



## Adaptation benchmarking survey: initial report

Climate Adaptation National Research Flagship

*Working paper #4*

Helping Australia Adapt to a Changing Climate

John Gardner, Richard Parsons and Gillian Paxton



**Australian Government**  
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### Enquiries

Enquiries regarding this document should be addressed to:

John Gardner  
PO Box 883  
Kenmore Queensland 4069  
Phone: + 61 7 3327 4076  
[John.Gardner@csiro.au](mailto:John.Gardner@csiro.au)

Enquiries about the Climate Adaptation Flagship or the Working Paper series should be addressed to:

Liese Coulter, Communication Manager  
CSIRO Climate Adaptation National Research Flagship  
Phone +61 7 3214 2642  
[Liese.Coulter@csiro.au](mailto:Liese.Coulter@csiro.au)

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## 1. EXECUTIVE SUMMARY

This document reports on research into the current level of adaptation planning in Australian organisations. The project is being conducted jointly by CSIRO's Climate Adaptation Flagship and the Australian Government Department of Climate Change (DCCEE), and involves a longitudinal survey of public- and private-sector organisations that would ideally play a significant part in Australia's efforts to adapt to the impacts of climate change. The project is designed to benchmark the current level of adaptation activities in sampled organisations, to allow for tracking of changes in adaptation activities, and to attribute observed changes to the impact of the DCCEE, the Climate Adaptation Flagship, and other agencies where appropriate. The project is also intended to raise levels of awareness of the Flagship and climate adaptation in general, and to provide information that could be used to help estimate the financial impact of the Flagship's activities.

Initial telephone surveys were conducted in late 2008, and included state and local government groups, infrastructure management organisations and a variety of industry representatives and individual businesses. The survey measured the type and extent of adaptation activities these organisations are currently undertaking. Survey results indicate that although most businesses recognise the challenge posed by climate change, and accept that both mitigation and adaptation are important, the nature and extent of adaptation activity was highly variable. Only 59% of surveyed organisations have conducted a formal vulnerability assessment, and less than 40% have implemented any specific planning or other changes aimed at adapting to future climate change impacts. Other specific findings of interest from the telephone survey are:

- There is a degree of confusion between mitigation and adaptation. Many respondents described mitigation activities when asked about adaptation activity, even after formal definitions of both adaptation and mitigation had been given to them.
- Adaptation activity appears to be linked to knowledge and beliefs about climate change issues. Organisations that rated climate change, adaptation and (to some extent) mitigation as more important, and those with higher knowledge of adaptation and mitigation, were more likely to have conducted vulnerability assessment and adaptation planning.
- Adaptation activity appears to be more likely to occur in organisations with longer planning horizons. There is also some indication that larger organisations (reflected by annual turnover and staff numbers) were somewhat more likely to have conducted vulnerability assessment and adaptation planning than smaller organisations.
- Adaptation activity appears linked to contact with outside organisations. Respondents who reported contact with outside organisations (including the DCCEE and CSIRO) were more likely to have conducted vulnerability assessment and adaptation planning.
- Once vulnerability assessment has been conducted, especially if it indicates that the organisation's vulnerability is high, subsequent adaptation planning is more likely. This finding suggests that prompting organisations to conduct vulnerability assessments may be expected to have flow-on impacts on levels of adaptation planning.

In late 2008 interviews were conducted with 19 state and federal government agencies that are involved in adaptation activities. These interviews indicated that state and federal government entities typically incorporate climate adaptation within a broader climate change framework, rather than having separate policy directed at adaptation. Further, the major area of activity related to adaptation was gathering additional information, suggesting that adaptation planning is still in its early stages within these entities. Commonly cited barriers to adaptation activity were lack of information, lack of clear responsibilities and coordination across jurisdictions, and uncertainty regarding funding, although this latter issue was more often identified by state/territory entities. Federal entities also cited lack of community engagement and the presence of climate scepticism as barriers to adaptation planning.

Sixteen in-depth interviews were conducted early in 2009 to gather more information about drivers and barriers to adaptation activity. Organisations with both low and high levels of adaptation activity (as identified by the first survey) were targeted for these interviews, to allow for examination of the differences between them. Drivers for adaptation planning that were identified included a growing awareness of climate change, a sense of vulnerability to climate change impacts, and a response to pressure from external stakeholders. Barriers to adaptation planning included a lack of information and resources (money, people and time), a lack of policy clarity and/or government support, scepticism about climate change impacts, and a culture of conservatism within the organisation.

It is noteworthy that the drivers and barriers to adaptation activity identified by both types of organisations were similar – this suggests that there are not extensive qualitative differences that are preventing organisations from taking action. Rather, the differences seem to involve the relative scale of drivers and barriers: if the drivers are extensive enough in an organisation to overcome the barriers, then it appears likely that the organisation will take action on adaptation issues. In particular, it appears that once organisations develop a sense of vulnerability to climate change (and overcome scepticism, lack of information and a lack of resources) they are likely to take action.

Finally, it is noted that the conceptual framework that acted as a guide for this research has received a substantial degree of support from the data. The drivers and barriers identified in the model were largely supported by both the quantitative survey findings and the qualitative interview results. It appears that adaptation planning is more likely to occur if an organisation:

- has more knowledge of climate change in general
- has conducted formal vulnerability assessment
- has prior experience with longer-term strategic planning
- has contact with external organisations to provide information and assistance.

Further, it appears that adaptation planning may be less likely if the organisation:

- is waiting for someone else to take responsibility for adaptation planning
- has an organisational culture that does not support change
- has a lack of information or physical resources (money, staff, time)
- has a degree of scepticism about climate change in general.

The three processes of data collection will be repeated in 2010, to allow for the tracking of changes over time and to provide some assessment of the impact of work conducted by the Climate Adaptation Flagship and DCCEE in the intervening period. Once the second set of survey data is collected, it will be possible to identify how, and to what extent, various organisations in the sample have changed over time. It will also be possible to identify organisations that have changed markedly, and compare them to those who have not changed; this approach will allow a further examination of the range of barriers and drivers of adaptation planning in Australian organisations.

## 2. INTRODUCTION

### 2.1 Background

Adapting to climate change and climate variability presents a substantial challenge for Australia. Our water resources, agriculture, built infrastructure, health, ecosystems, and regional and remote communities all have vulnerabilities to changes in climate. Even if only some of the future changes suggested by climate modelling eventuate, many public and private sector organisations across the country will be at risk of serious consequences. Responding effectively to this risk requires changes in planning, regulation and investment now, in order to prepare for the potential challenges and opportunities presented by future climate changes. Currently, it is unclear how prepared Australian organisations are for these potential climate changes.

This project is being conducted jointly by CSIRO's Climate Adaptation Flagship and the Australian Government Department of Climate Change and Energy Efficiency (DCCEE). The project is designed to assess the activities conducted by organisations that relate to climate adaptation – that is, activities aimed at preparing for the likely future impacts of climate change, either by dealing with the consequences of these impacts, moderating their harm, or exploiting beneficial opportunities that result. These future impacts include water shortages, changes in average temperature and rainfall, sea-level rise, and increases in bushfires, flooding and major storms. It is important to clarify that this research aims to assess adaptation planning, not actual adaptation. Further work of much larger scope is needed to examine details of actual adaptation actions, rather than just plans, and eventually it will be necessary to assess whether and to what extent adaptation activities do result in adaptation.

### 2.2 Project objectives

The *primary objectives* of the project are to:

- benchmark current level of adaptation activities in relevant Australian organisations
- track change in adaptation activities, with planned repetition after two years
- attribute observed changes, where appropriate, to the impact of the DCCEE, Climate Adaptation Flagship, and other agencies.

The *secondary objectives* of the project are to:

- raise levels of awareness of the Climate Adaptation Flagship and climate adaptation in general
- provide information that could be used to help estimate the financial impact of the Flagship's activities.

## 2.3 Overview of the research

The project proceeded through six stages which have contributed to this report:

### **Sample identification**

A cross-section of relevant organisations was identified via web-based search and use of Climate Adaptation Flagship and DCCEE networks. The target organisations were organised into a range of groups to be sampled, as described below. As well as the sample contacted for this initial round of data collection, a larger sampling frame of relevant organisations was compiled, to allow for expansion of the sample in the second round of data collection in 2010. The total sampling frame includes 740 organisations.

### **Development of sample database**

An initial desk-top review was conducted to compile publicly available contact information for each organisation in the sampling frame. Existing CSIRO interactions were identified where available, along with potential contacts for phone surveying, including all groups with a formal relationship with the Climate Adaptation Flagship. This review will be completed annually, to maintain the currency of the sampling frame.

### **Survey design**

Based on initial information yielded by the desk-top review, along with discussions with DCCEE and CSIRO stakeholders, a survey was designed to assess aspects of attitudes to climate change, the nature and extent of adaptation activities, and other relevant features of the organisation. The survey was also informed by prior conceptual work which proposed a model of drivers and barriers to adaptation planning (Gardner et al., 2009). The survey was fine-tuned through an iterative process of piloting with organisations and individuals, and subsequent adjustment of questions and layout. The final survey included just over 30 questions, and was designed specifically for telephone-based administration (see Appendix A).

### **Telephone interviews**

A randomised list of potential respondents was generated from the full sample frame, with a target number of interviews to be conducted with each sub-group in the sample. An external provider conducted the majority of telephone surveys in December 2008, with some additional interviews conducted by CSIRO staff in January and February 2009.<sup>1</sup>

### **State and federal government interviews**

Nineteen interviews were conducted with state and federal government departments that have some responsibility for, or connection with, climate change responses or planning. These interviews were conducted by DCCEE staff between January and April 2009, using a version of the telephone survey questions adapted to reflect the different nature and responsibility of these government departments. Details of the interview questions and method are provided in Appendix B.

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<sup>1</sup> One person from each organisation was interviewed: either the person who was most directly involved with adaptation issues, and/or the most senior manager who was willing to be interviewed.

### **In-depth interviews**

In order to pursue organisations' responses to climate adaptation in more detail, sixteen follow-up in-depth interviews were conducted by telephone during May 2009 by CSIRO staff. Interviewees were randomly selected from volunteer respondents to the first telephone survey. Half of the interviews were with organisations that had taken little or no action on adaptation ('low activity' organisations), and half were with organisations that had conducted formal vulnerability assessments as well as adaptation planning ('high activity' organisations). Details of the interview questions and method are provided in Appendix C.

## **2.4 Sample design**

The project required the identification of a large sampling frame that could be used to provide multiple samples. Within the sampling frame, a primary sample was identified for the time 1 (2008) survey. At time 2 (2010), the primary sample will be expanded to include more organisations of the same types already assessed.

The sample for the main telephone survey was designed in collaboration with staff from the Climate Adaptation Flagship and the DCCEE to provide coverage of the types of organisations that are potentially exposed to future climate impacts, or otherwise relevant to Australia's climate adaptation efforts. The sample was also designed to cover the range of entities defined by the three context-specific research themes within the Climate Adaptation Flagship: urban, natural systems and primary industries.

Twenty-four different organisation types were identified within four broad groups:

- industry
- local government
- infrastructure
- associations and non-government organisations (NGOs).

It is important to note that the sample was designed to include the diversity of relevant organisations, and was not intended to provide a representative sample of all organisations in Australia. Table 1 shows the final sample design and the number of respondents for the telephone survey.

