 demonstrated that the City is vulnerable to both coastal and catchment inundation as a result of the changing climate. It is estimated that a relatively small increase in sea level (10–15cm) could reduce the City's drainage effectiveness by as much as 30%.

Shortly after the climate risk assessment process, the Sustainability Department worked closely with the City's engineers, including those in the Asset Management Department, to understand how key climate risks, such as sea level rise and associated impacts on the City's drainage effectiveness, would impact on City assets. Individual assets were analysed in the context of their useful life and the projected changes. Engineers were thus presented with a challenge regarding how the associated risk factors could be addressed to ensure fit-for-purpose assets into the future – as well as a need to understand which asset types are most at risk.

With the formal adoption of the Climate Adaptation Plan in 2010, and with a strong level of support from Council and the administration, the City's Asset Management, Operations and Sustainability Departments collaborated to achieve a range of new frameworks for integrated regional stakeholder action on inundation, modelling inundation, determining effective infrastructure solutions, public communication on inundation, and community weather preparedness.

Process for development:

1. **Flood Management Plan** – These plans integrate and provide clarity to the roles and responsibilities of the key stakeholders (Melbourne Water, Victorian State Emergency Services and the City of Port Phillip). Flood management plans have now been developed and adopted for all metropolitan councils. The benefits for the City include clear and integrated stakeholder actions and key public, regional and internal messages.

2. **Comprehensive catchment inundation modelling** – Catchment hydraulic and hydrological modelling under a range of rainfall and climate scenarios has been brought together with Melbourne Water's modelling of main drains to provide a holistic overview of catchment inundation in the municipality. This has led to the development of a comprehensive new flood shape and depth based on both local and main drains, and for the first time there will be a Special Building Overlay (SBO), covering properties within Melbourne Water's drainage systems and properties primarily within Council's local drains. The benefits for the City include a detailed understanding of drainage capacity, subsequent clarity on sub-drainage augmentation opportunities and limitations, and comprehensive floor-level requirements for properties considering redevelopment/substantial renovations.

3. **Comprehensive coastal inundation modelling** – The City of Port Phillip and the Association of Bayside Municipalities (ABM) have initiated a comprehensive coastal hazards vulnerability assessment of Port Phillip Bay. Until this assessment is completed and ready for use, the City is using key coastal modelling of Elwood Beach/Canal gained through the Port Phillip Bay Coastal Adaptation Pathways project in order to develop two key tools:

    a. **Integrating catchment and coastal modelling into a dynamic model –** In partnership with CSIRO, the City is developing an integrated dynamic spatial model of inundation scenarios from the combined effects of flash flooding, sea level rise and storm surges/king tides. The benefits to the City include gaining a holistic view of the behaviour, depth and extent of inundation from a range of scenarios into the long term. This in turn assists the City in determining the likely vicinity of infrastructure solutions, and planning or development requirements that may need to be considered over time.[3]

    b. **Testing likely adaptation solutions in a dynamic inundation model –** The model being built with CSIRO also allows the City to model a range of likely adaptation solutions to test their effectiveness (e.g. local drains augmentation; critically placed offshore reef for reducing storm surge and king tide impacts; use of upstream retention/detention basins and diversion drains to reduce the reception of upstream flows into the municipality; effects of 50% onsite retention/detention in all Elwood properties). This will allow the City to test and provide a proper cost-benefit analysis of mitigating inundation solutions, with a focus on costs, time frames and effectiveness.

4. **Integrated key public messages about inundation in the municipality** – Council's Asset Management, Operations (including maintenance and emergency management), Sustainability, Strategic Planning, Statutory Planning and Media/Communications departments work together (through regular flooding meetings led by Sustainability) to integrate key community messages and provide consistent and ongoing dialogue opportunities with local communities. This has greatly reduced community anxiety about inundation and developed a more progressive format for gaining municipality-wide preventative action (refer Figure 25 below).

5. **Introduction of the Weather Ready Program for the community –** The City is currently rolling out its pilot community weather preparedness program, Weather Ready, designed with extensive key stakeholder and community input. The program targets street and apartment block-based mentors to develop community preparedness at the local level. A scribe animation of the program can be found at <http://www.enviroehub.com.au/weather-ready>.

[3] To get a perspective of this project, view the following video: <http://publish.viostream.com/play/xbz189s9wgu5>.

Lessons learnt:

- Council used a one-year long internal assessment of climate risks and impacts on infrastructure and assets over their lifecycle – this provided significant understanding and ownership across departments of the key changes required in modelling, and infrastructure and asset maintenance and renewal.
- Melbourne Water and Victorian State Emergency Services proved excellent regional partners and have been a critical component in achieving frameworks, modelling and consensus on next steps.
- A lack of state-based funds or focus to conduct a bay-wide vulnerability assessment means a much more complex and long term process for gaining coastal inundation data.
- Drainage and infrastructure for a changing climate is complex and difficult for councillors and community members to easily understand – it takes time and needs to be repeated with each new council.

Key Community Messages

The four key messages below are consistently used with the Port Phillip community at all City-provided information sessions, events and consultation around flooding and extreme weather events. They were developed after considering local demographics, and the analysis of around 250 community responses to how locals behaved before, during and after extreme weather.

a. Managing and preparedness for extreme weather is **a shared responsibility** and the community is both a critical and effective player in minimising impacts.

b. **Can minimise flooding, cannot prevent it** – the City is historically prone to flooding, and this flooding will intensify as the climate changes. Whilst Council and Melbourne Water will continuously aim to minimise flooding and ensure drainage capacity, there will be times when the City floods.

c. **Future flood behaviour not yet determined** – The climate is changing and we do not yet have all the information to understand how future flooding may behave (increased stormwater plus increased coastal vulnerability), or what the final flood shape duration and extent of flooding may be.

d. **Climate-resilient built form** – over time, we will have to significantly modify our current buildings and spaces to create a city that copes much better with extreme weather and a changing climate.

Figure 25: Key community messages

W2 CLIMATE CHANGE IMPACTS FINANCIAL SIMULATION MODEL – UNIVERSITY OF SOUTH AUSTRALIA

To assess the likely impacts of climate change on local government assets, the first stage of the project as defined by the project scope was to review the likely changes in the climate across southern Australia. This project was a collaboration of the University of South Australia (UniSA), the Local Government Association of South Australia (LGASA), the Western Australian Local Government Association (WALGA), the Institute of Public Works Engineering Australia (IPWEA) and the Municipal Association Victoria (MAV) and has had support and input from ten case study councils across southern Australia.

Councils have indicated that they are overwhelmed by the amount of information made available to them on climate change but do not know how to translate this information into planning processes to improve their capacity to adapt the built environment. The research undertaken in this project delivers a set of guidelines and technical modelling tools that fill this gap and provide a clear, comparative financial analysis of adaptation options for the management of local government assets.

The Climate Change Impacts Financial Simulation Model (the Model) quantifies the change in road asset useful life and corresponding maintenance and repair costs as a result of future climate change. Road assets included in the Model include spray sealed, asphalt (hot mix) and unsealed (gravel formation) roads. The impacts of climate change for each road asset type are modelled using road engineering equations that have been tested for appropriateness under Australian conditions by the Australian Road Research Board and climate data extracted from the Bureau of Meteorology High Quality National Real Time Monitoring gridded data set.

The Model has been configured and incorporated into the latest edition of the widely-used asset management package NAMS.Plus produced by the Institute of Public Works and Engineering Australia (IPWEA). Local governments who subscribe to the NAMS.Plus service can use the model outputs to modify their road asset maintenance and repair costs to include the impacts of climate change.

Sources:

- *NAMS.PLUS*, <http://www.namsplus.org.au/>.
- Results from the Model for a selection of southern Australian local government areas including all southern capital cities can also be accessed for free via the project Addendum report on the National Climate adaptation Research Facility (NCCARF) website: <http://www.nccarf.edu.au/sites/default/files/attached_files_publications/Balston_2013_Final_Report_Addendum.pdf>.
- Further details about the project and model can be found in the final project report: <http://www.nccarf.edu.au/sites/default/files/attached_files_publications/Balston_2013_Quantifying_cost_of_climate_change_impacts.pdf>.

- The Model was developed as part of a project led by the LGA SA and funded by NCCARF within the former Department of Climate Change and Energy Efficiency. Collaborating partners include the Local Government Association South Australia, IPWEA, University of South Australia, Bureau of Meteorology, Coast Protection Board South Australia, Western Australian LGA and Municipal Association.

W3 CLIMATE ADAPTATION TOOLKIT TO EMBED CLIMATE RESILIENCE IN DECISION-MAKING – CITY OF GREATER GEELONG, VIC

Contact: Coordinator Sustainability at contactus@geelongcity.vic.gov.au.

Background: In 2011, the City of Greater Geelong released its Climate Adaptation Strategy and Roadmap to respond to the impacts of climate change. Its purpose was to identify and communicate the key risk areas for the City of Greater Geelong and propose a roadmap for action. It acknowledged the uncertainties associated with the impact of climate change on Council's operations and provided a framework to introduce organisational change and to embed risks into decision-making.

In developing the Strategy, it was clear that traditional tools were not adequate to guide local government decision-making about climate change. The 'Adaptation Toolkit' was developed to help integrate climate change into decision-making. The challenge was to make it flexible enough to meet the widest range of future climate scenarios.

Process for development: The City of Greater Geelong (CoGG), Net Balance and RMIT University, in a unique tripartite relationship, have trialled and developed the 'Adaptation Toolkit' with a Creative Commons Licence over the last two years. All three organisations have contributed time and expertise, with an intention to deliver and aid other regional councils to develop adaptation governance systems. They also intend to enable other local government authorities to use the Adaptation Toolkit to go beyond risk assessments, and explore the implications of uncertainty on risk and adaptation actions.

RMIT University contributed experience in tracking and documenting organisational learning and change to enable future sharing of the experiences of using the Adaptation Toolkit application. RMIT continues to bring research vigour to the equation, as well as the most up-to-date research findings to inform the design of the toolkit roll-out and engagement.

Net Balance, through their not-for-profit foundation, provided technical input into the development of the Adaptation Toolkit and facilitated a comprehensive trialling program of the Adaptation Toolkit with various Council departments.

The City of Greater Geelong funded the development of the Adaptation Toolkit and trial program as part of its broader Climate Adaptation Strategy. CoGG has now further developed the Adaptation Toolkit into an interactive web-based tool, which is currently being integrated into its corporate planning processes.

The Adaptation Toolkit: The toolkit aims to help organisations to:

- integrate adaptation into existing processes
- develop effective risk management strategies
- make consistent decisions regarding climate change

- incorporate uncertainty into decision making by making decisions that are flexible and work across a range of future scenarios
- be more responsive to climate change shocks and trends
- maintain standards of service delivery during extreme weather conditions
- form linkages across different work areas – internally and externally.

The Toolkit is designed to be implemented once an organisation has developed a list of priority climate risks. It offers three tools that can be implemented in sequence or used as standalone steps:

1. exploring the risk context

2. developing adaptation actions

3. screening for climate change interactions.

Tool 1: Achieves a better climate risk definition. Climate risks do not occur in isolation. Tool 1 explores interactions with other stressors (environmental, social or economic). It helps users to recognise links between existing risks, their contexts and climate change.

Tool 2: Provides a process for identifying, exploring, evaluating and prioritising adaptation actions to test against climate scenarios.

Tool 3: Helps organisations embed climate adaptation considerations into processes and operations. Tool 3 helps identify climate risks and adaptation actions when developing new projects and strategies.

The City of Greater Geelong's Climate Adaptation Strategy and the Adaptation Toolkit have raised climate change awareness throughout the City's staff and beyond. Council has taken a significant step in embedding the consideration of climate change when making decisions about planning, infrastructure investments and environmental management (refer for example to case study W4 below).

Successful integration of the Adaptation Toolkit also depends on Council's broader Climate Adaptation Strategy program. This program includes priority work areas and specific climate adaptation inputs into planning policy and strategy development, and the provision of information and training for Council employees in climate vulnerabilities.

The Adaptation Toolkit has now been converted by the City of Greater Geelong into an interactive web-based tool so that it is easier for staff to use. This format is intended to be made available in the future for use by other councils.

The original format of the Adaptation Toolkit is available on the websites of the City of Greater Geelong, NetBalance and RMIT University.

Lessons learnt:

- An engagement and training program is essential for ensuring the Toolkit is utilised by local government employees. Challenges can include ensuring adequate that resources are available to carry out ongoing training as part of the corporate training calendar, and that training is made available to relevant levels of a local government from the executive to operational staff.
- A training program should be developed to cater for climate change adaptation introduction courses and for training in the use of the toolkit.
- Embedding the toolkit within a broader enterprise-wide risk management system takes time and resources. If your existing corporate risk management resources have a full work program then consider additional resources to assist with this task.

Sources:

- *Climate Change Adaptation Toolkit*, <http://www.netbalance.com/sites/all/themes/netbalance/research/Toolkit.pdf>.
- *Climate Change Adaptation Toolkit User Guide*, <http://www.netbalance.com/sites/all/themes/netbalance/research/UserGuide.pdf>.