Table 1: Details of the sample for the telephone survey

Group	Sub-group	Respondents
<b>Industry</b>	Natural resource management – less vulnerable <sup>2</sup>	10
	Natural resource management – more vulnerable	10
	Parks management	9
	Construction	10
	Health	10
	Tourism	10
	Agribusiness	10
	Forestry	13
	Fisheries/aquaculture	9
	Insurance/finance/banking	9
	Mining	10
	Emergency management	10
	<b>Sub-total</b>	<b>120</b>
<b>Local government</b>	Local government-related bodies	6
	Urban councils	20
	Rural councils	25
	<b>Sub-total</b>	<b>51</b>
<b>Infrastructure</b>	Ports	10
	Transport	10
	Water	10
	Energy	10
	Property	10
	<b>Sub-total</b>	<b>50</b>
<b>Associations and non-government organisations</b>	Built environment	6
	Natural environment/land use	5
	Indigenous groups	5
	Other associations/groups	5
	<b>Sub-total</b>	<b>21</b>
<b>TOTAL</b>		<b>242</b>

<sup>2</sup> Data from an assessment of natural resource management (NRM) regional vulnerability based on a survey of broadacre farmers (Nelson et al., 2009) were used to categorise NRM regions in the sample as more or less vulnerable. This classification represents only a very rough estimate of overall regional vulnerability to climate change.

## 2.5 Conceptual framework

The design of the survey and the nature of the data analyses were informed by a framework of adaptation planning in organisations, which was developed in previous conceptual research (Gardner et al., 2009). This framework, which is presented in Figure 1, specifies a linear pathway towards adaptation planning in organisations. Each successive step in the pathway represents a precondition of knowledge or motivation that is necessary before the organisation can proceed further towards adaptation planning.

The model also specifies specific drivers and barriers that are relevant at different points along the pathway. For example, in the early stages of the model, general information about climate change is an important driver of progression, but it is less relevant at later stages when the business has already decided that action is necessary. Likewise, lack of resources is a barrier to action later in the pathway, but is not so relevant at earlier stages. Finally, the model also specifies a number of over-arching influences that are likely to remain relevant throughout the pathway. These include specialised knowledge, leadership and/or prior experience with adaptation planning or other forms of strategic planning.

Although the model defines a pathway of successive preconditions, it is recognised that this is a simplification. It is possible that some organisations will skip steps, move through the steps in a different order, and/or move through other processes towards adaptation planning. The current survey research provides an initial means of testing whether and to what extent the model provides an accurate reflection of the actual experience of organisations as they progress towards adaptation planning.



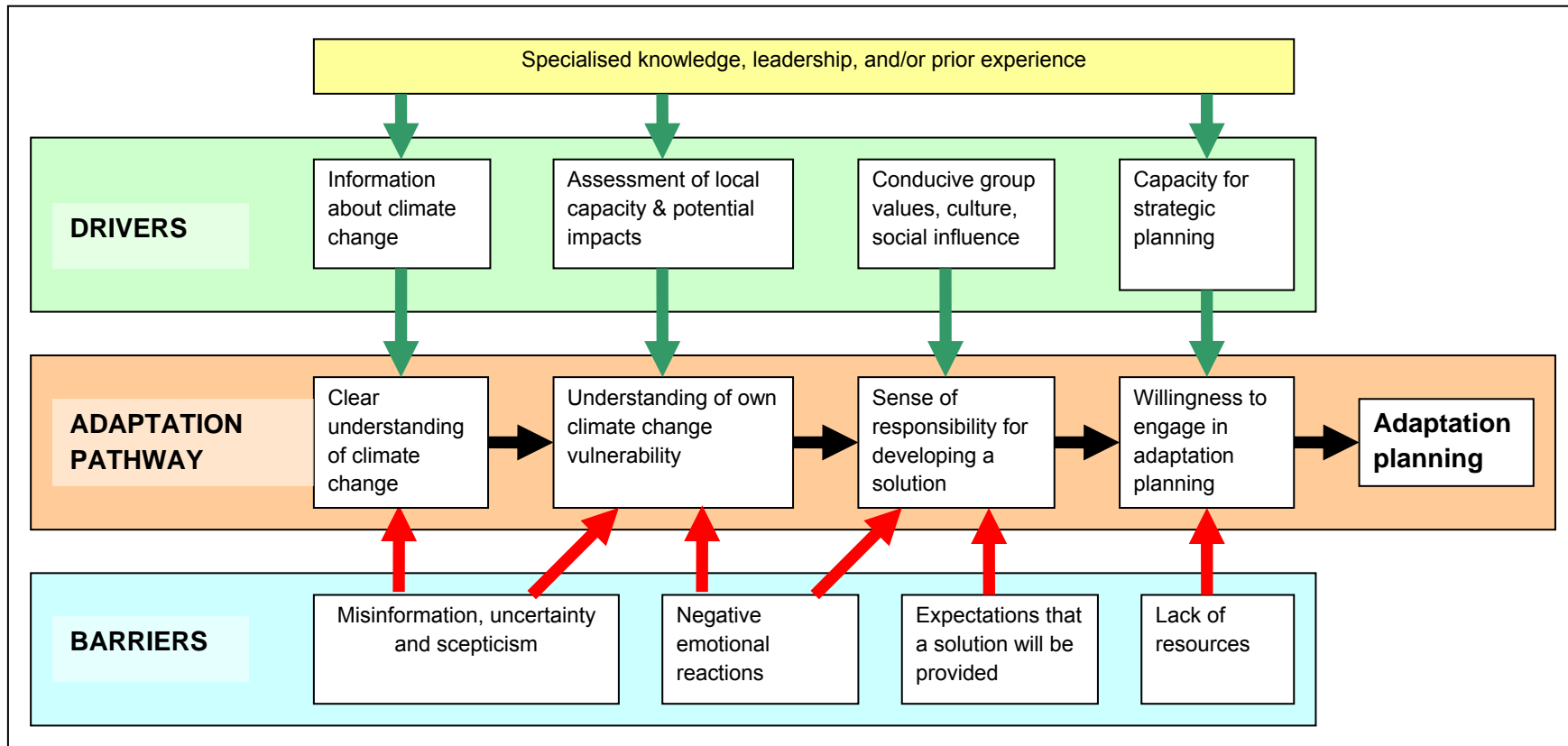


Figure 1: A pathway for adaptation engagement with associated drivers and barriers (adapted from Gardner et al., 2009).

### 3. SUMMARY OF FINDINGS

Findings are organised into three sections:

- telephone survey responses
- findings from state and federal government interviews
- findings from in-depth interviews.

#### 3.1 Telephone survey responses

##### Attitudes to climate change

The majority of businesses surveyed were completely convinced that climate change represents a real problem for Australia (see Figure 2). Respondents from agribusinesses and fisheries tended to be less convinced, while respondents from health organisations and local government-related groups tended to be more convinced.

Almost three-quarters of respondents rated climate change as very important or extremely important to their organisation (see Figure 3). Parks management groups, water management groups, and natural environment/land use bodies tended to rate climate change as more important, and health organisations and ports tended to rate it as less important to their business.

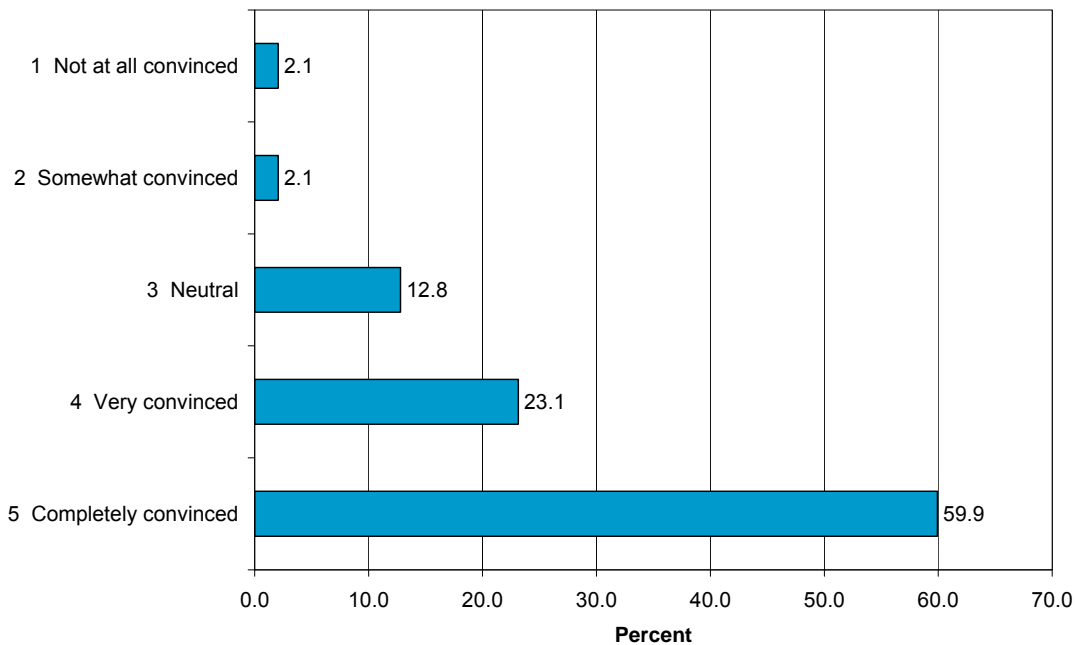


Figure 2: How convinced are you that climate change represents a real problem for Australia?

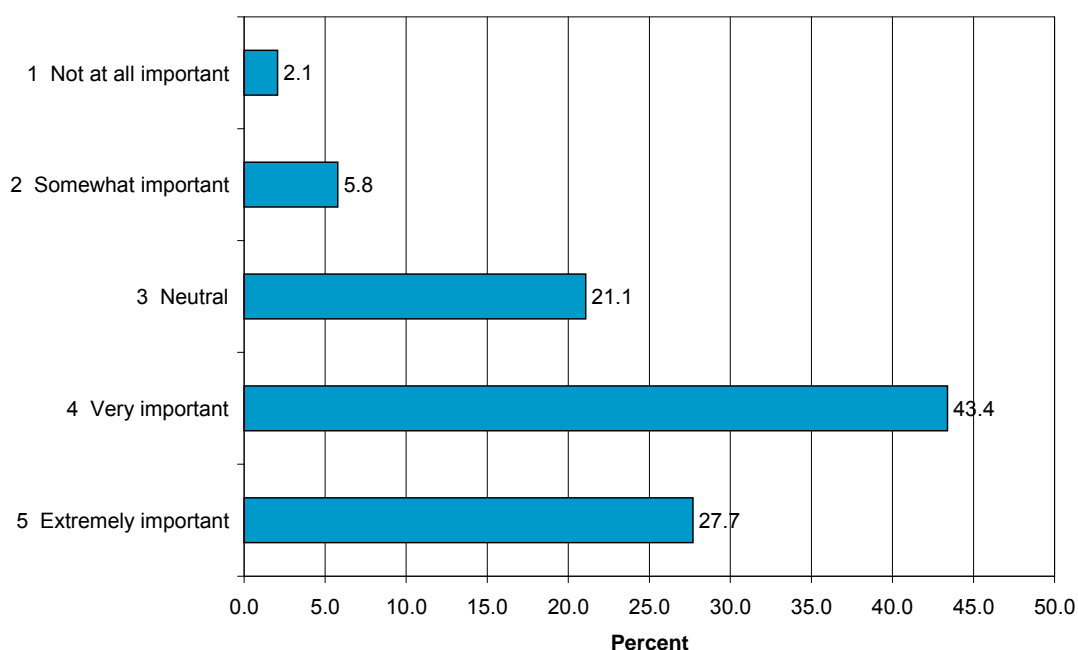


Figure 3: How important is climate change to your organisation?

### Climate change priority areas

Respondents were asked to describe their organisation's priority areas in responding to climate change. This question was asked *before* any mention of mitigation or adaptation in the survey, to allow for an unprompted evaluation of the relative importance of these issues. One or more mitigation issues were raised by 61% of the sample (see Table 2). The most common issues raised were non-specific mitigation (e.g. 'reduce emissions'), reduced energy consumption, and public engagement, education or research.

Table 2: Mitigation priority areas mentioned by survey respondents.

Priority areas	Number of mentions	Percent
Non-specific mitigation (e.g. 'reduce emissions')	57	23.6
Reduce energy consumption	28	11.6
Public engagement/education/research regarding mitigation	24	9.9
Reduce waste/increased recycling	21	8.7
Develop a climate strategy	19	7.9
Increase energy efficiency	19	7.9
Prepare for Carbon Pollution Reduction Scheme (CPRS)/compliance	17	7.0
Measure emissions footprint	17	7.0
Use cleaner energy sources	16	6.6
Reduce water consumption	16	6.6
Promote internal staff awareness or action	14	5.8
Carbon sequestration/capture/offsets	11	4.5
Influence policy	11	4.5

## SUMMARY OF FINDINGS

One or more adaptation issues were raised by 55% of the sample (see Table 3). The most common issues were non-specific adaptation, planning for water quality and supply, and resource and land management planning. It is noteworthy that only four organisations within the sample cited activity that involved capitalising on an opportunity presented by future climate changes. These organisations were in the mining, energy, forestry and fisheries sectors, and all mentioned market opportunities as a result of future climate change, although some of these opportunities may be derived more from societal response to climate change (e.g. demand for different products) rather than climate change impacts *per se*.

Table 3: Adaptation priority areas mentioned by survey respondents.

Priority Areas	Number of mentions	Percent
Non-specific adaptation (e.g. 'prepare for impacts', 'improve sustainability')	44	18.2
Planning for water supply/quality	36	14.9
Resource/land management planning	31	12.8
Planning for extreme weather	27	11.2
Engagement with stakeholders regarding adaptation	20	8.3
Address biodiversity issues	16	6.6
Risk management	15	6.2
Gather information on local scenarios/impacts	15	6.2
Planning/approvals for buildings/ infrastructure	12	5.0
Planning for sea-level rise	9	3.7
Investment planning	8	3.3
Capitalise on opportunity	4	1.7
Address health impacts	4	1.7

Figure 4 shows the average number of mitigation and adaptation issues cited by different types of organisations in the sample. The rate of mention of adaptation priorities was fairly consistent across organisation types. For mitigation, local government groups tended to mention more issues while associations and NGOs tended to mention fewer issues. Associations and NGOs, in particular, showed a marked disparity in their climate change priorities, with adaptation issues mentioned much more commonly than mitigation issues.

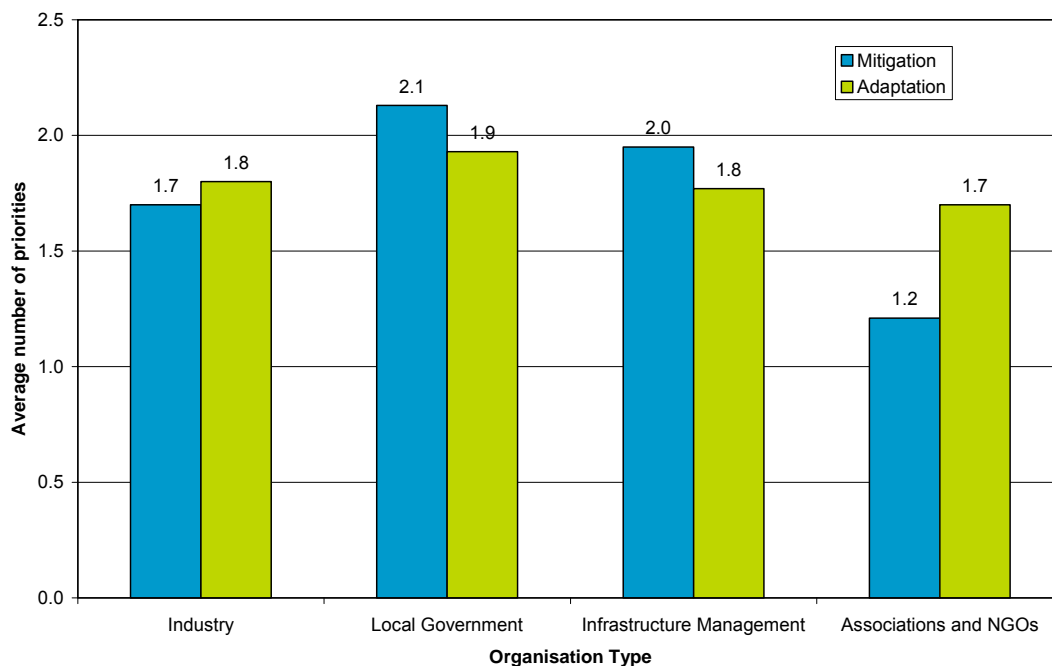


Figure 4: Average number of mitigation and adaptation issues mentioned by different types of organisations.

## Mitigation and adaptation issues

Most respondents reported high levels of familiarity with both mitigation and adaptation (see Figure 5). Familiarity with mitigation was highest for local government-related bodies, natural environment/land use bodies and insurance/banking/finance companies, and was lowest for fisheries, tourism groups and rural councils. Familiarity with adaptation was highest for local government-related bodies, natural environment/land use bodies, and lowest for agribusiness, construction businesses and ports.

Respondents tended to rate adaptation (preparing for future climate impacts) as *more important* than mitigation (reducing greenhouse gas emissions; see Figure 6). Given the confusion between mitigation and adaptation shown by respondents (see below), it may be that the high importance rating given to adaptation is inaccurate. This may reflect a misperception among respondents that ‘preparing for the future impacts of climate change’ included preparation for emissions trading or other potential policy changes.

Importance of reducing emissions was highest for parks management, insurance/banking/finance groups and urban councils, and lowest for other associations/groups, forestry and health groups. Importance of preparing for impacts was highest for vulnerable natural resource management (NRM) groups, water management, parks management and emergency management, and lowest for health and other associations/groups.

SUMMARY OF FINDINGS

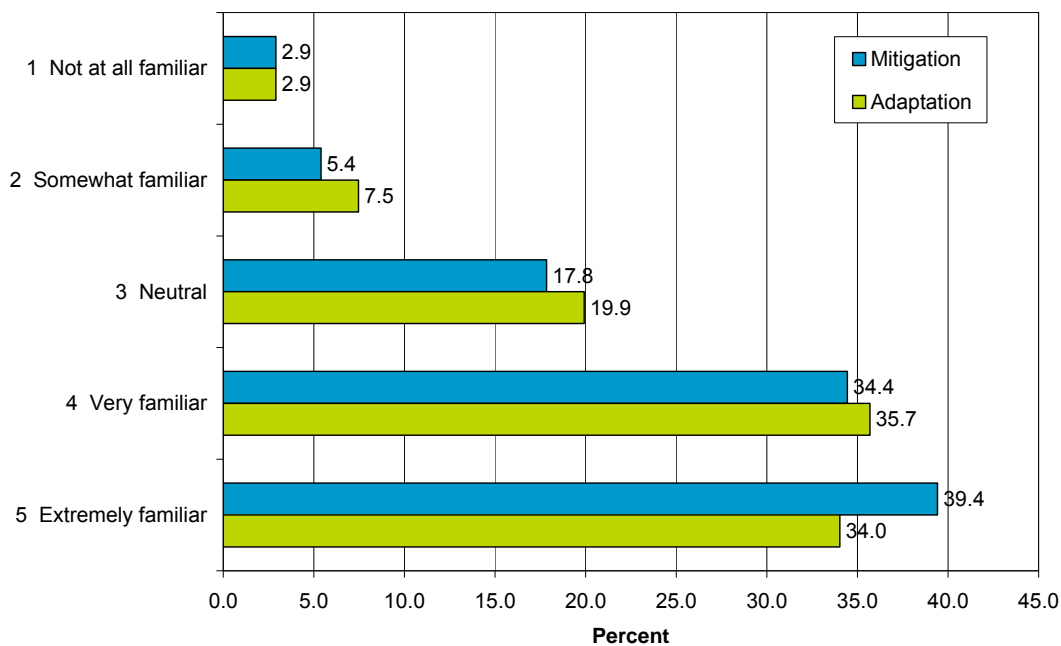


Figure 5: How familiar are you with the notion of mitigation/adaptation to climate change?

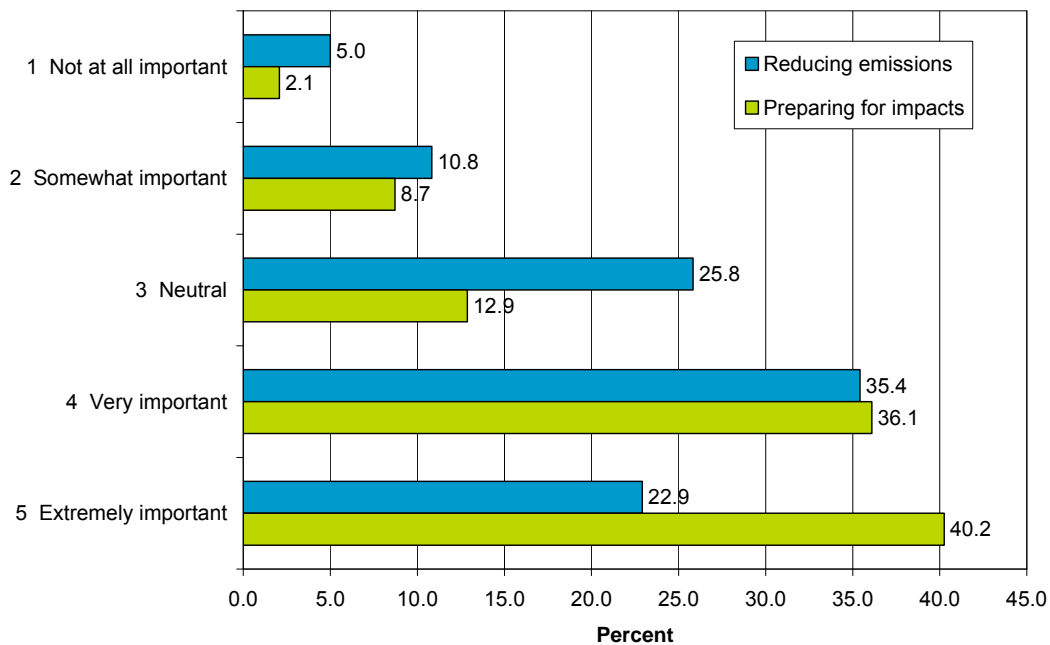


Figure 6: How important is it for your organisation to reduce emissions/prepare for future climate changes?

## Planning for climate adaptation

Respondents were asked if they had conducted an evaluation of their vulnerability to future climate changes: 59% said yes. Assessment rates were highest amongst insurance/banking/finance, less vulnerable NRM groups, energy and natural environment/land use groups. Assessment rates were lowest amongst local government-related bodies, rural councils, and health organisations.

Half (50.4%) of the organisations who had assessed their vulnerability reported that they were 'very exposed' or 'extremely exposed' to future climate changes. The highest rates of exposure were reported for local government-related bodies, built environment groups, and urban councils. The lowest rates of exposure were reported for Indigenous groups.