W4 INFRASTRUCTURE DEVELOPMENT GUIDELINES FOR EMBEDDING CLIMATE ADAPTATION INTO ASSET MANAGEMENT – CITY OF GREATER GEELONG, VIC

Contact: Coordinator Sustainability at contactus@geelongcity.vic.gov.au.

Background: In 2011, the City of Greater Geelong released its Climate Adaptation Strategy and Roadmap to respond to the impacts of climate change. Its purpose was to identify and communicate the key risk areas for the City of Greater Geelong and propose a roadmap for action. It acknowledged the uncertainties associated with climate change on Council's operations and provided a framework for organisational change and to embed risks into decision-making. The Sustainable Communities Infrastructure Guidelines incorporate the City Plan 2010–2014 Sustainable Built and Natural Environment objective: 'Advocate for and promote sustainable design and development'.

Sustainable Communities: Infrastructure Development Guidelines: The Guidelines have been prepared to facilitate the development of sustainable communities through quality planning, design and construction of infrastructure in the City of Greater Geelong. They will assist with the upgrade and redevelopment of existing infrastructure as well as the establishment of new communities throughout the municipality.

The guidelines address sectors of transport and movement, landscape and streetscape, water management, sport, recreation and open space, social and community facilities, and biodiversity and conservation areas. They are intended to be used by developers, agencies and authorities, council staff, and consultants on behalf of clients.

The City of Greater Geelong developed the Guidelines to facilitate the development of sustainable communities and assist with incorporating climate change considerations into upgrades and redevelopment of existing infrastructure. The Guidelines also assist with consistent cross-divisional decision-making, and planning referral advice.

Recent additions to the Guidelines incorporate climate change considerations. Infrastructure design principles and guidelines have been included to each chapter of the Guidelines. In addition, under each type of infrastructure section, the principle 'considering potential implications of climate change' has been added. Finally, a checklist designed to serve as a guide for infrastructure developers to ensure they consider climate change factors in their design has been included in the appendices of the Guidelines document.

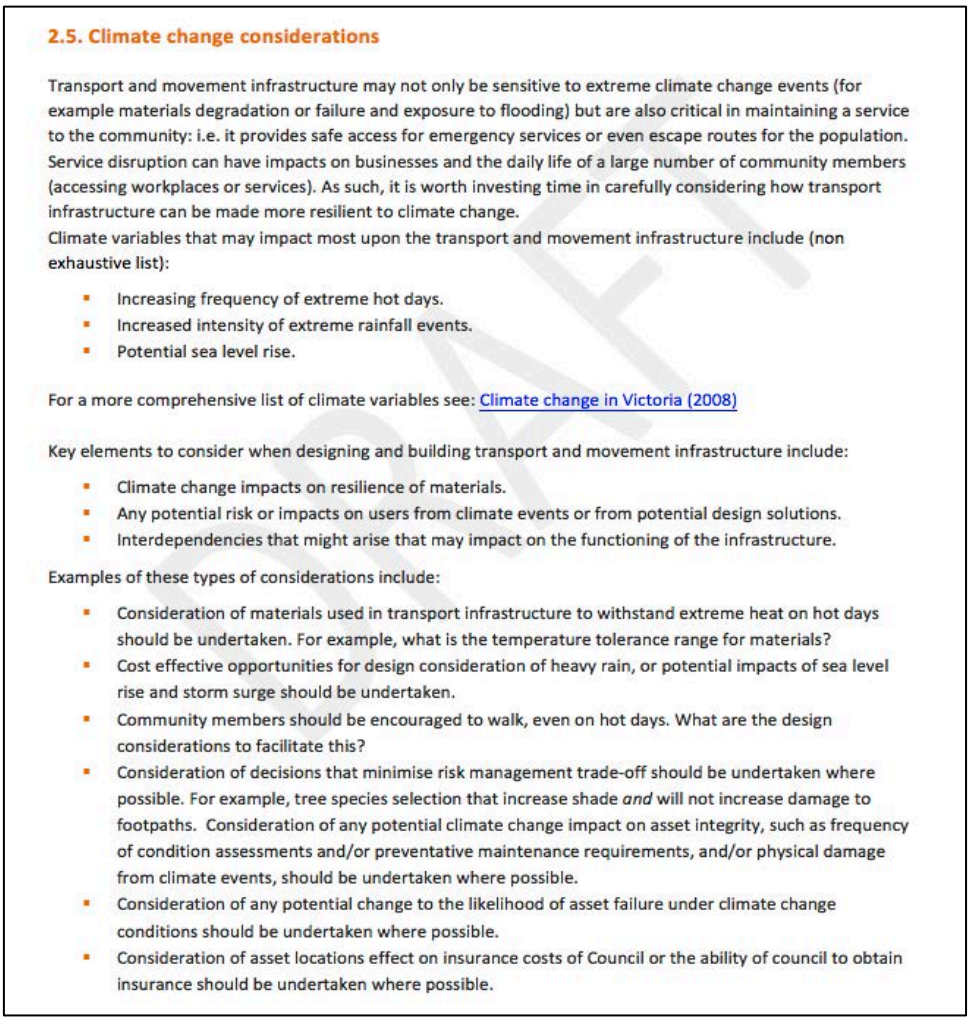
Process for development:

- The City of Greater Geelong formed an Infrastructure Development Guidelines – Governance Group to lead the development of the Guidelines and capture feedback and ensure that the Guidelines remain consistent with industry best practice. The Governance Group contains the

following representatives from across Council: Coordinator Infrastructure Management, Coordinator Recreation and Open Space, Coordinator Sustainability, Coordinator Community Facilities, Coordinator Urban Growth Area Planning.

- The Guidelines were developed in consultation with developers, consultants and Council employees across all local government service areas over a 12-month period.
- In the first review year of the Guidelines and the subsequent adoption and implementation of Council's Climate Adaptation Strategy, Council was systematically looking at strategic documents and identifying ways to embed climate change considerations across the organisation. As highlighted in Geelong's Climate Adaptation Strategy, infrastructure, depending on its location, can be exposed to the impacts of climate change. These impacts can occur through extreme weather events such as storms and flooding, storm surges and bushfires as well as other long term processes such as coastal erosion, sea level rise and drought. Much of Geelong's infrastructure is built for long term timeframes and it is important that potential changes in operating conditions are acknowledged during Council planning and building of new assets and major upgrades.
- It was identified by the Governance Group that the Guidelines required additional information regarding climate change considerations. To update the Guidelines, a consultant was engaged to facilitate a half-day workshop with the Governance Group and other key stakeholders from across Council and incorporate the relevant climate change considerations into the Guidelines.

A copy of the Infrastructure Development Guidelines and supporting appendices can be accessed via the City of Geelong's website, or by contacting the Sustainability Coordinator.



2.5. Climate change considerations

Transport and movement infrastructure may not only be sensitive to extreme climate change events (for example materials degradation or failure and exposure to flooding) but are also critical in maintaining a service to the community: i.e. it provides safe access for emergency services or even escape routes for the population. Service disruption can have impacts on businesses and the daily life of a large number of community members (accessing workplaces or services). As such, it is worth investing time in carefully considering how transport infrastructure can be made more resilient to climate change.

Climate variables that may impact most upon the transport and movement infrastructure include (non exhaustive list):

- Increasing frequency of extreme hot days.
- Increased intensity of extreme rainfall events.
- Potential sea level rise.

For a more comprehensive list of climate variables see: Climate change in Victoria (2008)

Key elements to consider when designing and building transport and movement infrastructure include:

- Climate change impacts on resilience of materials.
- Any potential risk or impacts on users from climate events or from potential design solutions.
- Interdependencies that might arise that may impact on the functioning of the infrastructure.

Examples of these types of considerations include:

- Consideration of materials used in transport infrastructure to withstand extreme heat on hot days should be undertaken. For example, what is the temperature tolerance range for materials?
- Cost effective opportunities for design consideration of heavy rain, or potential impacts of sea level rise and storm surge should be undertaken.
- Community members should be encouraged to walk, even on hot days. What are the design considerations to facilitate this?
- Consideration of decisions that minimise risk management trade-off should be undertaken where possible. For example, tree species selection that increase shade *and* will not increase damage to footpaths. Consideration of any potential climate change impact on asset integrity, such as frequency of condition assessments and/or preventative maintenance requirements, and/or physical damage from climate events, should be undertaken where possible.
- Consideration of any potential change to the likelihood of asset failure under climate change conditions should be undertaken where possible.
- Consideration of asset locations effect on insurance costs of Council or the ability of council to obtain insurance should be undertaken where possible.

Figure 26: Snapshot – climate change considerations in the Guidelines (Transportation and Movement Section)

Lessons learnt:

- A strategic approach to climate impacts can reduce the chances of Council reacting in an unconsidered way when faced with the political pressure of the time. The Guidelines help to ensure all climate risks are considered in a consistent way when Council or developers are planning new infrastructure.
- Involvement of Statutory Planners in the development and subsequent update of the Guidelines was essential to ensure there is consistency with any local and state planning policies.
- The Guidelines are not an incorporated document under the State Planning Policy Framework, however they are used by Council planners and departments to assist development proponents understand Council land management issues and speed up the planning referral process.
- Higher levels of service and infrastructure provision for new developments compared to those provided within an existing community can be challenging for Council and councillors to manage. As the Guidelines apply to both Council infrastructure works and new developments, it is hoped that this will close the gap between levels of service for new and existing communities.

W5 COUNCIL WATER AND SEWER ASSETS - ADAPTING TO CLIMATE CHANGE – GOSFORD CITY COUNCIL, NSW

Contact: Water & Sewer Asset Management & Planning at goscity@gosford.nsw.gov.au.

Background: By early 2013, Council completed a master plan for both water and sewer schemes with a planning horizon to 2050. This plan provides a blueprint for strategic direction and guidance for planning, development and operation of the two schemes. The main objectives of the master plan are to:

- assess current performance of the schemes and identify improvements necessary to meet levels of service
- provide long-term strategic direction and guidance for the planning, development and operation of the schemes.

Due to the long planning horizon and the longevity of many water and sewer assets, the impact of climate change was included as a key consideration of the master plan. Consultants were engaged to undertake a high level assessment of relevant future climate impacts, asset vulnerabilities and typical control measures. The key climate risks identified were sea level rise, precipitation changes and temperature rises.

Climate Variable	Climate Change Consequence	Impact	Master Plan
			Existing assets
Sea level rise and storm tide	Increased sea level and subsequent flood levels.	Infrastructure inundated and/or susceptible to more frequent flooding. Sewer overflows occur against higher external water levels which will generate elevated hydraulic grade lines in sewers; potentially affecting the number and location of overflow points in individual pump station catchments.	Identify and modify as necessary to prevent, reduce or accommodate impact on: Operation and access to assets (air valves, hydrants, electrical switchgear, pumping stations and Woy Woy STP[1]) . - Install sea walls or levees around critical infrastructure. Inflows to sewer system - Raise sewer access chamber and lift pump station covers or replace with watertight covers. Implement sewer overflow management strategy (TM-12).
		Development constrained.	Future water demand / sewer load estimates need to recognise former population growth and development forecasts may not be realised in affected areas (TM-05, TM-06).
		Reduced hydraulic capacity of the Kincumber STP ocean outfall.	
	Increased groundwater levels.	Increased groundwater infiltration into sewer mains.	Monitor and address as necessary. E.g. Minimum night flow analysis to monitor groundwater infiltration changes. Seal/reline affected pipes.
		Failure of OSSM systems.	
		Increased buoyancy forces on infrastructure.	
	Coastal recession	Infrastructure at risk of damage.	Identify areas and assets at risk; develop contingency operations plan.
	Saltwater intrusion	Structural integrity of materials compromised due to increased salt content. Increased rate of corrosion of susceptible materials (concrete, steel); asset life reduced.	Maintenance management plan for accelerated degradation of materials. Monitor and address as necessary.

Figure 27: Snapshot from the high level climate risk assessment process

Process for embedding: As part of the master plan and with support from the consultants, climate projections were developed for the key climate risks. The data for this came from regionalised climate

research from the Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS), which was based on information from the CSIRO and Bureau of Meteorology. This information was then used to model the impact on Council's water and sewer assets throughout the local government area.

Sea level rise: The projections from HCCREMS included an increase in sea levels of 40cm by 2050 and 90cm by 2100 and the storm tide was estimated to be 180cm for the 1 in 100 Average Recurrence Interval ARI. This data was superimposed over Council's GIS layer which identified the location of water and sewer assets vulnerable to sea level rise. Elevation data of assets was also included in the modelling to provide methodological detail.

Through this process, Council was able to clearly identify all water and sewer assets vulnerable to inundation from sea level rise, which projected a significant increase of inundation of Council's sewer pump stations, sewer manholes, and both water and sewer pipes.

Several consequences of projected sea level rise were identified including:

- increased infiltration into manholes and sewers
- overloading of sewer infrastructure
- increased buoyancy of pipelines and associated stressors, leading to increased system failures
- greater asset exposure to salt water, reducing structural integrity of pipes from enhanced corrosion
- increased sulphides in sewer pipes, increasing septicity and odour risks
- reduced capacity of sewer pumping transfer stations due to an increase in tidal levels.