Two-thirds of the sample *claimed* to have existing activities relating to adaptation, but many of the described activities involved mitigation rather than adaptation, especially efforts to reduce the organisation's exposure to rising energy prices and/or the impact of the CPRS. This finding suggests that despite the respondents' claims of familiarity with mitigation and adaptation, and despite the definitions of these terms provided during the survey, respondents often did not understand the distinction between the two. *Actual* adaptation activities were described by only 42% of the sample. The most common activities described were water supply and management planning, NRM planning, and non-specific adaptation planning. The types of adaptation activity reported are shown in Table 4.

Table 4: Types of adaptation activity reported by respondents.

Adaptation activity	Number of mentions	Percent
Water management planning	26	25.5
Natural resource management	22	21.6
Non-specific adaptation planning	22	21.6
Education of constituents/members	16	15.7
Planning for extreme weather	16	15.7
Infrastructure/construction planning	15	14.7
Risk management	9	8.8
Planning for sea-level rise	7	6.9
Planning for threats to biodiversity	6	5.9
Pursuing funding for adaptation	2	2.0
Conforming with legislation	2	2.0

Note: Percentages are based on the 102 respondents who reported actual adaptation activities. Comments that did not qualify as adaptation were excluded.

The highest rates of adaptation planning were reported by more vulnerable NRM groups, local government-related bodies, and parks management; lowest rates of planning were reported by health and fisheries groups. Three-quarters of the sample who had conducted adaptation planning reported that the planning was 'very useful' or 'extremely useful'. Respondents also described the issues that prompted their adaptation activity (see Table 5).

## SUMMARY OF FINDINGS

Table 5: Issues reported by respondents that prompted adaptation activity

Prompts	Number of mentions	Percent
General awareness and expectation (social/community/staff)	68	66.7
Identification of potential risks/benefits to organisation	32	31.4
An internal priority (driven by CEO/board/strategic plan)	23	22.5
Outcome of research (internal/in partnership/external)	16	15.7
Current impacts of climate change	16	15.7
Legislation/regulation	14	13.7
Following the lead of industry/government	13	12.7
Organisation has a leadership/awareness role	11	10.8
Access to funding/grant/subsidy	7	6.9
Influence of media	5	4.9

Note: Percentages are calculated from the 102 respondents who reported actual adaptation activities. Comments that did not qualify as adaptation were excluded.

Most respondents were unable to judge the financial benefit expected from the adaptation activity. The broad categories of responses given by those 65 organisations who did answer are presented in Table 6. Actual financial benefits are difficult to codify, since some respondents who reported a financial benefit gave dollar figures (ranging from a few thousand dollars to millions of dollars), while others reported percentage changes to costs or profits. Respondents who reported a non-financial benefit typically cited impacts on community or the environment.

Table 6: Benefit of adaptation activity

Response	Frequency	Percent
A financial cost	4	6.2
Cost-neutral	13	20.0
A non-financial benefit	11	16.9
A financial benefit	37	56.9
<b>Total</b>	<b>65</b>	<b>100.0</b>

### Barriers to adaptation activity

The most common reasons given for not assessing vulnerability to future climate changes, and for not conducting any adaptation planning, were similar. These responses are shown below in Table 7 and Table 8, respectively. The three most common responses were:

- the perception that there was no need or no justification for such action
- the organisation had other priorities/a lack of time
- lack of money or lack of resources.



Table 7: Reasons given for not assessing vulnerability to future climate change.

Reason	Number of mentions	Percent
No need or no justification for the assessment	25	25.3
Lack of money or resources	24	24.2
Organisation has other priorities or lack of time	21	21.2
Have just started or are about to start the assessment	18	18.2
Lack of capacity or staff experience	12	12.1
Waiting for outside help/direction	11	11.1
Lack of information	11	11.1
Already know what the impacts are	7	7.1

Note: Percentages are based on the 99 organisations who had not conducted formal vulnerability assessments.

Table 8: Reasons given for not conducting any adaptation activity.

Reason	Number of mentions	Percent
No need or no justification for the activity	21	15.0
Organisation has other priorities or lack of time	21	15.0
Lack of money or resources	15	10.7
Have just started or are about to start the planning	13	9.3
Lack of information	11	7.9
Waiting for outside help/direction	7	5.0
Lack of capacity or staff experience	4	2.9
Existing policies cover the issues	3	2.1

Note: Percentages are based on the 140 organisations who had not conducted any actual adaptation activities.

## Relationships with other organisations

Respondents were asked to describe any outside organisations they were involved with in relation to climate change adaptation planning: two-thirds reported one or more such relationships. Contact was most common for organisations within the ‘associations and NGOs’ group, and least common for organisations within the ‘infrastructure management’ group. Descriptions of external contacts included 20 mentions of CSIRO, and 18 mentions of the Department of Climate Change and Energy Efficiency (including mentions of the Australian Greenhouse Office). Other groups mentioned include a variety of local, state and federal government bodies, as well as universities, NGOs and commercial organisations (see Table 9).

SUMMARY OF FINDINGS

Table 9: Organisations involved with respondents in relation to climate adaptation planning.

Organisations	Number of mentions	Percent
NGOs and industry associations	65	40.9
State government body	58	36.5
Local council body	37	23.3
University or Cooperative Research Centre (CRC)	25	15.7
Federal government body (other than DCCEE)	24	15.1
CSIRO	20	12.6
DCCEE	18	11.3
Commercial organisations/consultants	17	10.7

Note: Percentages based on the 159 organisations who reported relationships with other organisations. These mentions were unprompted; later survey questions asked specifically about contact with CSIRO and DCCEE, and larger numbers of organisations reported contact once they were prompted.

*Contact with the Department of Climate Change and Energy Efficiency*

Respondents were prompted about whether they had any contact with the Australian Government Department of Climate Change and Energy Efficiency: 51.4% said yes. The nature of this contact ranged widely, from *‘looking at their website’* through *‘attending information forums’*, *‘developing position papers in partnership with DCCEE’*, *‘receiving DCCEE funding’*, and *‘holding a seat on a DCCEE advisory group’*. The contact was most commonly rated as *‘very useful’* or *‘extremely useful’* (see Figure 7).

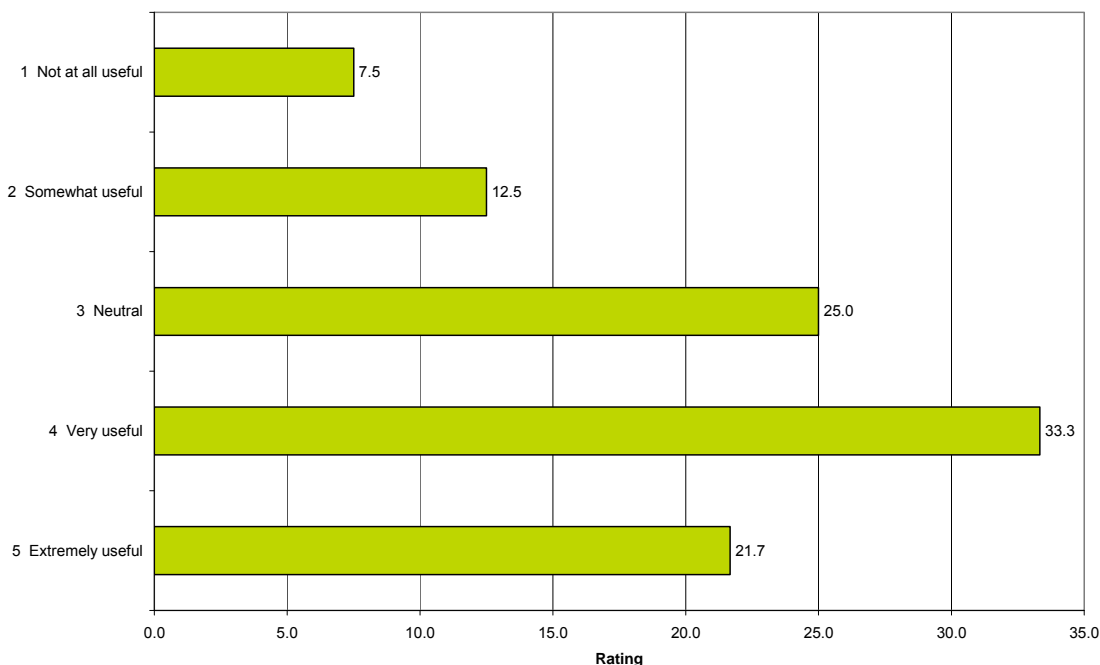


Figure 7: Ratings of the usefulness of contact with the DCCEE regarding climate adaptation.

Relevant respondents were also asked what prompted the development of their relationship with the DCCEE. The responses are shown in Table 10.

Table 10: Sources that prompted the development of relationships with the DCCEE

Response	Percent
Someone from your organisation	31.7
Someone from the Department of Climate Change	18.7
Something or someone else (responses were varied, but commonly cited an existing network, a third party, or legislative requirements)	53.7
Don't know	8.1

Note: People gave multiple answers, so percentages sum to more than 100%.

### Contact with CSIRO

Respondents were prompted about whether they had any contact with the CSIRO: 36.6% said yes. The nature of this contact ranged widely, from '*reading CSIRO reports*' through '*attending briefing sessions by CSIRO scientists*', '*involvement in ongoing CSIRO research projects*', and '*hiring CSIRO to conduct consulting work*'. The contact was typically rated as 'very useful' or 'extremely useful' (see Figure 8).

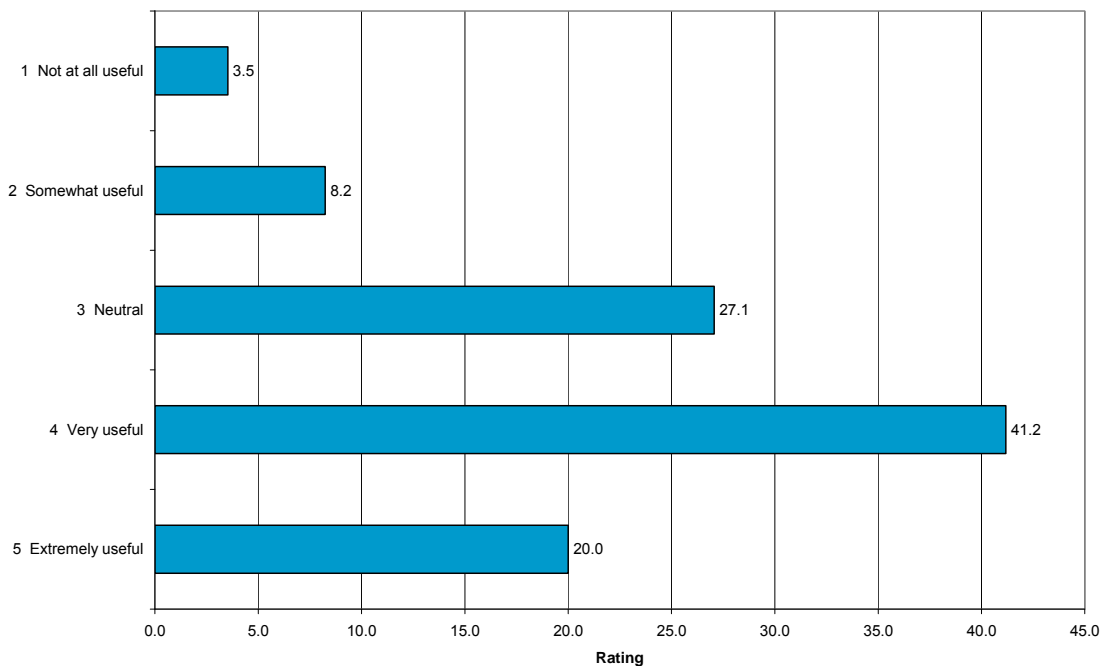


Figure 8: Ratings of the usefulness of contact with CSIRO regarding climate adaptation.

Relevant respondents were also asked what prompted the development of their relationship with the CSIRO. The responses are shown in Table 11.

## SUMMARY OF FINDINGS

Table 11: Sources that prompted the development of relationships with the CSIRO.

Response	Percent
Someone from your organisation	42.0
Someone from CSIRO	20.5
Something or someone else (responses were varied, but commonly cited extension of an existing network, a request from a client of the respondent organisation, or driven by government legislation/policy)	40.9
Don't know	10.2

Note: People gave multiple answers, so percentages sum to more than 100%.

In comparing the findings for respondent contact with DCCEE and CSIRO, some differences are apparent. The DCCEE has more contact with infrastructure management and associations/NGOs than with other types. CSIRO has high levels of contact with associations/NGOs, and lower levels of contact with other organisation types (see Figure 9).

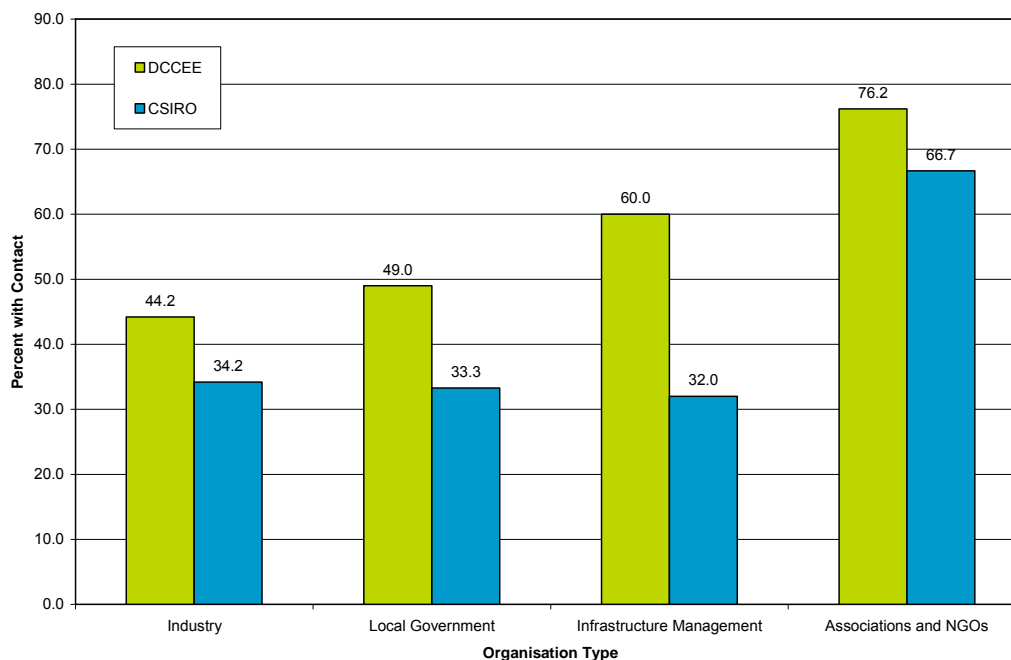


Figure 9: Percent of different organisation types reporting contact with DCCEE and CSIRO on climate adaptation issues.

### Further services

Respondents were asked whether they would be interested in further services or programs from outside organisations to help them prepare for climate changes: 83.1% said yes. The services that respondents were interested in are summarised in Table 12.

Table 12: Services that would help respondents prepare for climate change.

Service	Number of mentions	Percent
Specialist advice (legal, technical, commercial, etc)	54	26.9
Specific climate impact info/modelling of local impacts	49	24.4
General climate impact info	26	12.9
Research and development (of products and services)	20	10.0
Information on legislative/regulatory/public obligations	20	10.0
Networking, relationships, links with others in industry	15	7.5
Help with risk management/strategic planning	14	7.0
Funding	9	4.5
Other (don't know what is available, anything that might help)	9	4.5

Note: percentages are based on the 201 organisations who reported interest in further services/programs.

## Predictors of adaptation activity

This section reports various statistical analyses designed to assess potential predictors of adaptation-related behaviour amongst the sample organisations. Separate sets of analyses were conducted to examine:

- a) potential predictors of vulnerability assessment
- b) potential predictors of adaptation planning.

These analyses were guided by the conceptual adaptation pathway shown in Section 2, and were conducted using chi-squared and analysis of variance tests as appropriate. The testing included various responses from the survey, including ratings of the importance and knowledge of climate change issues, various measures of the organisation's characteristics, and the presence of relationships with other organisations in relation to climate adaptation planning. To account for the large number of tests being conducted, a Bonferroni adjustment was applied: p values of 0.01 (rather than the more typical 0.05) were interpreted as statistically significant.

### *Predictors of vulnerability assessment*

Table 13 summarises the results of statistical testing of the potential predictors of vulnerability assessment in the surveyed organisations. A number of variables showed a significant relationship to the presence of vulnerability assessments in the sample. Organisations that gave higher ratings to the importance of climate change, and the importance of mitigation and adaptation, and organisations that reported higher familiarity with the issues of mitigation and adaptation, were more likely to have conducted vulnerability assessments.

Surprisingly, there was no relationship between a respondent's rating of whether they were convinced that climate change is real and the presence of vulnerability assessment. This finding may reflect the impact of a ceiling effect for this measure: as apparent in Figure 2, the majority of respondents reported that they were largely convinced that climate change was real.

## SUMMARY OF FINDINGS

Table 13: Statistical testing of the potential predictors of formal vulnerability assessment in surveyed organisations.

Variable	Measure	Average		Test statistic	P
		No vulnerability assessment	Vulnerability assessment		
Convinced that CC is a real problem	1-5 rating	4.27	4.43	F(1,239) = 1.66	ns
Importance of climate change to the organisation	1-5 rating	3.58	4.11	F(1,239) = 19.61	<0.01
Familiarity with mitigation	1-5 rating	3.65	4.27	F(1,239) = 23.13	<0.01
Familiarity with adaptation	1-5 rating	3.53	4.16	F(1,239) = 22.95	<0.01
Importance of reducing greenhouse gas emissions	1-5 rating	3.19	3.88	F(1,239) = 24.56	<0.01
Importance of preparing for impacts	1-5 rating	3.69	4.28	F(1,239) = 20.90	<0.01
Organisation turnover <sup>a</sup>	\$ per annum	\$1.04 billion	\$1.19 billion	F(1,162) = 6.31	<0.05
Staff numbers <sup>a</sup>	Number	670 staff	2210 staff	F(1,228) = 4.72	<0.05
Typical strategic planning horizon <sup>a</sup>	Years	9.4 years	11.6 years	F(1,225) = 10.84	<0.01
Any external relationships	Proportion	50.0%	76.7%	X <sup>2</sup> (1) = 18.65	<0.01
Contact with DCCEE	Proportion	40.0%	59.1%	X <sup>2</sup> (1) = 8.62	<0.01
Contact with CSIRO	Proportion	24.0%	45.1%	X <sup>2</sup> (1) = 11.26	<0.01

<sup>a</sup>Statistical testing for these variables was conducted using a log-transformed version of the variable to adjust for strong positive skew in the distribution of scores.

In terms of organisational characteristics, those respondents who had conducted vulnerability assessments reported a longer typical strategic planning horizon. Staff numbers and organisational turnover were marginally related to the presence of vulnerability assessments: in both cases, larger organisations more commonly conducted such assessments.

In terms of contact with outside organisations, respondents who had conducted vulnerability assessments were more likely to have reported contact with external organisations for the purpose of adaptation planning, and were also more likely to have reported contact with both the DCCEE and the CSIRO.

On the basis of these results, it appears that organisations are more likely to conduct formal vulnerability assessments when they have:

- a better understanding of adaptation and mitigation issues
- a stronger sense of the importance of both adaptation and mitigation
- contact with external organisations specifically to discuss adaptation
- longer typical strategic planning horizons.

### *Predictors of adaptation planning*

Table 14 summarises the results of statistical testing of the potential predictors of adaptation planning in the surveyed organisations. As for the testing of vulnerability assessments reported in the previous section, numerous variables showed a significant relationship to the presence of adaptation planning. Organisations that gave higher ratings to the importance of climate change, and their familiarity with mitigation and adaptation, were more likely to have conducted adaptation planning.

Again, there was no relationship between a respondent's rating of whether they were convinced that climate change is real and the presence of adaptation planning. Adaptation planning was also unrelated to the rated importance of reducing greenhouse emissions. It is possible that a stronger focus on adaptation in some organisations is associated with a weaker focus on mitigation. This possibility warrants more detailed investigation in subsequent research for this project.

Organisations that had conducted adaptation planning showed no differences in organisational turnover, and only marginal difference on staff numbers compared to organisations with no adaptation planning. Strategic planning horizons were associated with adaptation planning: organisations with longer planning horizons were more likely to report adaptation planning.

Organisations that reported adaptation planning were more likely to have had contact with external organisations for this purpose, and were also more likely to have had contact with both the DCCEE and the CSIRO, than were organisations that reported no adaptation planning.

Unsurprisingly, the use of formal vulnerability assessments was itself associated with adaptation planning: those organisations who had conducted vulnerability assessments were more likely to report adaptation planning as well. Further, the level of vulnerability indicated by the formal assessment was also related to adaptation planning: organisations with higher levels of assessed vulnerability were more likely to pursue adaptation planning than were organisations with lower levels of assessed vulnerability.

On the basis of these results, it appears that organisations are more likely to engage in adaptation planning when they have:

- a better understanding of adaptation and mitigation issues
- a stronger sense of the importance of adaptation (but not mitigation)
- contact with external organisations specifically to discuss adaptation
- longer typical strategic planning horizons
- access to a formal vulnerability assessment, especially when the assessment indicates high levels of vulnerability to climate change impacts.

## SUMMARY OF FINDINGS

Table 14: Statistical testing of the potential predictors of adaptation planning in surveyed organisations.

Variable	Measure	Average		Test statistic	P
		No adaptation planning	Adaptation planning		
Convinced that CC is a real problem	1-5 rating	4.24	4.54	F(1, 239) = 6.16	<0.05
Importance of climate change to the organisation	1-5 rating	3.65	4.23	F(1,239) = 24.39	<0.01
Familiarity with mitigation	1-5 rating	3.77	4.37	F(1,238) = 21.44	<0.01
Familiarity with adaptation	1-5 rating	3.74	4.14	F(1,238) = 8.96	<0.01
Importance of reducing greenhouse gas emissions	1-5 rating	3.46	3.79	F(1,237) = 5.08	<0.05
Importance of preparing for impacts	1-5 rating	3.76	4.43	F(1,238) = 27.30	<0.01
Organisation turnover <sup>a</sup>	\$ per annum	\$1.12 billion	\$1.14 billion	F(1,162) = 2.68	ns
Organisation size <sup>a</sup>	Number of staff	956 staff	2440 staff	F(1,228) = 5.10, p=.025)	<0.05
Typical strategic planning horizon <sup>a</sup>	Years	9.4 years	12.6 years	F(1,225) = 8.31	<0.01
Any external relationships	Proportion	52.8%	84.0%	X <sup>2</sup> (1) = 25.32	<0.01
Contact with DCCEE	Proportion	42.3%	64.0%	X <sup>2</sup> (1) = 11.11	<0.01
Contact with CSIRO	Proportion	24.6%	53.0%	X <sup>2</sup> (1) = 20.38	<0.01
Conducted vulnerability assessment	Proportion	47.9%	74.3%	X <sup>2</sup> (1) = 16.50	<0.01
Rated vulnerability to impacts from assessment <sup>b</sup>	1-5 rating	3.20	3.80	F(1,136) = 11.54	<0.01

<sup>a</sup>Statistical testing for these variables was conducted using a log-transformed version of the variable to adjust for strong positive skew in the distribution of scores.