Key strategies are being developed to mitigate the consequences, particularly in the following areas:

- seal and re-line pipes to prevent excessive infiltration
- adopt appropriate materials for new assets and renewals
- raise and/or seal pumps stations to become watertight, provide increased temporary storage to sewerage pumping stations
- provide additional ocean outfall for Council's major sewerage treatment plant.

Precipitation changes: The projections from HCCREMS predict that 24-hour rainfall intensity will increase by twenty per cent with a likelihood of sustained droughts and an increase in flood events.

Council was able to model the changes in precipitation against water and sewer assets to identify the vulnerable assets. Consequences of a change in precipitation are likely to include:

- higher inflow into sewers during wet weather events, resulting in higher likelihood of sewer overflows
- extreme wetting/drying of soils, creating greater stresses and consequent failure of pipelines

- reduction in water for flushing flows, leading to higher solid concentration and sedimentation in pipes and pump stations.

In light of these consequences, the following key strategies are being developed:

- maximise storage within the sewer network to delay the conveyance of flows further downstream
- greater use of the sewer network to temporarily store flows until a storm event subsides.

Temperature increases: The HCCREMS research predicts a mean annual temperature increase of 1. 5^{o} C by 2050 with an increased bushfire season extending into autumn. Although a greater risk of bushfires was identified, from a water and sewer asset management perspective, the main risk was the average increase in temperature. The consequences of this projection are likely to include:

- higher sewer temperatures leading to greater hydrogen sulphide generation and consequential conversion to sulphuric acid, which attacks the inner pipe, reducing asset life
- higher temperatures in water supply which can degrade efficiency of disinfectants and result in increased disinfection by-products
- water demand reduction through water savings measures may increase retention times in the supply network, leading to degradation of water quality.

The following strategies are being developed to address a projected increase in average temperatures:

- appropriate material selection for renewals and new assets
- chemical dosing to reduce hydrogen sulphide
- protective sewer linings for concrete pipes
- additional chlorine dosing stations for water supply.

There are many existing management strategies to increase Council's water and sewer assets' resilience to sea level rise, temperature increases and precipitation changes being implemented, including:

- Mardi Mangrove Link to improve fresh water yields for dams
- groundwater bores for alternative sources during droughts
- implementation of permanent conservation measures to save water during droughts
- improvements to temporary storage facilities when upgrading sewerage pump stations to reduce overflows
- smoke testing to minimise illegal sewer connections
- overflow investigations to identify troublesome areas
- sewer gauging to increase our understand the network
- calibration of water and sewer models to improve network performance

- septicity and odour control in readiness to reduce levels of sulphides
- public education to increase awareness of water conservation and climate issues.

Lessons learnt: Council has purposefully designed flexibility and responsiveness into the master plan and associated strategies to allow adaptability for the consequences of future climate change. All of the strategies are works in progress, but the Water & Sewer Asset Management & Planning department is ensuring that these measures are considered in all relevant decision-making – and that the engineers working within the department are driving this.

One important avenue for developing these strategies has been Council's membership and participation in the Water Surfaces Association of Australia's member forums on climate risk and water and sewer assets. In these forums, lessons and practical initiatives are being discussed and shared. Other councils with water infrastructure at risk from climate change impacts should consider participating in these forums (see <http://www.wsaa.asn.au>).

W6 THE ROLE OF THE IS RATING SCHEME IN EMBEDDING CLIMATE ADAPTATION INTO INFRASTRUCTURE DELIVERY – INFRASTRUCTURE SUSTAINABILITY COUNCIL OF AUSTRALIA (ISCA)

Contact: Technical Director ISCA at: <http://www.isca.org.au/contact>.

Background: The Infrastructure Sustainability Council of Australia (ISCA) is a peak industry body whose mission is to enhance the liveability and productivity of major cities and regional communities through advancing sustainability in infrastructure planning, procurement, delivery and operation. ISCA has developed the IS Rating Scheme, Australia's only comprehensive rating system for evaluating sustainability across design, construction and operation of infrastructure. Further information on ISCA and the IS Rating Scheme (including a copy of the Tool) can be found at: <http://www.isca.org.au>.

Climate Change Category: Climate Change Adaptation is one of 15 categories within the IS Rating 'Tool' – a key component of the IS Rating Scheme. The intent of the category is to facilitate the self-assessment and thus rating of the appropriateness and effectiveness of how climate change risk and adaptation issues have/will be addressed for infrastructure projects/assets. Assessment under the category is supported by a technical manual which includes guidance for undertaking a climate change risk assessment, and enables self-assessment of the appropriateness and effectiveness of different methods. The category is also intended to help raise awareness of climate change risks and adaptation opportunities among infrastructure owners, financiers, planners, designers, constructors and operators.

There are two credits within the Climate Change Adaptation Category:

- Cli-1 Climate change risk assessment which aims to reward the assessment of climate change risks.
- Cli-2 Adaptation options which aim to reward the assessment and implementation of climate change adaptation measures.

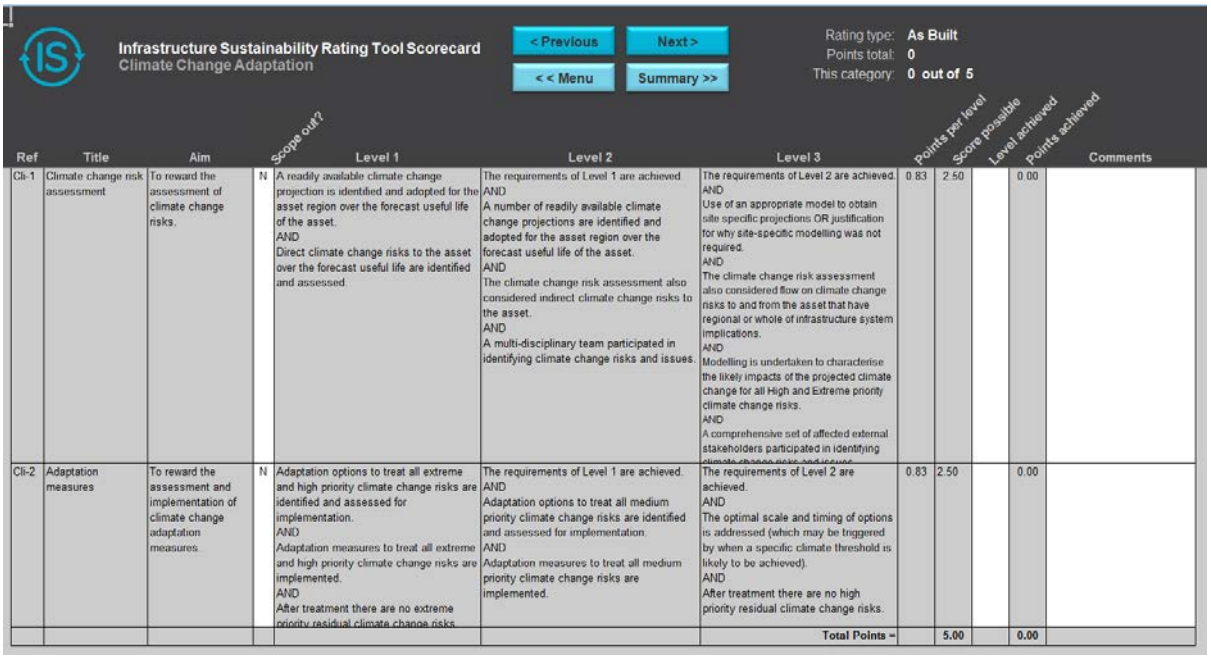
ISCA also produced a Climate Change Adaptation Guideline to inform industry on climate change risks and opportunities for new infrastructure projects and existing assets and to provide a roadmap for developing appropriate adaptation measures. ISCA subsequently contributed to the development of the recently released 'Australian Standard on Climate change adaptation for settlements and infrastructure – A risk based approach' (AS 5334-2013).

How to apply the IS Rating Scheme in council infrastructure planning, delivery and operation: Councils can utilise the IS Rating Scheme in a number of ways, including in the procurement process. Some organisations have mandated IS ratings for projects over a certain size. For example, Transport for NSW (Transport Projects Division) has mandated an IS rating for all projects with a capital value greater than $50 million. IS ratings are increasingly being set as requirements in the procurement of major projects including in the rail and road sectors e.g. the requirement to achieve an 'Excellent' rating (overall score of 50 to 74 points).

A local government project achieved the very first IS rating in Australia. This was the Whitsunday STP Upgrades project for Whitsunday Regional Council. In this case, the design, build and operate contractor, Tenix, voluntarily pursued the IS rating. In regard to climate change adaptation, use of the IS rating tool provided a mechanism for Tenix to undertake a thorough, formal climate change risk assessment and through the design and construction process implement controls to reduce 22 'high' or 'very high' risks to a 'moderate' or 'low' rating. This provides a good example of how use of the IS rating scheme can assist councils to manage their climate change risks more effectively.

Benefits of using the ISCA Rating Scheme: The IS rating scheme:

- provides a common national language for sustainability in infrastructure.
- provides a vehicle for consistent application and evaluation of sustainability in tendering processes.
- facilitates scoping whole-of-life sustainability risks for projects and assets, enabling smarter solutions that reduce risks and costs.
- fosters resource efficiency and waste reduction, reducing costs.
- fosters innovation and continuous improvement in the sustainability outcomes from infrastructure.
- builds an organisation's credentials and reputation in its approach to sustainability in infrastructure.



Infrastructure Sustainability Rating Tool Scorecard
Climate Change Adaptation

< Previous | Next > | << Menu | Summary >>

Rating type: As Built
Points total: 0
This category: 0 out of 5

Ref	Title	Aim	Scope out?	Level 1	Level 2	Level 3	Points per level	Score possible	Level achieved	Points achieved	Comments
Cli-1	Climate change risk assessment	To reward the assessment of climate change risks.	N	A readily available climate change projection is identified and adopted for the asset region over the forecast useful life of the asset. AND Direct climate change risks to the asset over the forecast useful life are identified and assessed.	The requirements of Level 1 are achieved. AND A number of readily available climate change projections are identified and adopted for the asset region over the forecast useful life of the asset. AND The climate change risk assessment also considered indirect climate change risks to the asset. AND A multi-disciplinary team participated in identifying climate change risks and issues.	The requirements of Level 2 are achieved. AND Use of an appropriate model to obtain site specific projections OR justification for why site-specific modelling was not required. AND The climate change risk assessment also considered flow on climate change risks to and from the asset that have regional or whole of infrastructure system implications. AND Modelling is undertaken to characterise the likely impacts of the projected climate change for all High and Extreme priority climate change risks. AND A comprehensive set of affected external stakeholders participated in identifying	0.83	2.50		0.00	
Cli-2	Adaptation measures	To reward the assessment and implementation of climate change adaptation measures.	N	Adaptation options to treat all extreme and high priority climate change risks are identified and assessed for implementation. AND Adaptation measures to treat all extreme and high priority climate change risks are implemented. AND After treatment there are no extreme priority residual climate change risks.	The requirements of Level 1 are achieved. AND Adaptation options to treat all medium priority climate change risks are identified and assessed for implementation. AND Adaptation measures to treat all medium priority climate change risks are implemented.	The requirements of Level 2 are achieved. AND The optimal scale and timing of options is addressed (which may be triggered by when a specific climate threshold is likely to be achieved). AND After treatment there are no high priority residual climate change risks.	0.83	2.50		0.00	
						Total Points =		5.00		0.00	

Figure 28: Snapshot from the ISCA Rating Tool Scorecard (available for download from the ISCA website)

W7 COUNCIL BUILDING VULNERABILITY ASSESSMENT TOOL – CITY OF WHITEHORSE COUNCIL, VIC

The City of Whitehorse developed an approach to assess the vulnerability of key building assets to climate change, and subsequently audited 14 key buildings within the LGA. The results and recommendations for adaptation (specific to the 14 key buildings) were used to inform Council's future building Capital Works and Asset Management Programs. The vulnerability assessment developed by Council included a series of checklists, toolkits, prioritisation processes and adaptive design measures, and has illustrated the potential to address climate vulnerability within existing Asset Management and Capital Works Programs.

Sources:

- City of Whitehorse 2010, *Climate Change Adaptation Plan 2011*, City of Whitehorse, <http://www.whitehorse.vic.gov.au/IgnitionSuite/uploads/docs/Climate%20Change%20Adapation%20Plan%202011.pdf>.

W8 EMBEDDING CLIMATE CHANGE RESILIENCE INTO ASSET MANAGEMENT – CITY OF CANADA BAY, NSW

Contact: Technical Services and Operations (TS&O) at council@canadabay.nsw.gov.au.

Background: The City of Canada Bay Council (CCBC) has developed a *Climate Resilience Assessment Tool* to gain a deeper understanding of the exposure, sensitivity and adaptive capacity of built and natural assets to a changing climate. Integrating this tool into Council's existing Asset Management Strategy will enable Council to proactively increase the resilience of key assets across the local government area (LGA).

Process for Development:

1. In 2010 Council established a cross-departmental Climate Change Adaptation Working Group (CCAWG), with the aim of identifying potential climate change issues impacting Council operations and the broader community in the years leading to 2030 and 2070.

Framing the impacts of climate change across a number of socio-economic growth scenarios, the CCAWG completed a series of in-depth risk assessments, identifying sea-level rise, changes in temperature and increased periods of drought and rainfall to be the areas of key concern in future years.