<sup>b</sup>Testing for this variable was conducted only for those organisations that had conducted vulnerability assessments (N = 143).

It is important to note that many of these relationships (for both vulnerability assessment and adaptation planning) have unclear causal direction. While it is possible (for example) that longer planning horizons lead organisations to be more likely to conduct vulnerability assessments, it is also possible that the process of conducting vulnerability assessment might lead an organisation to lengthen its planning horizon.

The correlation analyses we conducted here cannot by themselves demonstrate a causal relationship between measures. However, the presence of the significant relationships identified in the current survey data provide some evidence to support the causal links that have been hypothesised in the conceptual model. Other data on the drivers and barriers of adaptation activities (for example, data from the in-depth interviews reported later in this document) provide further evidence to support the conceptual model.



## Differences between sectors

The results presented in the previous section suggest that there are differences in the patterns of responses for different organisations in the sample. This section provides further investigation of these differences, beginning with differences between groupings of organisations. Figure 10 shows the percentage of each organisational grouping in the sample that had conducted vulnerability assessment and adaptation planning. For industry, infrastructure management, and associations and NGOs, the reported proportion of vulnerability assessment was higher than the proportion of adaptation planning, while for local government, the proportions of the two activities were similar.

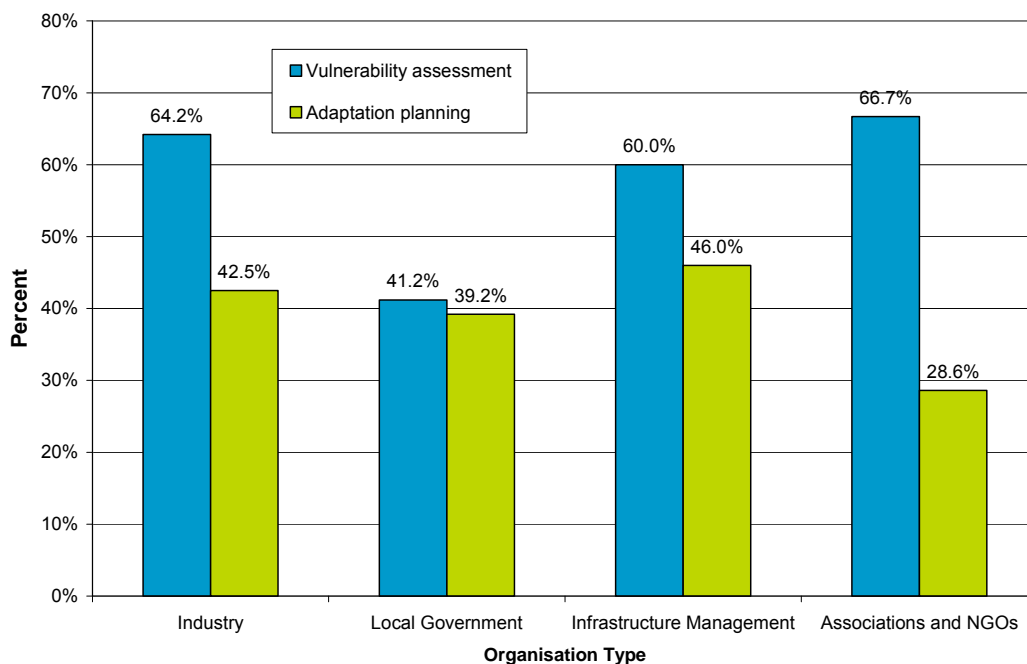


Figure 10: Percent of different organisation groupings that have conducted vulnerability assessment and adaptation planning.

The levels of vulnerability assessment and adaptation planning within individual organisations were also examined, and are categorised schematically in Figure 11. Organisations that had done no assessment and no planning are labelled ‘no action’. Organisations that had done vulnerability assessment but no adaptation planning are labelled ‘initial assessment’. Organisations that had done vulnerability assessments and adaptation planning are labelled ‘extensive action’. The remaining organisations had done planning without any vulnerability assessment and are labelled ‘pre-emptive action’. This general framework may provide a useful means of categorising organisations involved in adaptation research and interventions. Organisations in different quadrants are likely to have very different profiles in terms of their goals, information requirements and likely reactions to interventions.

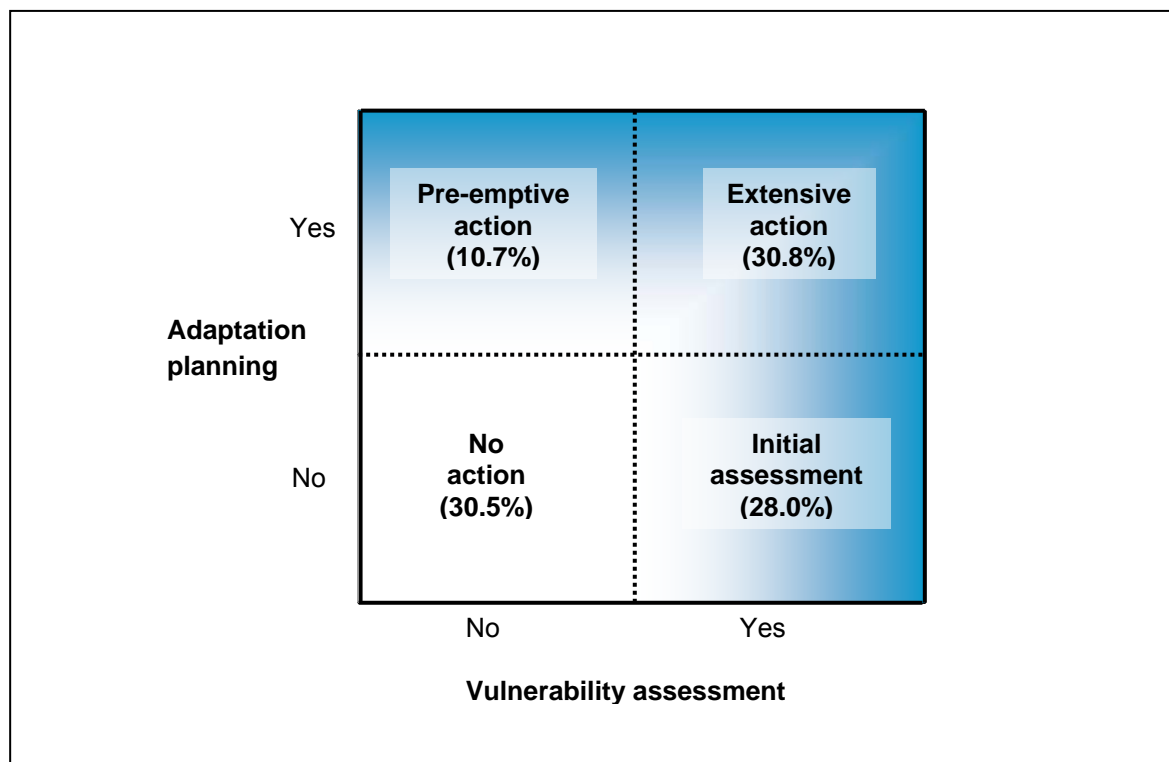


Figure 11: Percent of the sample reporting different actions related to climate adaptation.

To examine these differences in more detail, the proportion of vulnerability assessment and adaptation planning in each type of organisation in the sample were used to produce a map of adaptation activity for organisation types (see Figure 12). It is important to note that these results are based on relatively small samples of each organisation type (typically 5-10 organisations), so it is inappropriate to conclude that the position of organisations on the map is representative of all organisations of that type. Even within the survey data, there is a great deal of variability in adaptation activity within a single type of organisation.

The map highlights some major differences in the relative levels of adaptation activity being undertaken within the sample of organisations. Local government bodies appear to have conducted extensive adaptation planning without formal vulnerability assessment (i.e. pre-emptive action). This may reflect local councils’ recognition of their likely vulnerability to climate change impacts and their active adaptation planning agendas. Rural councils, health groups and Indigenous groups appear to have the lowest proportion of adaptation planning and vulnerability assessment, appearing in the lower left-hand quadrant of the map.

Organisations relating to water, ports and transport management are grouped near the centre of the map, indicating a fairly even split between organisations who have (and have not) conducted vulnerability assessment and adaptation planning.

Other organisation types within the sample range fall mostly along the right hand side of the map, suggesting that they have conducted some level of vulnerability assessment, but that the relative proportions of actual adaptation planning are much more variable. Relatively low proportions of adaptation planning are demonstrated by fisheries, mining, property, and natural environment groups, while higher proportions of adaptation planning are reported in parks management organisations and NRM groups in more vulnerable regions. It is also noteworthy

that NRM groups in less vulnerable regions have undertaken lower levels of adaptation planning.

This type of mapping, if expanded to larger, more representative samples, may provide useful guidance in identifying the relative levels of adaptation activity among different industry groups, and would also allow tracking of relative changes over time. This map (Figure 12) will be updated in 2010 as part of the current project. This will allow an examination of whether, and to what extent, different organisation types in this sample have shifted over time to higher proportions of adaptation planning and/or vulnerability assessment.

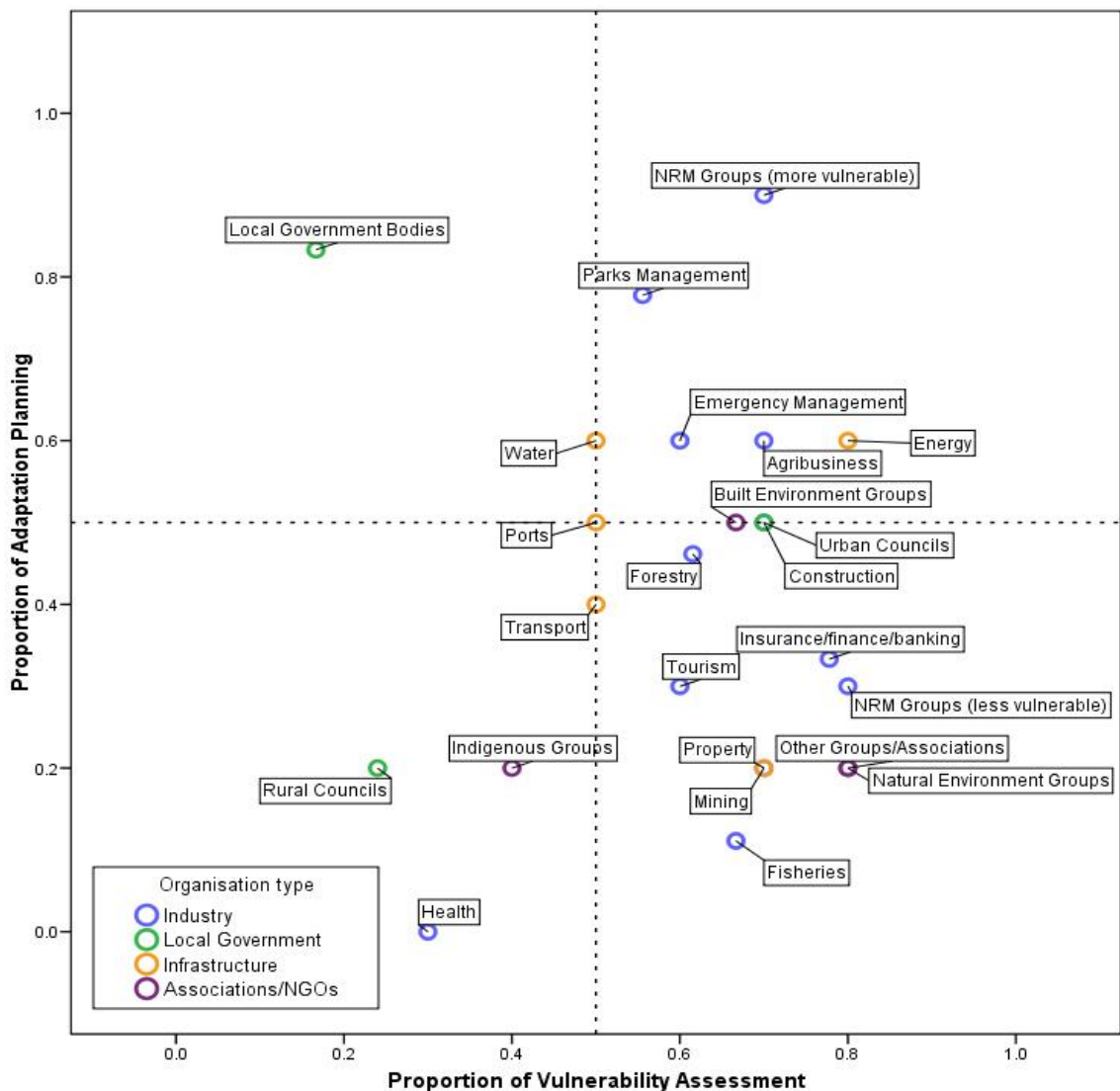


Figure 12: Organisation types mapped by their proportion of vulnerability assessment and adaptation planning.

## 3.2 Findings from state and federal government interviews

### Method and sample

This section describes the results of a separate series of telephone interviews conducted by Department of Climate Change staff with representatives from 19 government departments with some responsibility for or connection with climate adaptation. The questions for these interviews were based on the questions used in the telephone survey, but were adapted to reflect the different responsibilities and focus of government departments. The questions are shown in Appendix B.

Of the 19 departments involved, eight were state or territory government agencies (one from each jurisdiction), and eleven were federal government agencies. The federal agencies were interviewed specifically on the activities of their department, while representatives from state/territory agencies were asked to comment on the activities of their government more broadly. A summary of the most important themes emerging from these interviews is presented separately for state/territory and federal government departments below.

### State/territory departments

#### *Addressing climate change adaptation*

Three issues were discussed regarding state and territory governments' activities regarding climate change adaptation.

When asked about the development of policies or strategic plans with which to address the issue of climate change adaptation, all but one agency reported having at least one strategy or policy statement prepared. Many strategies, action plans and other policy instruments were mentioned by the agency representatives, and most were overarching strategies aimed at dealing with climate change in general. Specific issues of climate change adaptation were addressed within these larger strategies. Only one agency reported a policy statement designed specifically to deal with climate change adaptation.

In regard to the major areas of adaptation activity, respondents most commonly mentioned gathering more information and research. Key activities mentioned included:

- assessing the impacts of climate change in a range of contexts (e.g. biodiversity, agriculture, and community)
- mapping climate change science and research capacity, and finding ways to increase this capacity
- establishing collaborative opportunities between the agency and universities.

Other key areas included:

- developing strategies and plans
- engaging with a range of stakeholders (e.g. communities, businesses) to promote awareness and share information regarding climate change
- natural resource and ecosystem management.

Protecting industry, health and emergency management, policy reform and infrastructure/building adaptation were also mentioned.

In terms of the existing policy and programs that will be affected by climate change impacts, many diverse responses were received. While some respondents indicated that climate change would have an effect on all strategic areas, a number of respondents mentioned more specific areas, such as emergency management due to the impacts of more frequent extreme weather events, health services, primary industries, natural resources (e.g. water, biodiversity), infrastructure, and coastal protection.

### *Barriers to addressing climate change adaptation*

A lack of information and knowledge was widely identified as a key barrier, for example:

- lack of clear knowledge regarding climate change impacts
- making that information accessible to decision makers
- developing frameworks, tools and models to cope with rapid change
- lack of agreed methodologies regarding risk and vulnerability assessment
- lack of knowledge to guide investment decision making
- a lack of suitably down-scaled regional projections of climate change impacts.

Strategic barriers were also reported. One common issue raised by state/territory agencies was the difficulty coordinating across jurisdictions including state and local government boundaries. As well as a lack of clear responsibilities across jurisdictions and agencies, there is the potential for wasted effort and duplication through poor collaboration and sharing of approaches and resources between jurisdictions, between agencies, and between tiers of government.

Social, economic and community barriers were also reported, such as lack of awareness and understanding within the community and economic dependence on natural resources and industry.

Uncertainty regarding resources and funding for climate change adaptation activities was mentioned by all state and territory agencies as a barrier to climate adaptation. When asked what resources were allocated to climate change adaptation activities, only one agency was able to stipulate a specific allocation of staff and operational resources for addressing climate change adaptation. Another agency stipulated a staff resource allocation, but no operating budget.

### *Engaging key stakeholders for climate change adaptation*

A broad array of stakeholders were reported, the most common being state, federal, and local government agencies. Landholders and other natural resource managers, including the regional NRM bodies and catchment management authorities, were also important stakeholders across the state/territory governments. Industry and development groups, such as meat and livestock

representatives, tourism and fisheries groups, were also mentioned. Other key stakeholders were primary industries, irrigators, agricultural peak bodies, and the general public.

Engaging these stakeholders was reported to be done in a number of ways. A common method was via high level ministerial advisory committees, roundtables, and panels involving experts and key stakeholder representatives. Targeted consultation in relation to the development of strategies and plans was also mentioned, including community consultation forums, presentations, and invitations for submissions. The regional NRM bodies were also seen as a means for engagement with landholders.

### **Federal government departments**

#### *Addressing climate change adaptation*

Of the eleven departments surveyed, only four reported having strategic plans or policies that dealt with climate change adaptation. Like the state and territory governments, climate change adaptation was included as a subcomponent to broader climate change action plans.

When asked about the key areas of strategic activity regarding climate change, three Australian Government departments reported no major strategic areas. The remainder had varied strategic areas of activity. Although not as broadly identified, gaining more information and knowledge was reported as a key area in four of the eleven departments. Specific examples included providing statistical/information support for climate change adaptation, as well as research, modelling and analysis of climate change, its impacts and the adaptation activities being undertaken by others.

As with the state/territory agencies, stakeholder engagement, awareness raising and communication was reported as a key area for activity. This included information sharing and extension to increase farmers' uptake of sustainable land practices. Natural resource management and ecosystem protection, building adaptive capacity for the agricultural and other industry sectors, and ensuring the adaptive capacity of emergency and health services were also key areas of activity reported. Policy reform and energy market reform were strategic areas of activity reported by two of the Australian Government departments; these were not mentioned by the state or territory departments.

#### *Barriers to addressing climate change adaptation*

As in the state/territory governments, lack of knowledge and understanding of the impacts of climate change, strategies to prepare for it, other information/capacity needs were reported as barriers by the majority of Australian Government departments.

Strategic barriers were also reported, with many federal departments citing uncertainty over planning, the need for a consistent approach or the lack of Commonwealth control of assets (such as transport and some natural resources). Social barriers such as climate scepticism and lack of adequate community engagement were also seen as barriers. Funding uncertainty was also mentioned, but not to the same extent as the state government departments surveyed. When asked what resources were allocated to climate change adaptation in the 2008-09 financial year, seven of the eleven agencies reported no specific resources.

### *Engaging key stakeholders for climate change adaptation*

A broad array of stakeholders was described, the most common being government: state, federal, local and international. The scientific community was also reported as a key stakeholder, as were various industries and industry bodies (e.g. primary industries, tourism, and energy) and the community (incorporating consumers, regional communities, and traditional owners).

Although two departments reported no specific activities to engage with climate change adaptation stakeholders, other agencies reported a variety of engagement methods, including whole of government and stakeholder consultative committees, stakeholder advisory groups and reference panels, engagement coordinated through cooperative research centres, and presentations at relevant conferences.

## **3.3 Findings from in-depth interviews**

### **Method and sample**

As outlined earlier, we interviewed eight representatives of organisations that had taken little or no action on adaptation planning ('low activity' organisations), and eight representatives of organisations that had conducted formal vulnerability assessments and adaptation planning ('high activity' organisations). Within each group of eight, we aimed to achieve a cross-section of various organisation types. The participants were identified from a list of those who had responded to the telephone survey and indicated that they were willing to participate in a more detailed interview. Further details of the interview questions and participants are presented in Appendix C and Appendix D respectively.

Notes were made during the interviews, and these were subsequently typed up by the interviewer. The notes were then scanned inductively for common themes; this enabled the principal barriers and drivers, and other issues, to be identified and described, and allowed comparisons to be made between the two target groups.

### **'High activity' organisations**

#### *Nature of activities undertaken*

To map the kinds of planning activities that organisations had undertaken, respondents were initially asked to briefly describe the nature of their organisations' planning. This was checked with the previous survey responses. Two respondents noted that their organisations had not produced specific documentation on climate change adaptation, suggesting that their approach may be somewhat *ad hoc*. Nevertheless, based on the eight interviews, planning can be categorised into three types:

- Research
- Changing organisational practices
- Enhancing organisational capacity.

### **Research**

Three respondents cited research as their organisations' principal planning activity. At one organisation, the sustainability coordinator was preparing a discussion paper on climate change adaptation, looking at implications of various scenarios. Additionally, a planning group was using modelling of possible climate change over 20 years. Another organisation was working on a three-year research project looking at adaptation strategies, which will be used as an education and advocacy tool. A third organisation has conducted a scoping study.

### **Changing organisational practices**

Three organisations were actively making, or planning to make, fundamental changes to their organisational practices. One organisation, a winery in an area increasingly prone to heatwaves, was changing viticulture methods by providing better mulch protection for the soil and using wire trellising to protect fruit from the sun. Another, a forestry company, was re-evaluating both the selection of plantation sites and the appropriate tree species for planting. A third, a local council with a coastline vulnerable to flooding and tidal surges, and populated by several thousand residents, was planning for relocation of residents, and considering developing new towns in more climatically appropriate areas.

### **Enhancing organisational capacity**

Two organisations had focused more on enhancing organisational capacity to adapt. One, in particular, had concentrated in this area, as might be expected of an emergency management organisation. It had appointed a full-time environmental manager to work on information gathering and monitoring, established an environmental steering committee comprising senior management, and started training staff in new skills to cope with more frequent emergency events.

### *Drivers of activity*

To elicit respondents' perceptions of the drivers for adaptation planning, they were asked what had prompted the organisation to do the planning they reported. These drivers can be grouped into three broad categories:

- Sense of being directly vulnerable
- Growing awareness of climate change
- Response to external pressures

Some organisations sensed multiple drivers operating concurrently, so these drivers are not mutually exclusive.