2. The CCAWG subsequently distilled the risk assessment findings to develop *The City of Canada Bay Climate Change Adaptation Strategy*, which clearly articulated potential climate change risks and impacts across the LGA.

3. Following Council's support of the *Climate Change Adaptation Strategy*, a working group was established within the Technical Services and Operations (TS&O) Directorate, to identify ways in which responses to key climate change impacts could be integrated into Council's existing Asset Management Framework, ensuring that existing and future assets had the resilience and adaptive capacity to withstand potential climate impacts.

4. Through a process of sense-making, the group identified the resilience of existing assets to be dependent upon age, structure, size and location, with the resilience of new assets safeguarded by ensuring that they are located, designed, built and operated with the current and future climate in mind.

Although the working group identified the key criteria informing the level of resilience of both existing and new assets, it was decided that the initial focus would be on building the adaptive capacity of existing assets.

5. Climate modelling and community vulnerability data was subsequently extracted from the *Climate Change Adaptation Plan*, to identify levels of asset sensitivity, followed by a process of prioritising key assets exposed to high climate change risk, and classifying the assets that serviced more vulnerable community groups across the LGA.

Figure 29: Sample Map of City of Canada Bay Council, which was used in combination with vulnerability data extracted from Council's *Climate Change Adaptation Plan* to determine the location of sensitive asses

6. Having identified the assets most sensitive to future climatic changes, Council partnered with a consultant specialising in climate change, to develop a *Climate Resilience Assessment Tool*, enabling Council to assess the resilience of critical assets across the LGA.

The assessment tool was established using the three central criteria detailed Table 11 below, with each criterion assessed against a pre-determined credit allocation system.

Table 11: Summary of the three (3) assessment criteria forming the Climate Resilience Assessment Tool

ASSESSMENT CRITERIA	
Exposure to climate effects	This criterion assesses the site's overall exposure to climate effects, using climate change projections selected in Council's *Climate Change Adaptation Plan (*Intergovernmental Panel on Climate Change (IPCC) A1B Medium Emission Scenario). Examples of such effects include: extreme heat and mean temperature change
Sensitivity and adaptive capacity of asset elements	This criterion assesses site-specific asset characteristics to determine to overall sensitivity and adaptive capacity of an asset. Examples of such characteristics include: location and design, structure and landscape, and utilities and services

ASSESSMENT CRITERIA	
Potential impact of climate risks	This criterion assesses the potential climate change impacts that may affect a specific property. Examples of such impacts include: mean temperature change, extreme heat, wind and hail and bushfires

7. The credit allocation system outlined in Table 12 below, was used to assess each of the three central criteria, with a scale ranging from 1 (low level exposure) being desirable, through to 5 (advanced level exposure, vulnerability and nominal resistance).

Zero (0) credits were allocated to non-applicable components which were subsequently excluded from the rating.

Table 12: Protocol credit allocation used to assess each of the three central criteria

ASSESSMENT COMPONENTS		RATING				
		1	2	3	4	5
Climate Effects	Exposure	Minimal	Low	Moderate	High	Advanced
Asset Elements	Sensitivity	Minimal	Low	Moderate	High	Advanced
	Adaptive Capacity	Extreme	High	Moderate	Low	Nominal
Climate Risks	Potential Impact	Minimal	Low	Moderate	High	Advanced

Given that each criterion was made up of a number of components, the total credit score of each criterion was averaged out of five (5).

The Resilience Assessment Process

8. **Assessing asset exposure to climate effects (1st criterion) –** To assess Council's overall *exposure to climate effects*, climate projections for timeframes 2030 and 2070 were directly adopted from *The City of Canada Bay Climate Adaptation Plan*.

Based on the Intergovernmental Panel on Climate Change (IPCC) A1B Medium emission scenario, projected climate effects were assessed within the context of the LGA, using the developed rating system to give an overall average rating for exposure.

A component of this assessment (completed for Council's administration building) has been provided in Table 13 below. The results indicate a moderate level of exposure to climate effects. It should however be noted that the overall exposure rating below is based on three climate effects only, and thus is not reflective of the final calculated rating.

Table 13: Climate effects exposure rating using several of the components that made up the original criteria

CLIMATE EFFECTS	SUMMARY OF REGIONAL PROJECTIONS (2030-2070)	CREDIT
Mean temperature change	Increase mean temperature: 2030: 0.95 ^{O}C 2070: 2.47 ^{O}C	2.0
Extreme heat	Increase in extreme temperature (>35 ^{O}C) Current: 8 days per summer 2030: 19 days per summer 2070: 26 days per summer	4.0
Extreme rainfall – inland flooding	Increase in extreme rainfall events (>150mm) Current: 9 days p.a. 2030: 5% (9 events p.a.) 2070: 10% (10 events p.a.)	3.0
Overall Exposure Rating		3.0

9. **Assessing the sensitivity and adaptive capacity of assets (2nd criterion) –** To determine the sensitivity and adaptive capacity of an individual asset, a comprehensive site audit was undertaken across each site with particular focus placed on the following five asset elements:

1. location and design

2. structure and landscape
3. operation and maintenance
4. utilities and services
5. stakeholders.

Asset elements were broken down into a number of sub-elements that were assessed against the developed credit rating system. They were then combined to give an overall average rating for the sensitivity and adaptive capacity of a particular asset.

Table 14 provides a sample of the sub-elements that were assessed under each of the five asset elements, with ratings for each component based on specific audit findings at Council's administration centre.

Once again, it should be noted that whilst the overall result indicates a moderate sensitivity and adaptive capacity for the specific asset, this value is based on a small number of asset sub-elements, and thus is not reflective of the final calculated rating.

Table 14: Sensitivity and adaptive capacity rating using several of the components that made up the original criteria

ASSET ELEMENT	ASSET SUB-ELEMENT	CREDIT
Location and Design and design	Proximity to a coastal zone, inland waterway or urban drainage area	3
	Proximity to an existing flood plain	3
	Sub-Rating	3.0
Structure and Landscape e	Flooring constructed above ground level	2
	Construction made of water resistant materials	5
	Provision of building insulation	3
	Sub-Rating	4.0
Utilities and Services	Provision of back-up power supply for essential services	5
	Proximity to emergency services	3
	Sub-Rating	4.0
Operation and Maintenance	Location of vital equipment and essential services	4
	Capacity of stormwater drainage systems	5
	Sub-Rating	4.5
Stakeholders	Socio-economic profile of surrounding community	3
	Education and awareness raising on climate related issues amongst community	5
	Sub-Rating	4.0
Overall sensitivity and adaptive capacity rating		3.9

10. **Assessing site-specific climate risks (3rd criterion) –** To assess site-specific climate risks, a comprehensive list of all potential climate impacts identified for a typical property was created and subsequently used during individual site audits. A credit score from 1 to 5 for each potential impact was allocated, and combined to give an overall average rating for site-specific climate risk.

Table 15 provides a sample of the climate risk elements were assessed, with ratings for based on specific audit findings at Council's administration centre.

Table 15: Site Specific Climate Risk rating, using several of the components that made up the original criteria

CLIMATE RISK	IMPACT ON ASSET	CREDIT
Mean Temperature Change	Building overheating – increased requirements for cooling	4
	Impact on thermal performance and comfort	5
	Sub-Rating	4.5
Extreme Heat	Reduced network capacity – increase in black-outs	5
	Increased requirements for cooling	5
	Sub-Rating	5.0
Extreme rainfall –inland flooding	Greater intensity of water runoff	5
	Proximity to emergency services	3
	Sub-Rating	4.0
Overall potential impact rating		4.5

11. Individual credit ratings for each of the three central criteria were then combined to determine an overall score out of 15, reflecting a certain level of resilience as outlined in Table 16.

Table 16: Overall Climate Resilience

OVERALL RATING	LEVEL OF RESILIENCE
0.0 - 3.0	Extreme Resilience
3.1 – 6.0	High Resilience
6.1 - 9.0	Moderate Resilience
9.1 -12.0	Low Resilience
12.1 – 15.0	Nominal Resilience

Based on the above partial assessment of Council's administration centre, the overall level of resilience is calculated to be 11.4, indicating that this asset has a low level of resilience to climate change impacts (Note that level of resilience is based on the values of above partial assessments)..

Overall level of resilience of 11.4 = Climate Effects Rating (3) + Sensitivity and Adaptive Capacity Rating (3.9) + Site Specific Climate Risk Rating (4.5)

12. Once the overall resilience of an individual asset was determined, a series of **site specific** adaptation actions were developed and prioritised, enabling Council to undertake specific actions immediately, whilst integrating longer term actions into Council's existing asset management systems.

Table 17 below highlights several adaptation actions identified post-assessment, to increase the resilience and adaptive capacity of Council's administration building.

Table 17: Site Specific adaptation actions to increase resilience and adaptive capacity of Council's administration building

OVERALL RATING	ADAPTATION ACTIONS
Structure and landscape	Investigate the effectiveness of applying heat reflective coatings to the existing roof, or replacing the existing roof (when required) with sheeting that has specified
Operation and Maintenance	Ensure that existing roof drainage system has increased capacity during heavy rain events over 150mm that are projected to increase by 5% by 2030
Utilities and services	Ensure that plant capacity of any replacement HVAC plant factors in the projected increase in extreme heat days over 35°C and an increase in maximum mean temperatures by 2030.
Stakeholders	Implement a proactive program to raise awareness amongst building users and staff around emergency response to an increase in climatic events, such as heavy rain and heatwaves.

13. Council is currently in the process of integrating all resilience measures into both its asset management and long term financial planning strategic documentation, ensuring that future maintenance and renewal works take into consideration identified actions, whilst ensuring that proposed works are budgeted for.

Next Steps – Short Term

Over the coming months, Council will systematically review the *Climate Resilience Assessment Tool* that has been developed, expanding and diversifying the tool where possible to allow for it to be used across all built assets within the LGA.

Additionally, Council will investigate ways in which to adapt the tool such that it may be used to assess the vulnerability of **natural assets** within the LGA as well.

Medium to Long Term

Longer term objectives include extending this tool to inform new developments and capital works projects, whilst integrating this assessment process into the daily operating activities of asset inspectors.

E1 HIGH PERFORMANCE LANDSCAPE GUIDELINES – NEW YORK CITY, U.S.

The New York City Department of Parks and Recreation (DPR) has created High Performance Landscape Guidelines, providing comprehensive guidance and checklists on park planning, design, construction and maintenance, with a focus on mitigating and adapting to climate change. The guidance manual incorporates climate change impacts in its more than 100 best practices, including retaining stormwater in parks and increasing the resiliency of vegetation by considering climate change. Furthermore, in order to quantify greening practices, measure the progress of the projects, and highlight strengths and areas for improvement, DPR also developed the Sustainable Parks Scorecard which enables users to measure the results of implementing a number of initiatives.

Sources:

- Schechtman, J. & Brady, M. 2013, *Cost Efficient Climate Change Adaptation in the North Atlantic*, National Oceanic and Atmospheric Administration Sea Grant and North Atlantic Regional Team, <http://seagrant.uconn.edu/CEANA/NewYork.pdf>.
- *NYC High Performance Landscape Guidelines*, <http://scenariojournal.com/article/high-performance-landscapes/>.
- NYC Parks 2011, *A Plan for Sustainable Practices within NYC Parks,* NYC Parks, <http://www.nycgovparks.org/sub_about/sustainable_parks/Sustainable_Parks_Plan.pdf>.
- NYC Parks 2012, *A Plan for Sustainable Practices within NYC Parks: 2012 Progress Update*, NYC Parks, <http://www.nycgovparks.org/pagefiles/51/SustainableParks_Update_Final.pdf>.
- McKinney, C. et al. (eds.) 2010, *High-Performance Landscape Guidelines: 21st Century Parks for NYC*, NYC Parks, <http://www.nycgovparks.org/sub_about/go_greener/design_guidelines.pdf>.

E2 IRRIGATION MANAGEMENT FRAMEWORK AND DECISION SUPPORT TOOL – CITY OF MARION, SA

Contact: Water Resources Coordinator, City of Marion at council@marion.sa.gov.au.

Background: The City of Marion recognises that climate change is emerging as a vital issue for its community, with recent scientific research showing that societies and ecosystems are highly vulnerable to even modest levels of climate change. Identified impacts of these changes that are relevant to the City of Marion local government area include higher temperatures – including more extremely hot days (over 35°C) and heat waves, more frequent very high and extreme fire danger days, and decreased flows in water supply catchments.

Recent prolonged drought events, coupled with rising water costs, meant that open space and recreation parks were becoming economically unviable for the City of Marion to maintain to a 'fit for purpose' level. This affected amenity values for the community, inhibiting their ability to enjoy the reserves for their intended purposes. Although the most recent drought broke in 2012, many reserves have significantly deteriorated. Council realised the need for a comprehensive, systematic and equitable approach for selecting reserves to bring back to a 'for purpose' state, leading to the development of an Irrigation Management Framework and Decision Support Tool.

a)  b)  c) 

Figure 30: Aerial shot of Travers Street Reserve in (a) 1999; (b) 2006; (c) 2010

Process for development:

- Development of the Irrigation Management Framework and Decision Support Tool was driven by the Water Resources Coordinator with support from the Team Leader for Open Space and Recreation.
- A budget for a three-stage process was secured. The budget was secured from the Open Space planning department through a budget paper and project brief submission. The stages comprised:

1. **Stage 1:** Developed an Irrigation Management Plan, including a Decision Support Tool to assist Council staff in selecting which open space sites should be irrigated and the appropriate level of service provision for each site.

2. **Stage 2:** Prioritised the top five public irrigated open space sites for irrigation infrastructure upgrades. Engaged contractors for design and installation of the irrigation system.

3. **Stage 3:** Bridged the gap between current and required funding for upgrading of irrigation infrastructure. This involved identifying the required budget by auditing and undertaking site condition assessments. Several meetings were then held with key staff and an issues paper was produced. Reports to Council were then submitted and a provision was made to include the identified funding gap in the long-term financial plan.

A working group with landscape planners, operational staff, management, IT and procurement was formed to ensure inter-disciplinary 'buy in' and input into management framework.

The Decision Support Tool: The Decision Support Tool poses questions for consideration when making a decision to irrigate sites. The questions relate to the function of the irrigated landscape, the area to be irrigated, water supply options, maintenance levels and the cost of irrigation. While the cost of irrigation is a major consideration it should not be the initial factor considered. Factors such as functional benefit, developed amenity and community usage should be considered in the first instance followed by an evaluation of water supply options and cost. See below for the document 'Irrigated Public Open Space Decision Support Tool' and accompanying figure, as well as excerpts from the Excel-based tool.

The Irrigation Management Framework addresses the following aspects of turf and landscape management:

- irrigation policy and strategic objectives
- Council's drought response review
- source water options and cost of supply
- turf and irrigation management principles
- landscape design and management principles
- turf and landscape monitoring and performance reporting.

It also includes the Landscape Irrigation Policy, which has the following key objectives:

- Achieve a balance between the provision of an amenity landscape that is aesthetically pleasing, meets the needs of the community and is economically and environmentally sustainable.
- Implement the principles of 'Water Sensitive Urban Design' to achieve integration of water cycle management into urban planning and design.
- Achieve a consistent approach in the provision and development of the irrigated landscape.
- Provide a clear direction and framework for irrigation and water management strategies to enable water conservation and financial accountability.

Council is also implementing an incremental centrally controlled irrigation management system that enables monitoring and control of irrigation systems via a 3G network using laptops and iPads. This

allows more effective and efficient maintenance regimes, and effective reporting. Centrally controlled irrigation systems are available off the shelf and City of Marion selected a provider that was also able to manage flow across Council's new stormwater treatment and aquifer recharge scheme that effectively displaces mains water with treated stormwater for irrigation.

Cost savings are anticipated via reductions in water use (for example by having remote monitoring and control to avoid sites irrigating when it's raining, and through leak detection), as well as from maintenance and reporting efficiencies.

Lessons learnt: While development of the Irrigation Management Framework and Decision Support Tool was fuelled by existing dry conditions, the framework and tool present a process adaptation measure in light of increased temperature and changes in rainfall patterns. Climate change considerations have therefore been embedded into the management of recreation parks and open spaces at City of Marion.

Sources:

- City of Marion, *Turf & Irrigation Management Plan, Irrigated Public Open Space Decision Support Tool*, <http://www.acelg.org.au/sites/default/files/CC-toolkit/E2_Irrigated-Public-Open-Space-Decision-Support-Tool.pdf>.
- City of Marion, *Irrigated Public Open Space Decision Support Tool Flow Chart*, <http://www.acelg.org.au/sites/default/files/CC-toolkit/E2_Tool-Figure.pdf>.

City of Marion - Landscape Irrigation Management Plan - DRAFT 20/06/2013

Appendix No 1.

City Of Marion - Irrigated Public Open Space Inventory

Base Site Data									SA Water Information					
Spec Lis	Inspec te	Irrig Reserves Past and Curre nt	Curre nt / ASR Propo se	IDST Reco mmen de	Reserve Total	Reserve name.	Reserve Type	UBD r	Property Location	Property Descripti	Number Of Meters Connect ed	Account number	Meter Serial Num	Meter Size
					1	Albatross walk 1	developed Rese	175 N4	LT 276 PETREL CL HALLETT COVE	UNDEV RES	1	1064620457	D00425402	25MM
					1	Albatross walk 2	developed Rese	175 N4	LT 270 ALBATROSS WALK HALLE	RES	1	1064635157	X10240239	40MM
				1	1	Aldridge Ave Reserve	Reserve Mains	141 C3	46-48 ALDRIDGE AVE PLYMPTON	RES	1	1009435005	K00400654	20MM
					1	Alia Dr Reserve	developed Rese	164 L15	LT ISLAND ALIA DR SHEIDOW PA	SUPPLY	1	1054716754	95070018	32MM
1		2	1	1	1	Alison Avenue Reserve	Reserve Mains	141 E14	LTS 56 173 ALISON AVE MARION	RES	1	1012842058	98051861	20MM
1	1	3	1		1	Allawoona Reserve 1	Reserve Mains	141 H16	LT 119 BRADLEY GR MITCHELL PA	RES	1	1004824001	99050211	40MM
1	1				1	Allawoona Reserve 2	Reserve Mains	141 H16	86B ALAWOONA AVE MITCHELL	DEVELOPED	1	1004870016	13374	32MM
1	1	3		1	1	Alpine Reserve	Reserve Mains	153 D11	LTS 164 165 ALPINE RD SEACOM	RES	1	1029827305	M30125438	25MM
		3			1	Anton St Reserve	Reserve Mains		PT LT 478 ANTON ST MARION	RES	1	101228800*	K00225154	25MM
1			1	1	1	Appleby Reserve	Reserve Mains	141 A7	LT 101 APPLEBY RD MORPHETTV	RESERVE	2	1018832512	K10232004	32MM
					1	Arthur St Reserve	Streetscape	129 D15	RESERVE ARTHUR ST PLYMPTON	RES	0	1009048005		
		1	1	1	1	Ascot Park Bowling Club (Davidso	Bowling Club	141 E9	9 DAVIDSON AVE PARK HOLME	CLUBRM BO	1	101205000*	M10450027	50MM
1	1	2	2	1	1	Audrey St Reserve	Reserve Mains	141 J8	35-37 AUDREY ST ASCOT PARK P	RES	1	1006166006	98061015	32MM
					1	Bahloo Ave Traffic Island 1	Streetscape		LT 88 BAHLOO AVE MITCHELL PA	SUPPLY BY N	1	1004910102	K10500230	20MM

City of Marion- IPOS Inventory Base Data

Water Supply Cost ($ / kL)

Water Supply	Option	Price	TQVS
Bore	1	0.60	1
ASR	2	2.20	2
GAP	3	2.40	3
Mains	4	3.45	4

Irrigation Requirement

TQVS	kL / m2 / annum	kL / ha / annum
1	1.05	10,500
2	0.57	5,700
3	0.45	4,500
4	0.33	3,300

Turf Maintenance Costs

TQVS	$ / m2	$ / ha
1	-	
2	1.42	14,200
3	1.42	14,200
4	0.52	5,200

City of Marion - Landscape Irrigation Management Plan Tables

Table No 1 - Mains Water Usage 2006 - 2012

Year	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Total Mains Water Usage (kL)	278,114	232,002	120,573	154,309	143,814	132,402	158,544
Diff compared to 2005/06 (kL)		46,112	157,541	123,805	134,300	145,712	119,570
Diff compared to 2005/06 (%)		16.60%	56.60%	44.50%	48.30%	52.40%	43.00%

Chart No 1 – Mains Water Usage 2006 - 2012

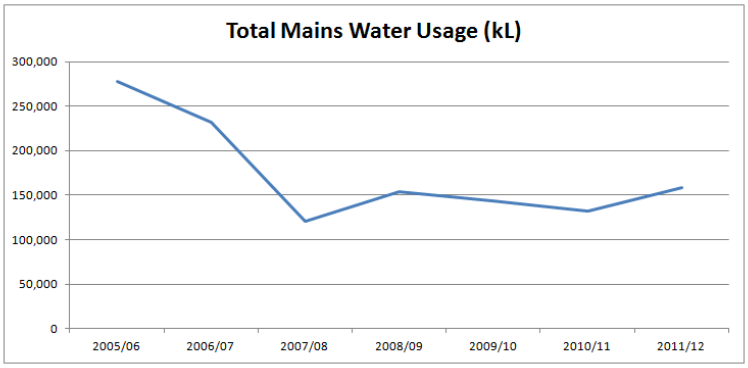


Figure 31: Screen shots from the Excel-based Decision Support Tool

E3 WEED MANAGEMENT PROGRAM – CITY OF LATROBE, VIC

Latrobe City Council utilised publicly available information from the Department of Primary Industries (now Department of Environment and Primary Industries **(**DEPI) to determine the weed species which are likely be more and less problematic in its municipality under future climate change scenarios. The use of this information assisted Council in its decision-making processes, resulting in the operational decision to **not** treat *Senecio Jacobaea* (ragwort) as part of its annual roadside weed management program, unless it was in support of an active community control program. The management of this weed dropped to the bottom of Council's priority list, and provides an example of how existing climate change predictions and information may assist councils in effectively prioritising the use of scarce resources.

The DPI (now DEPI) assessment of climate risk and ragwort (and other weeds) can be found at:

- Steel, J., Kohout, M. & Newell, G. 2008, *Climate change and potential distribution of weeds: Whither the weeds under climate change?*, Department of Primary Industries (Vic), Frankston, pp. 142-8, <http://www.climatechange.vic.gov.au/__data/assets/pdf_file/0007/73249/Whitherthe weedsunderclimatechange2008v1.pdf#page=145>.

E4 WETLAND CONSTRUCTION – SALISBURY CITY COUNCIL, SA

In order to secure a reliable water supply and manage flooding impacts, Salisbury City Council has constructed wetlands, which form an integral part of the City's stormwater drainage system. This strategy has resulted in greater flood control and harvesting of water for reuse and aquifer recharge, whilst demonstrating the importance of managing climate change holistically in order to identify and implement win-win adaptation options.

Source:

- *Wetlands*, <http://www.salisbury.sa.gov.au/Our_City/Environment/Wetlands_and_Water/Wetlands>.

E5 MODELLING FUTURE HEATWAVE RISKS – CITY OF PORT PHILLIP, VIC

The City of Port Phillip is one of the first municipalities in Australia to capture aerial maps of urban heat island effects and how they impact the LGA. The maps (day and night thermal) have assisted the Council's Parks and Open Spaces Team to determine future succession planning for streets and parks, and allow for the development of informed key values and actions when preparing the Urban Forest Strategy and Alternative Greening Strategy. The maps also provide great value in determining ways that the city could enhance building design by building thermal efficiencies and increasing relevant greening in new developments and redevelopments.

To assist community education and action, Council is also developing a community query tool for these maps which will enable local community members to view, understand and build resilience to urban heat island effects. The UHI maps and community query tool were launched in late 2013.

Sources:

- NATCLIM 2007, *Planning For Climate Change: A Case Study*, City of Port Phillip, <http://www.portphillip.vic.gov.au/default/Planning_For_Climate_Change_-_A_Case_Study.pdf>.

CES1 COASTAL STORM EDUCATION STRATEGY TO INCREASE COMMUNITY AWARENESS AND RESPONSIVENESS – PITTWATER COUNCIL, NSW

Contact: Manager – Catchment Management & Climate Change Pittwater Council at pittwater_council@pittwater.nsw.gov.au.

Background: Councils have a responsibility to the community to communicate known risks and help build resilience. Ensuring the community is resilient to floods and coastal hazards is a key adaptation outcome for coastal councils. Pittwater Council realised that a consistent, regional approach was necessary to build community preparedness. As such, Pittwater Council approached the State Emergency Service (SES), and Warringah and Manly Councils to collaborate.

Pittwater, Warringah and Manly Councils partnered with the State Emergency Service (SES) to create a Northern Beaches Flood and Coastal Storm Education Strategy, which follows a consultative and participatory approach to community education, and utilises technical and education staff from across council business units. The education strategy aims to: i) increase community awareness for flooding and coastal storm hazards on the Northern Beaches, ii) increase community preparedness for flood and coastal storm hazards, iii) increase community understanding of, and willingness to engage in appropriate emergency response behaviour, and iv) strengthen regional networks with stakeholders for ongoing support and adaptive capacity within the community.

Process for development:

1. In June 2011 a committee was formed with Pittwater Council, Warringah Council, Manly Council and the SES with the aim of working together to build the Northern Beaches community resilience, understanding, knowledge, attitudes, awareness and behaviours towards flooding and coastal hazards through a tailored and ongoing education program.

2. A project agreement (refer to Attachment 1) amongst the four parties was signed, demonstrating formal 'buy-in' from the general managers of each council. The project agreement is for five years after which it will be reviewed and updated if necessary.

Highlights of the agreement include:

- sharing resources, ideas and practices to produce and implement an education strategy that will satisfy the requirements of all parties involved.
- meeting council and SES legislative requirements.
- developing more consistent and readily available sources of relevant educational information to assist the community with their awareness of flood and storm threats in their vicinity, as well as appropriate responses and actions.

3. Pittwater Council applied to the Auxiliary Disaster Resilience Grants Scheme to assist funding for a community survey on behalf of the committee. The grant was successful.

4. The committee agreed a successful education strategy should be tailored to the community's current level of understanding, awareness and needs. Micromex Research was engaged through a request for quotation to develop and undertake a survey of 600 respondents. A sub-committee prepared the brief and evaluated quotes. This process took approximately six months from the formation of the sub-committee and writing of the brief to receiving the final report on the community survey from Micromex Research.

The aims of the survey were to understand:

- the current level of awareness and perceptions of flood and coastal risks
- awareness of alerts and warning methods
- awareness of the roles and responsibilities of each body
- the community's preparedness for emergency events
- levels and types of emergency events experienced by residents
- pertinent knowledge gaps
- preferred methods of communication to inform the community of emergency events.

The results and recommendations of the survey were used to inform the objectives and actions of the Strategy. The survey results guided the following four key outcomes the Strategy should achieve:

- increase community concern for the potential risk and impact of flooding and coastal storm hazards on the Northern Beaches.
- increase community preparedness for flood and coastal storm hazards evidenced by owning a home emergency kit and establishing an evacuation plan.
- increase community understanding of – and willingness to engage in – appropriate emergency response behaviour.
- strengthen regional networks with stakeholders for ongoing support and adaptive capacity within the community.

5. A sub-committee wrote and compiled the Strategy document. A draft version was circulated for comment amongst members of the committee. The Strategy has a four-year review cycle. It is anticipated that the SES will oversee the review process.

6. The final report was presented to the relevant level of management for each council for information. Each council was then able to include actions and budgets within their respective yearly plans.

7. The Northern Beaches Flood and Coastal Storm Education Strategy final document was reported to the relevant level of management for each council for information.

8. Two to three meetings are held each year to keep the group together, report on recent activities and the success and lessons learnt, and discuss upcoming tasks/events/opportunities to increase awareness within the community.

Attachment 2 includes the program used in the development of the strategy. **Attachment 3** provides a copy of the associated consultation and information document 'Community Floodsafe'.

Lessons learnt:

- The community survey is a valuable tool to guide the outcomes and outputs of the Strategy. It also provides a baseline of information which can be used to compare results over time and assess the effectiveness of the implementation of the Strategy. It is envisaged that a similar community survey will be conducted in the future to measure any changes in community resilience and adaptation to flood and coastal hazards.
- This approach combines resources, experience and funding, and shares workloads and the spread of knowledge. It provides consistent messaging in a coordinated manner. The approach also allows for monitoring and review of the strategy to assess the uptake of messages and methods used in order to improve and refine the actions and direction in future revisions.
- Flood risks and coastal erosion hazard education has been shown to be an effective method of minimising damages, however, the education messages need to be provided at least every six months to enforce the message and build the community resilience.
- Typically, all costs (except staff time) will be split fairly among the parties, dependent on the availability of funds. The Strategy allows for each council to undertake their own education initiatives should the need arise. This would benefit their own residents, without having to split the costs or approach the committee.
- Working with the neighbouring councils and SES has strengthened the relationships and communication lines between the organisations. An example is the sharing of information on social media and direct communication between the councils and SES media staff to exchange information and provide up-to-date information to the community during a natural hazard event.
- The challenge with such a project is to keep the momentum and motivation from year to year. Biannual meetings are a useful tool where each council commits to achieve certain goals by the next meeting.

Acknowledgements: Pittwater Council acknowledges Manly Council, Warringah Council, Sydney Northern SES, and Warringah-Pittwater SES unit for ongoing commitment towards this project. Pittwater Council also acknowledges Micromex Research for the community survey.

Attachment 1: *Project Agreement for the Northern Beaches Flood and Coastal Storms Education Strategy*, **<**http://www.acelg.org.au/sites/default/files/CC-toolkit/CES1_Project-Agreement.pdf**>.**
Attachment 2: *Program for Development of Education Strategy*, <http://www.acelg.org.au/sites/default/files/CC-toolkit/CES1_Program-for-development.pdf>.
Attachment 3: *Community Floodsafe Guide*, <http://www.acelg.org.au/sites/default/files/CC-toolkit/CES1_Floodsafe-Guide.pdf>.

CES2 REGIONAL HAZARD MITIGATION PLAN – KING COUNTY, U.S.

In 2007 an executive decision was made that all King County Departments take actions to address climate change issues associated with land use, transportation, environmental management and clean energy use. Following collaboration and consultation between all key departments, King County developed a Global Warming Mitigation and Preparedness Plan. Within the Plan, climate change issues including severe weather, flooding, drought, fire, landslides and related issues were observed and integrated into emergency management planning and programs, including the 2014 King County Regional Hazard Mitigation Plan.

This living document is now undergoing its first five-year major update since 2009. The plan was a cooperative effort by the Regional Planning Team with participation from King County internal government departments/agencies, the King County Office of Emergency Management, and other city and federal agencies.

Sources:

- *Regional Hazard Mitigation Plan (RHMP)*, <http://www.kingcounty.gov/safety/prepare/EmergencyManagementProfessionals/Plans/RegionalHazardMitigationPlan.aspx>.
- King County 2007, *King County 2007 Climate Plan*, King County, <http://your.kingcounty.gov/exec/news/2007/pdf/climateplan.pdf>.

CES3 TARGETED COMMUNITY ENGAGEMENT – MORNINGTON PENINSULA SHIRE COUNCIL, VIC

Mornington Peninsula Shire Council has undertaken targeted community engagement sessions on climate change issues, with each session tailored to the needs of specific stakeholder groups and the climate change issue in question. The engagement sessions have subsequently motivated residents and local community groups to contribute to the Shire's climate change adaptation agenda.

This work has been complemented by engagement activities focused on certain risks at a more local level. For example, 'Fire Walk and Talk' sessions have been undertaken at a neighbourhood level to inform residents of future fire risks in light of climate change projections. The sessions involve actual walk throughs of reserve areas with shared responsibility messaging. Adaptation measures discussed included the retrofitting of houses. In contrast, engagement on updated flood mapping (which includes an increase in rain intensity and sea level rise based on climate projections) and flooding impacts has been undertaken at a catchment level.

Sources:

- Mornington Peninsula Shire Council's community engagement programs, <http://www.nccarf.edu.au/localgov/case-study/mornington-peninsula-shire-councils-community-engagement-programs>.

CES4 SUPPORT FOR VULNERABLE COMMUNITY MEMBERS DURING HEAT WAVE EVENTS (COMMUNITY CARE PROGRAM) – CITY OF MARION, SA

Contact: Community Development Department at council@marion.sa.gov.au

Background: The City of Marion recognises that climate change is emerging as a vital issue for its community, with recent scientific research showing that societies and ecosystems are highly vulnerable to even modest levels of climate change. City of Marion's climate change policy is to lead its community in response to the risks and opportunities posed by climate change and to enable climate resilience into the future.

Identified impacts for the region include higher temperatures including more extremely hot days (over 35ºC) and heat waves. In previous heatwaves, staff of the City of Marion and SA Health recognised that frail aged people and people with a disability were vulnerable to heat stress, in part because of the difficulty of affording rising energy bills to keep their home cool and/or because some of them have no air conditioning or inadequate air conditioning.

A key response to previous heat wave events has been through City of Marion's Home and Community Care Program. The Community Care Program provides gardening and house cleaning, social support through Neighbourhood and Community Centres and a volunteer program where clients are transported to medical appointments and shopping by trained volunteers in the volunteer's vehicle. The service is supported by both state and federal government funding, recognising that people who are frail and aged, people that have a disability and carers of these people, may require assistance to enable them to remain in their own homes and to lead fulfilling lives and to remain connected to the broader community. Other agencies are involved in the program, including Red Cross.

Specific 'heat-related' program services were formulated in response to information gathered from clients about the assistance available to them and their behaviour during heat waves. Importantly, the services will enable this sector of the community to adapt to rising temperatures and other changes in climate conditions into the future.

Program components: components of the program addressing heat waves include:

- A brochure giving tips on safely coping with heat waves was provided by SA Health: 'Preventing Heat Related Illness,' and was sent out in a newsletter by mail to the Community Care Program clients.
- Council funds two community buses, which provide a door-to-door service and typically takes people to shopping services and occasionally to organised outings.
- The buses continued to transport clients, as the buses were air conditioned and the destinations were air conditioned.

- Generally across the Council, the Council's swimming pool and libraries extended their opening hours to provide a cool refuge for people.
- Bottles of cooled water were provided to the bus drivers and the clients on the community bus.
- If a resident came to the front counter of the council, bottles of cooled water were available for them to take.
- Community Safety Inspector staff (formerly called General Inspectors) took bottles of cooled water with them when they went out in the community and offered them to any people they saw walking in the heat.
- The drivers of the community buses were spoken to regarding keeping cool and ensuring clients' safety in the heat.

Process for embedding:

- As a response to a series of heatwaves, City of Marion Council was asked by staff of the Community Care Unit to take an active role in contacting residents about their knowledge and behaviour in coping with extreme heat.
- A meeting was held with staff of the Community Care Unit regarding strategies to assist their clients.
- Clients of the Community Care Program were contacted over the phone and asked general questions about whether they had air conditioning or a fan, how they kept cool, did they keep blinds closed to keep the heat out of the home and then open windows in the evening to let in cool air, security (e.g. having windows or doors opened), did they have family or friends who regularly contacted them, did they know about the Red Cross telephone service and were they registered for this service and if not, they were referred to the service. These behavioural patterns were then addressed in the Community Care Program services to increase the community's adaptation to the increased frequency of extreme heat waves.
- The City of Marion's Risk Unit was consulted.
- Strategies for aiding community adaptation to extreme heat were decided and put into the Community Care Program Services.
- Home and Community Care (HACC) funding was provided by state and federal governments and Council funds the two community buses as part of their disability services.
- No extra staff were employed.
- No changes were required to job descriptions.

Sources:

- Department of Health (SA) 2011, *Preventing heat-related illness*, SA Health, <http://bit.ly/1hGYs98>.

CES5 COMMUNITY SURVEY – BASS COAST SHIRE COUNCIL, VIC

In September 2014 Council undertook a survey to determine where the community 'sits' on the topic of climate change, including to establish community perceptions on roles, responsibilities and key issues for the council and community to consider (refer to the attachment for copy of the survey). The survey results will be used to inform future engagement and consultation, including the scope and methods of engagement. The key issues and concerns will also feed into a climate risk assessment and adaptation planning process for Council's services and operations.

Attachment:

- Survey: *Bass Coast Shire Council is seeking your input on climate change*, <http://www.acelg.org.au/sites/default/files/CC-toolkit/CES5_Climate-Change-Survey.pdf>.

ED1 BUSINESS CLIMATE TOOLKIT AND CHECKLIST FOR ENGAGING SMES IN CLIMATE RESILIENCE – SEFTON COUNCIL, U.K.

Contact: Environment Service contact form.

Background: In 2010, Sefton Council in partnership with Invest Sefton (a government agency providing advice and support to existing and new businesses) initiated a six-month project to examine and build the resilience of local businesses, and in particular small to medium enterprises (SMEs). SMEs were a focus in recognition of their generally limited time and resources to take the necessary steps to adapt to the risks and opportunities presented by climate change.

Key aims of the project were to provide businesses with a toolkit to assess their own risks and opportunities, and to signpost local businesses regarding wider climate change support and information.

Process for development and implementation: The project involved three parallel, and interlinked, processes (illustrated by Figure 33):

1. engagement with businesses, in order to raise awareness of the impacts of climate change and the benefits of adaptation; to understand the information and support that they needed; and to test the draft toolkit materials

2. the development of the adaptation toolkit materials, which included a leaflet, web pages, and a business climate checklist (see below)

3. the development of ideas for future support to businesses on climate change adaptation.

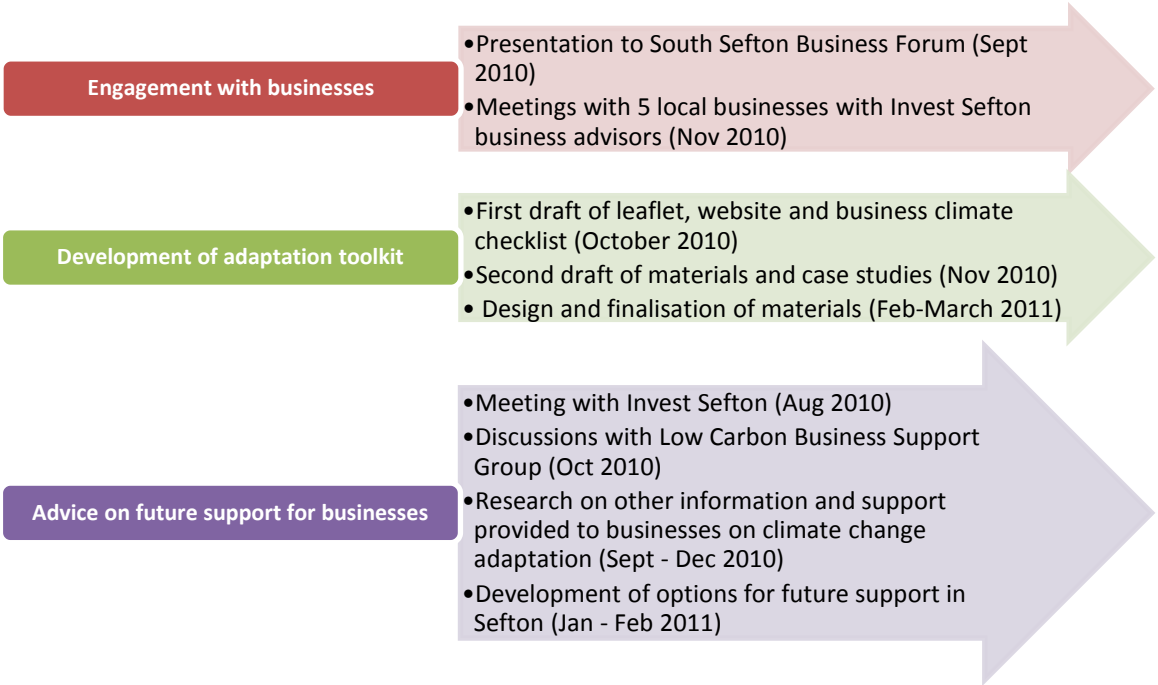


Figure 32: Process for development of the toolkit

Business Climate Checklist: The Business Climate Checklist was designed to enable businesses to carry out a self-assessment of the risks and opportunities of climate change for their business. The Checklist was accompanied by explanatory notes or a glossary on each of the risk areas (see the glossary below). The engagement revealed that businesses, while aware of the risks and opportunities of climate change, found the Business Climate Checklist a useful resource.

Lessons learnt: Benefits of the project included building strong links with Invest Sefton as well as building local businesses' understanding of adaptation. The project has also provided the basis for a future project to further assist businesses on a range of environmental/financial resilience issues.

The key lesson for improving the project is the need to undertake more preparation work to 'warm' businesses to the project – for example, by making clearer links with the financial and longevity/survival implications of adapting (or not adapting)**.**

Business Climate Checklist

Planning ahead for climate change makes good business sense.

This Business Climate Checklist is intended to help you:

1. **THINK** about how climate change will affect your business
2. **PLAN** – assess and address the risks and opportunities by putting a plan together:
    - Consult those who are likely to be affected (your managers, staff, suppliers and customers – using it as an opportunity for market research)
    - Access information and support to help you adapt your business
    - Identify the actions that you need to take
    - Identify who is responsible for doing what
    - Keep your plan up to date
3. **ACT** – take action to reduce the costs of climate change, and cash in on the opportunities.

A quick check of your business's resilience to climate change

<table>
<tr><th colspan="2">1. Learn from the past</th></tr>
<tr><td colspan="2">Your business may have already been affected by extreme weather. Learning from past incidents and procedures will help you plan for the future.</td></tr>
<tr><td>THINK
1. How has your business been affected by weather in the past?
2. What were the impacts?
3. How did your business manage these risks?</td><td>ACT
Learn from the past.
Look back at how your business has been affected by extreme weather, how your business coped, and how you can improve procedures.</td></tr>
<tr><td colspan="2">PLAN
Remind yourself of recent weather events by looking at Sefton Council's website, which will sooner be updated with information about climate change and the impacts of extreme weather.</td></tr>
</table>

2. Finance and insurance

Company finances will be affected by climate change through the cost of disruption, damage and lost sales. Not addressing climate risks could make securing investment and insurance cover difficult, while good risk management will make your business more attractive to investors and customers.

THINK	ACT
4. Is your business insured for the correct value, including the full cost of rebuilding, site clearance and professional fees? 5. Does your policy include business interruption cover? 6. Are you covered for floods and storm events? 7. Does your insurance policy replace new for old or have limits for repairs? 8. Do you review your insurance policy each year to accommodate growth, capital expenditure and sales peaks? 9. Have you photographed or video recorded your premises inside and out and archived offsite?	**Check your insurance**. Check that your business is fully insured for business interruption, flooding and storm damage. • Confirm that your policy includes business interruption cover. • Make sure that the period of time that you are insured for is adequate. Major floods can involve long delays while the property dries out and affected customers return to do business with you. • Confirm that your policy covers the full value of your business, including the full cost of rebuilding, site clearance and professional fees. • Check whether your policy will replace new for old or have limits for repairs. • Check that buildings and content insurance covers flooding and storms. • Review your insurance cover at least annually to accommodate growth, capital expenditure and sales peaks. • Catalogue your assets by photographs or video and store offsite to facilitate replacement.

PLAN

For more information about the different types of insurance your business may need see the Association of British Insurers guide to Insurance for Small Businesses: a guide to protecting your business or phone 020 77600 3333.

3. Make your premises resilient	
The costs of damage to your premises from heavy rain, flooding, storms, subsidence and higher temperatures are likely to rise. Making sure your buildings are fit for changing conditions and extreme weather will reduce unnecessary costs and fuel bills.	
THINK 10. Are your (current or future) business premises at risk from flooding? 11. Are any of your local drains ineffective or blocked? 12. Can your roof and guttering cope with heavier downpours and more gales? 13. How well do your buildings cope with high temperatures – without replying on air conditioning? 14. Could your buildings be affected by subsidence? 15. Do you check regularly to ensure that your premises are adequately maintained? 16. Do you catalogue high value assets to ensure that they are insured for the correct value? 17. Is your (electronic and paper-based) data backed up and archived regularly off site? 18. If you are at risk from flooding, do you have appropriate flood defences e.g. sandbags, plywood or metal barriers? 19. Do you have the equipment to clean up after an event? 20. Have you considered whether you could operate from alternative premises if you had to? 21. Do you have any processes or products that are temperature or climate sensitive? 22. Are your products, stock and raw materials stored in places that are safe from severe	ACT Check your flood risk and weather warnings. • Find out if you are in a flood risk area • Sign up to, and regularly check weather warning services • Environment Agency - free 24 hour Floodline Warnings Direct Service: 0845 988 1188 • Met Office • Air pollution forecasts. **Protect your premises**. • Regularly check local drains, downpipes, gutters and culverts to ensure they are not blocked with debris. • Empty oil traps regularly to minimise pollution in the event of floods. • Protect your premises and their contents from flooding. • Where possible, move critical assets and stock as high off the floor as possible (including paper archives, central IT and communication equipment). • Do not store assets or stock in the basement if possible. • Think about expensive stock such as plant and vehicles and whether they can be relocated rapidly. • Move electrical sockets to above the flood level and separate electrical circuits.

weather (including hot temperatures and areas at risk from flooding)? 23. Do you know how to contact your employees out of hours to get assistance in moving or protecting your stock?	• Lay ceramic tiles on the floor instead of rugs or carpets. • Use lime plaster instead of gypsum. • Fit stainless steel or plastic kitchens instead of chipboard. • Position main parts of heating and ventilation system upstairs. • If you are in a high flood risk area, fit back-flow devices to drains and sewers. Take steps to manage and regulate temperature of premises and storage, for example by installing insulation, ventilation and cooling and shading. • Use greenery on site to provide shade, absorb rain water and reduce flooding, and wind protection. • Insulate your premises to keep heat out in summer and keep heat in winter. • Reduce solar gains in summer by using shading, such as blinds. Use surface treatments which reflect heat in summer, such as light coloured paints, and materials that soak up unwanted heat, such as concrete, stone and tiled floors. Ensure ventilation (such as windows) can be regulated through the day and night.
PLAN *Would your business stay afloat?* from the Environment Agency • Prepare a flood risk plan – see advice from the Environment Agency • Prepare a Business Continuity Plan – see the Sefton Council's Emergency Planning website for advice and further information • Investigate a reliable archive system or specialist storage facility • Check your lease agreement and insurance and maintenance arrangements with the owner. • If upgrading your premises, consider ways to make your property more resilient to severe weather. • Consider sharing clean-up equipment with neighbouring businesses. • Consider alternative temporary accommodation in the event of an emergency.	

4. Protect your people

During the heavy snow in 2007, one in seven staff in small businesses failed to make it to work because of transport disruption and school closures. Your staff could be more exposed to hotter summer temperatures and at risk during extreme weather events. Putting in place measures to manage these risks and providing appropriate training will help you to retain high quality staff and improve your reputation as a good employer.

THINK

24. Do your premises suffer from high internal temperatures from direct sunlight or on hot days?

25. Do your premises suffer from cold internal temperatures on cold days?

26. Have you experienced problems with staff attendance during severe weather e.g. when hot, or when flooding disrupts transport links?

27. Are your staff vulnerable to extreme temperatures? Have you considered risks such as fainting, injury and reductions in efficiency?

28. Are there any areas where slips and falls could occur during extreme cold or rainfall?

ACT

Review health and safety procedures.

- Identify individuals and roles more at risk.
- Raise awareness of the impact of extreme temperatures on people and provide appropriate training.
- Make sure you reduce the risk for staff with medical conditions such as high or low blood pressure, heart disease, epilepsy or diabetes which might be made worse by extreme temperatures (hot or cold).
- Minimise the risk for other people that could be at risk, such as nursing mothers, outside workers, manual workers who are physically active, kitchen staff, or staff operating equipment or machinery.

Protect your staff in very high, and very low, temperatures.

Protect staff in very high temperatures.

- If the task allows, encourage workers to wear suitable summertime and comfortable clothing to work to minimise discomfort.
- Install thermometers and identify cool areas.
- Insulate high temperature pipes and plant.
- Ensure there is good ventilation and encourage regular breaks (provide water and ice).
- Move workstations away from direct heat and

	fitting external shutters can help reduce glare. • If you do not have suitable air conditioning equipment and it is too expensive to install, consider other ventilation and working-from-home options. Protect staff in very low temperatures. • Ensure that you have grit/salt supplies and that adequate gritting of access routes is undertaken in snowy and icy conditions. • For outside workers, increase breaks to avoid hypothermia and consider other measures such as cold weather clothing. • Encourage staff to wear appropriate footwear to prevent slipping on ice.
PLAN • Ensure that you have identified potential problems. For further information visit the Health for Work Advice website for small businesses or contact them on 0800 0778844. • Check your legal obligations (under the Health and Safety at Work Act 1974) and understand your liabilities with respect to working conditions in the workplace by visiting the Health & Safety Executive's (HSE) advice on thermal comfort and outdoor working. • Consider smart working arrangements, such as flexitime, home working and remote working to manage the impacts of weather events on your staff.	

5. Reassess your markets

Extreme weather may affect the quality of your suppliers' products and services and could lead to reduced sales of specific products. Warmer, wetter weather will present opportunities for developing and marketing existing and new products such as climate-resilient construction techniques, tourism opportunities and summer-related products.

THINK	ACT
29. Does the weather affect your sales? Do seasonal variations affect demand for your products or services? 30. Does severe weather and/or hotter, drier summers and warmer, wetter winters offer any opportunities? 31. Do you have a product or service that could be exploited/developed in this market?	Cash in on a changing climate. Understand and make the most of the specific threats and opportunities that extreme weather and climate changes pose for your own market area.

PLAN

- Understand the specific threats and opportunities for your sector:
- Agriculture; see also the National Farmers Union's Farming Futures website
- TourismBuilding design and construction
- Motor manufacturing
- Financial services.

6. Adapt your logistics	
Transport, supply chains, utilities could be disrupted by extreme weather events locally and internationally. Your business will have a competitive advantage if flexibility is built into supply chain and delivery systems. Supplying local markets can help reduce the likelihood of disruptions and reduce transport and carbon costs.	
THINK Transport 32. What happens if staff cannot get to work because of extreme weather? 33. Do staff travel regularly on company business in company vehicles? 34. Do you have a procedure for driving in severe weather? 35. Are your vehicles checked regularly for road worthiness? 36. What would be the implications if a staff member was injured on company business?	ACT Check the safety of your vehicles and staff. • Reduce the need for business travel where possible, to save costs and carbon emissions. • Check insurance of staff whilst travelling on company business – does this cover problems due to extreme weather conditions? • Make your staff aware of procedures for driving in severe weather. • Make sure the drivers of vehicles transporting your products are experienced and are aware of the risks of driving in extreme weather (i.e. through floodwaters, on icy roads or during high winds).
Supply chain 37. Are you reliant on a single source supplier for critical goods? 38. What would be the implications if something happened to that supplier? 39. What would happen if your supplier(s) is/are affected by severe weather? E.g. their premises and products are damaged or they cannot get to you because of weather-related disruptions. 40. What would happen if you could not get your products or services to your customers because of weather-related disruptions to road, rail or air services?	Think how your supply chain will be affected and consider alternatives in the event of extreme weather. • Consider alternative suppliers and/or increasing storage capacity to increase your ability to operate without deliveries. • Consider sharing suppliers with similar businesses in your area. • Think about how you get your products to your customers or how your customers get to you. Consider how the routes could be disrupted by extreme weather. • Consider using alternatives (e.g. teleconferences) for meetings when you

41. What would happen if your customers could not get to you because of extreme weather? 42. Do you lease equipment or plant which could be damaged at a customer's property? Would production come to a halt?	cannot deliver your service in person. • Investigate having a reciprocal agreement with key suppliers to ensure cooperation in the event of a major incident happening to either party, including cancelling, delaying or changing delivery address.
Utilities 43. What would be the implications to your business if you had water restrictions or your supply was cut off? Water companies have a legal duty to supply households, but not businesses. 44. What would be the implications to your business if you lost your electricity or gas supply? 45. How would your business be disrupted if your computers, phones or equipment does not work? 46. If your pipes freeze, are they vulnerable to bursting?	Reduce your energy and water consumption. • Consider alternative sources of power and water, such as on-site renewable energy, a back-up generator, emergency water supplies. • Reduce your business' reliance on energy and water where possible. • Ensure that you have arrangements for communicating by phone/electronically if the telephone, mobile or computer network is affected in the event of an emergency.
PLAN For advice on road related safety see the Health & Safety Executive website. For more information, advice and support to help you manage your energy and water consumption, contact: - ENWORKS – the North West's environmental business support service - Business Link North West.	

This checklist has been produced by CAG Consultants Ltd on behalf of Sefton Borough Council and Invest Sefton, through a project funded by the Climate Change Local Area Support Programme (CLASP).

The Business Climate Checklist and advice have been adapted from a number of documents, including:

- Business in the Community North East's Business Resilience Health Check
- Weathering the Storm – Saving and Making Money in a Changing Climate. A Practical Guide for Small Businesses in the West Midlands (May 2010). Produced by URS Corporate Ltd on behalf of the West Midlands Climate Change Adaptation Partnership.

- Adapting to climate change: a brief guide for business (February 2009). Produced by Business in the Community and supported by the Northumbria Regional Flood Defence Committee and the Environment Agency.
- Adapting to climate change: a checklist for development. Guidance on designing developments in a changing climate. (November 2005). Published by the Greater London Authority on behalf of the South East Climate Change Partnership, the Sustainable Development Roundtable for the East of England and the London Climate Change Partnership.

GLOSSARY
Loss of Habitat, Species & Species Migration Climatic conditions will change to favour some species more than others which will lead to losses of some types of habitats and an encroachment of others.
Sea level rise/associated coastal flooding The potential for rising sea levels could mean a net loss of area and increased flood risk. This would lead to disruption/damage of coastal land and threaten its sustainability. Also some services would be disrupted and affect permission to develop and use land threatened areas. There is also Is the threat to existing buildings and infrastructure.
Flooding/Drainage (Not attributed to Sea level rise) Extra winter rainfall and more intense rainfall events throughout the year will disrupt transportation, power supply and other services due to flooding. Development & Design standards are likely to be inadequate Land use and subsequent development changes will be necessary.
Heatwave – Effects on human health Hotter and drier Summers will have an effect on human health. This will affect how services are required and resourced. As a result there will be an increased need for health related services/care. Some buildings or parts of building might not be suitable for use. It is possible there could be inadequate availability of water in public areas and the population will be more vulnerable to sunburn.
Drought (Water supply/shortage) Hotter and drier Summers will increase demand for water from all sectors whilst potential supplies will be more limited.
Road degradation and associated infrastructure A combination of hotter summers and wetter winters compounding the effects of rutting, potholes and road collapse

GLOSSARY
Increased storminess and high winds (frequency and severity) Such extreme weather is likely to threaten all buildings and their ability to stay open safely (Such as schools, hospitals other public buildings and businesses) Transport systems could face disruption if blocked by fallen debris and services reliant on mobility would suffer be unable to run normally.
Ground Conditions for buildings (wetter winters/drier summers) A combination of wetter winters and drier summers can potentially lead to increased damage to built structures from swelling and contraction of the ground. Therefore design/construction methods will become increasingly inadequate
Milder Winters - Effects on human health Warmer and wetter winters could increase the occurrence of respiratory diseases. The increased growth of mould and mildew will compound this effect Certain diseases which are normally regulated by cold snaps could become more prevalent. In the case of contagious diseases it is likely to have implications on mobility and effectiveness of services which require close contact amongst people.
Traffic Congestion (Summer) Traffic jams increasing in frequency and severity with an increasingly inadequate transportation network. This effect is hard to define but will be influenced by anticipated tourism demand increasing. As well it is linked strongly to other climate change risks already listed such as Heat stress, effects on health services and road degradation.

ED2 COMMUNITY ECOSYSTEM-BASED ADAPTATION OPTIONS FOR EMPLOYMENT AND UPSKILLING – ETHEKWINI MUNICIPALITY, SOUTH AFRICA

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Background: Ecosystem-based Adaptation (EBA) is the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people adapt to the adverse effects of climate change. It is about conserving and restoring ecosystems while at the same time building the resilience of those ecosystems as well as of communities, for example through increasing food security and water purification, or building wetlands to reduce the need for stormwater infrastructure.

Durban is addressing the complex challenges of climate change through the development of a city-wide Municipal Climate Protection Programme initiated in 2004. In developing the Programme, EBA was identified as an important mechanism for increasing the adaptive range of the city – based on its potential for the protection of Indigenous biodiversity and the associated ecosystem services. EBA was also identified for playing a role in alleviating poverty by promoting employment and creating upskilling opportunities in the local Durban communities.

Process for implementing EBA: The steps outlined below for implementing EBA have been developed as a potential roadmap for local government and include lessons learnt based on the Durban experience.

Step 1: Asking the question: It is important for local governments to understand the consequences of climate change on biodiversity. In Durban, the impacts of changing temperature and precipitation regimes (and associated changes in landscape processes) on the distribution and status of key ecosystems and species were assessed using bioclimatic modelling (associated with five General Circulation Models (GCMs)). This modelling defines the 'envelope' that best describes the limits to a species' spatial range and uses this information to simulate future occurrences under climate change conditions. This modelling allowed Council to understand at a species level likely changes such as increased distribution of invasive plant species, and a retreat inland of other species. There were limitations with this modelling, including the availability of distribution and occurrence data. A research partnership has therefore been established to improve the quality and coverage of datasets available for future modelling exercises. This is a key lesson for other councils as biodiversity research is not the core business of local government.

Step 2: Filling the gaps: Effective climate adaptation requires the uncertainty associated with regional-level climate change projections to be addressed. In Durban a research partnership has been formed between the eThekwini Municipality and the University of KwaZulu-Natal through a memorandum of agreement signed in 2011. The partnership is focused on advancing knowledge in biodiversity conservation and management within the context of global environmental change and includes an internship programme. Seed funding has been provided for the research and is being used by the University to seek additional funding to expand the project scope and range of partners. Such institutional partnerships are essential to generate the knowledge capital needed for effective EBA.

Step 3: Reducing the impact of non-climate stressors: In Durban, the principles of systematic conservation planning have been utilised to identify priority biodiversity and ecosystem service areas. Systematic conservation planning allows biodiversity processes that provide the links between species, ecosystems and their environments. This enables incorporation of projected climate changes into the planning framework. This resulted in a strong emphasis on hydrological processes such as run-off and sediment supply. Information resulting from the systematic conservation planning process is being used to produce one comprehensive plan that optimises the representation of biodiversity and ecosystem services. Work is also being done to understand and predict the replacement costs of various ecosystem services. This information can be used to build incentives, such as payment for ecosystem services, into the 'green economy' with more certainty.

The development of this plan has involved a broad spectrum of stakeholders, and includes a memorandum of understanding with the provincial conservation authority that can support in development of locally developed fine-scale plans. This level of cooperation is important, given that ecosystems rarely respect political and jurisdictional boundaries.

Step 4: Securing the conservation estate: A key challenge to conservation in local government is that in many cases the natural resources will not be owned by local government. Durban has addressed this through various approaches including:

> Land acquisition: Council's Environmental Planning and Climate Protection Department has received US $250,000 annually for land acquisition since 2002. As of early 2012, 270 hectares had been acquired. This represents 12.1 per cent of the formally conserved areas within the municipality. Improved landscape connectivity has been the key criterion for land acquisition selection.
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> Special rating area (SRA).: as it is not practical to acquire all at-risk ecosystems, a suite of targeted and varied land use management interventions are being used. One of these is the 'special rating area'. The Municipal Property Rates Act makes provision for the formation of SRAs through an additional levy on property tax to enable improved services or upgrades in an area. A variety of requirements need to be met including an implementation program to ensure commitment by landowners to manage the SRA. Management of the SRA established for conservation/restoration purposes may include invasive alien plant control, fire management and pollution monitoring and enforcement.
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> Town planning tool: including nil property tax rating of environmentally sensitive properties that are protected and managed. The introduction of environmental considerations into the general valuation methodology is also being investigated, so that perverse incentives to develop sensitive land are removed and that land that can't be developed because of its environmental characteristics is taxed nominally. Assistance to landowners on the provision of biodiversity protection such as fire management techniques is a critical part of the equation.

Step 5: Expanding the conservation estate: Durban has established community reforestation initiatives including on land previously cleared for dry land sugar cane cultivation (521 hectares). Trees for the project are provided by adjacent rural communities who are trained by a municipally appointed NGO to become 'treepreneurs', sourcing seeds from local forest patches, which are then propagated at local homesteads. Project facilitators (also drawn from the community) collect tree seedlings and issue credit

notes that can be used at quarterly 'tree stores' for food, building materials, school fees and other pre-ordered goods. The communities involved are some of the most impoverished and vulnerable in Durban. Since its inception, a total of over 20 full-time, 10 part-time and 600 temporary jobs have been created for members of local communities, with another 550 community 'treeprenuers' engaged in producing and trading trees. This and other projects have been initiated using Danish International Development Agency funding, but are not fully funded by eThekwini Municipality. Research programs to monitor the resulting change in ecosystem services as well as the socioeconomic impacts of the project are being established.

Step 6: Expanding green infrastructure: The Green Roof Pilot Project was initiated in 2008 on an existing municipal building to explore the benefits of green roofs in reducing temperatures and stormwater runoff, and in enhancing the city's adaptive capacity. Crop trials have also been undertaken to improve urban food sovereignty. The success of the project has encouraged the uptake of the idea by other organisations – demonstrating the value of pilot projects in changing perceptions. Scaling up of the projects however remains a challenge.

Step 7: Reducing the threat of invasive alien species and woody encroachment: Durban is addressing the important issues of invasive alien plants (IAP) through a phased and multi-pronged approach including:

- development of an IAS Framework Strategy and Action Plan
- a process for prioritising areas for control
- an IAP Control Training Programme
- coordination of IAS control activities across municipal departments
- control of emerging weeds
- auditing of municipal propagation and storage nurseries and some formal parks, and
- the development of web-based data capture system to ensure improved monitoring, reporting and verification.

Step 8: Building the green economy: This is a two pronged approach – firstly, making the existing economy greener through changes to production and consumption processes thereby reducing the demand for ecosystem services, and secondly, by building a new economy based on bio-infrastructure, which increases the supply of ecosystem services. EThekwini does not yet have a formal strategy for greening the existing economy. More progress has been made in the second area. Two expanded public works projects of note are:

- **Working for Ecosystems:** an ecosystem management and restoration programme initiated in 2006. Initial funding was through the National Environmental Department. The programme involves training and employment for approximately 155 people in rural and peri-urban areas of the city in IAP control, business development, HIV/AIDS awareness and basic fire-fighting and first aid. Assistance in developing small businesses has also been provided so that emergent contractors can be registered as service providers on the municipal procurement database. In early 2012, three contractors had been registered.

- **Working on Fire:** In 2009 a team of 25 staff and one manager was appointed by eThekwini Municipality to clear IAPs within the municipal area. The team works primarily in previously unmanaged areas, removing IAP manually and through the use of fire. Due to the success of the program, an additional team was appointed in 2010. All received training including in basic ecology. Employment is targeted again at poorer communities.

Step 9: Institutional change: Implementation of the above programmes has necessitated a restructuring of the eThekwini Municipality's Environmental Planning and Climate Protection Department on two levels:

- creation of a dedicated Climate Protection Branch in 2007 in acknowledgement that local government has a clear role in ensuring climate protection
- the establishment of a dedicated Biodiversity, Climate and Green Project Implementation Branch in 2011 to manage large-scale, long-term projects.

This will ensure that the research and implementation aspects of the adaptation work stream are comprehensively addressed.

Step 10: Exploring new directions: There is a pressing need to identify innovative opportunities to communicate and promote the links between biodiversity, ecosystem services and successful climate adaptation. Durban is using locally well-known ecological phenomena, such as the potential impacts of climate change on the arrival of sardines and the associated eco-tourism industry, to convey strategic messages in an accessible way. Other mechanisms are also being explored.

About ACELG

ACELG is a unique consortium of universities and professional bodies that have a strong commitment to the advancement of local government. The consortium is based at the University of Technology, Sydney, and includes the UTS Centre for Local Government, the University of Canberra, the Australia and New Zealand School of Government, Local Government Managers Australia and the Institute of Public Works Engineering Australia. In addition, the Centre works with program partners to provide support in specialist areas and extend the Centre's national reach. These include Charles Darwin University and Edith Cowan University.

Program Delivery

ACELG's activities are grouped into six program areas:

- Research and Policy Foresight
- Innovation and Best Practice
- Governance and Strategic Leadership
- Organisation Capacity Building
- Rural-Remote and Indigenous Local Government
- Workforce Development.

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