### **Sense of direct vulnerability**

For four organisations the need to adapt is an essential response to a sense of vulnerability to the impacts of climate change. For one, dwindling water stocks demanded a need to rethink previous practices. Another perceived a need to be better prepared for increasing frequency, and increasing severity, of emergency events, such as bushfires and floods. One considered it necessary '*to drought-proof ourselves*' just to survive economically. Another, meanwhile, had already witnessed breaches of tidal walls, and described sea-level rises and ongoing dry weather as '*real issues that we can't ignore*'.



### **Growing awareness of climate change**

While ‘awareness’ could be seen as a prerequisite for change rather than a driver of it, growing awareness and recognition of climate change seemed itself to have catalysed many organisations’ planning efforts. For one organisation awareness of changing weather patterns implied that *‘we’ve got to be greener’*. Two others recognised that historical data are no longer reliable indicators of future climate, especially as they relate to rainfall figures. For others, recent bushfires had further raised awareness, and another noted that ‘exceptional circumstances’ seem to be becoming ‘normal’.

In some cases though, growing awareness was complemented, or perhaps driven, by specific efforts of an individual. One specific interviewee was making an explicit attempt to raise the profile of climate change in their organisation. Another, having read various reports from the Intergovernmental Panel on Climate Change, had become an ‘Al Gore presenter’ outside work, with the explicit intention of bringing back this experience to the organisation. In other cases, awareness appeared to extend beyond individuals. For one organisation, high awareness at board level had led to a proactive approach. For another, though, awareness permeated the entire organisational culture: *‘the motivation was always there... [because the impact of climate change] is something we confront on a daily basis’*.

### **External stakeholder pressures**

The need to respond to external pressures had acted as a driver for five organisations. In particular, pressure had been felt from governments and local communities. Referring particularly to the federal level, one noted a need to acknowledge that *‘climate change is part of mainstream policy’*. Referring to the state level, two others perceived a need to plan to comply with specific government policies. Another, meanwhile, experienced local community members demanding action. One organisation wanted to be able to provide adequate answers when community representatives asked what the organisation is doing to adapt. Another, similarly, perceived that the local community exerted pressure to act, and that landholders expected information and support. A third also cited a need to comply with newer building and engineering codes. Finally, as well as sensing government pressure, one organisation responded when three ‘ethical’ investment bodies pointed out that the company would not meet certain sustainability standards, making it ineligible for inclusion in certain investment funds.

### ***Barriers to activity***

To elicit respondents’ perceptions of the barriers that had impeded adaptation planning, they were asked what had made planning more difficult, and what might have made it easier. Six barriers emerged, and again these may overlap conceptually, as some respondents cited multiple barriers:

- Lack of resources – money, people and time
- Lack of information
- Waiting for policy clarity
- Inadequate government support
- Lack of economic justification
- Scepticism.

### **Lack of resources – money, people and time**

Perhaps not surprisingly, five respondents saw lack of resources as an impediment to planning. Illustrating budgetary pressures, one respondent noted: *'We're doing more with the same, or less, than we had before'*. Another argued for government subsidies to facilitate adaptation, especially for small business. A third also cited lack of funding as a barrier, and additionally noted that planning is made more difficult by staff being mostly on temporary contracts, as this hinders relationship-building processes. The term 'resources', then, means more than money. One respondent noted that the absence of a permanent employee dedicated to this work imposed a significant burden on existing staff. Another noted, similarly, that planning had been more difficult before the recent creation of a risk coordinator position. A further respondent, as well as arguing for government financial assistance, cited lack of time for planning, as he is always too busy meeting more immediate demands.

### **Lack of information**

Three respondents felt constrained by a perceived lack of information. A lack of information on mapping predicted sea-level rises made it difficult for one organisation to know where priorities should lie. The second, similarly, had been unable to identify reliable data on sea-level rises, which was needed to guide design specifications. A third wanted to see better explanation of the processes an organisation could follow and of frameworks for useful response approaches.

### **Waiting for policy clarity**

For three organisations it was difficult to plan until there was greater clarity on government policy. One wanted to see clearer legislative direction in general. Another asserted that the organisation's actions depend on government priorities and policies. The third argued that the Carbon Pollution Reduction Scheme white paper was silent on agriculture and forestry, and that the base year (1990 vs 2000) is unclear. Thus, he questioned: *'How can you decide how to adapt when you don't know what you're adapting to?'*

### **Inadequate government support**

As well as waiting for greater policy clarity, organisations may be constrained by ambivalent government leadership. One, for example, proposed that planning would be easier with both clearer direction and more supportive government policy. Another proposed that adaptation planning would be facilitated by greater leadership on climate change from federal and state governments. More critically, a third argued that planning would have been easier *'if government had not been so cynical about climate change'*. Another, meanwhile, argued that the state government was insufficiently proactive, and was failing to facilitate councils' planning efforts. A final respondent urged the need for more concentrated efforts at awareness-raising, and for education and research.

### **Lack of economic justification**

For two organisations action on climate change is always more difficult in the absence of clear economic justification. One respondent, for example, found that a barrier was the need always to show bottom-line benefits to initiatives. It was difficult, he added, to argue convincingly that a climate change response would result in a more profitable outcome, rather than imposing further costs. The second, similarly, noted that the profile of climate change as an issue is constrained by a lack of economic assessment of impacts. This does not necessarily mean that

the respondents themselves thought that there is no economic justification; rather, it is assembling an unequivocal justification for others in the organisation that is challenging.

### **Scepticism**

Climate change scepticism would not be expected to exist significantly among organisations classified as ‘high activity’. Nevertheless, some respondents had encountered it. One respondent had first to secure internal acceptance of climate change science to justify the need for planning. Another cited people within the organisation not being aware of climate change, or being sceptical, as a barrier because climate change is *‘not part of regular conversation’*. This posed a particular challenge for adaptation planning, as she had found adaptation to be more difficult to discuss than mitigation. Another, meanwhile, referred to an *‘institutionally entrenched infrastructure of thinking’* that made *‘attitudinal change’* very difficult. Specifically, she explained, this thinking involves mainstream land-management practices inherited from European traditions, which marginalise Indigenous ways of understanding the landscape, and thus ignore critical sustainability issues.

### *Internal resources*

The extent of resources available to the organisation may play a key role in facilitating or impeding adaptation planning. Thus, respondents were asked about their organisations’ available skills and resources, to shed further light on perceived drivers and barriers. Responses suggested that ‘resources’ for adaptation planning might mean a favourable organisational culture, as well as adequate staffing levels. Respondents were also asked how they had overcome the barriers they reported, to identify any additional available resources.

### **Level of staffing**

Perhaps surprisingly among organisations identified as ‘high activity’, none had employed someone specifically to plan for climate change adaptation. In most cases, there were only one or two people working on this planning, but not as a key part of their job. Typically, therefore, organisations had expected certain staff to take on this additional responsibility, or those staff themselves had added adaptation planning proactively to their roles. The diversity of types of staff responsible for adaptation planning suggests that some confusion exists over responsibility in this area: among the eight people interviewed, there were six substantially different job titles.

### **Organisational culture and practices**

Two respondents considered that their organisational culture constituted a resource that predisposed them towards proactive responses to sustainability, or to environmental issues in general. One described his organisation as a ‘can-do’ type of organisation, meaning one that is good at adapting and problem-solving, and thus well disposed to re-evaluating skills needs for climate change. Another referred to *‘a real passion for sustainability’* among the profession (landscape architecture).

### **Overcoming barriers**

The respondents reported that their organisations had overcome barriers with a combination of reactive and proactive measures. Reactive, or passive, strategies are reflected in the comment

*‘We fight the battles as they come along’*, and in observations that attitudes are changing anyway as more people experience more frequent extreme weather events.

Proactive measures mostly concerned gathering and applying scientific information. One respondent was researching the behaviour of aquifers and various tree species’ water consumption. Another was conducting research in collaboration with a university. A third was mapping likely effects of tidal surges and sea-level rises. In a bid to gain internal acceptance for adaptation planning, another was improving staff access to climate change information, and actively promoting educational material. One was running a professional development program that requires practitioners to understand climate change issues, and was also helping to organise a conference focusing on climate change.

Another proactive approach, particularly to overcome scepticism, concerned effective communication. One respondent made a point of frequently referring to extreme weather events internally, to raise awareness. She also commented that the discussion paper she was preparing must communicate to readers some practical examples of adaptation. Another respondent, as environment manager with an infrastructure company, ensured that engineers are asked relevant questions, such as *‘How have issues of climate change been addressed in this specification?’*

However, the barrier that appeared the most insurmountable was lack of resources, and respondents articulated fewer options for overcoming this. One had simply reallocated small amounts of money from elsewhere. Another submitted multiple grant submissions. A third, as a small business owner, looked for economies of scale where possible, and suggested that, while planning would consume resources in the short term, it would pay dividends in the long term.

### *External resources*

Respondents were asked what outside organisations had helped, and in what ways. They were also asked to identify what further help might be useful.

#### **Who had helped and how?**

Three respondents said that no outside organisations had helped in any major way. Among the remainder, a variety of organisation had provided help and support (see Table 15).

Table 15: External resources used by ‘high activity’ organisations

<b>Type of organisation</b>	<b>Type of help</b>
State government departments	<ul style="list-style-type: none"> <li>• co-running climate change workshops</li> <li>• developing scenarios</li> </ul>
Government agencies	<ul style="list-style-type: none"> <li>• helping to develop an action plan</li> </ul>
CSIRO	<ul style="list-style-type: none"> <li>• co-running climate change workshops</li> <li>• sharing research findings</li> </ul>
Universities	<ul style="list-style-type: none"> <li>• providing in-kind support for a scoping study</li> <li>• collaborating in research</li> </ul>
Industry associations	<ul style="list-style-type: none"> <li>• collaborating and support in planning</li> </ul>
Sister organisations (i.e. other organisations in the same industry)	<ul style="list-style-type: none"> <li>• running joint projects</li> <li>• sharing networks</li> <li>• sharing knowledge and planning strategies</li> </ul>
Regional partnerships/alliances	<ul style="list-style-type: none"> <li>• helping with process matters</li> <li>• collaborating in planning</li> </ul>

### **Further help**

Most respondents were largely satisfied with the external support that they had received, although a common sentiment was that more information on climate change modelling would be beneficial, especially if this information were easier to access. Two respondents would like to see more sharing of experiences within their industry or sector. One of these also argued that further help from the relevant state government department was needed. Another respondent was disappointed in the level of support from an industry association. For two respondents help could also comprise having a greater input into research, principally because this would provide a useful opportunity to discuss the issues that their particular organisations are confronting. Finally, one respondent felt a need for external support from someone who can operate both at board level, where the need to adapt to a changing climate is understood, and at a grass-roots level, where this need is often not understood.

### *Comparisons with similar organisations*

The organisations in this group were identified as ‘high activity’ based on the survey responses. However, the findings above indicate that some organisations are better prepared than others. Respondents were asked, therefore, to compare their organisations with others in the same industry or sector, in terms of the extent of the adaptation planning that they had done.

Of the eight respondents, five were confident that their organisations had done more planning than others in their industry or sector. The reasons cited were that, compared to similar organisations, they had:

- greater top-level commitment and determination
- experienced a higher frequency and/or diversity of extreme weather events
- a more environmentally-conscious organisational culture
- a greater desire or willingness to change
- experienced more vigorous community pleas for action.

One respondent, by contrast, considered that their organisation was doing approximately the same level of planning as others. Two others, meanwhile, said that their organisations were probably doing less than larger equivalent organisations, but more than smaller equivalent organisations. In both cases, they reasoned that the extent of planning reflects the size of the organisation and available resources. One of these added that, as a regional organisation, their culture tended to be less ‘green’ than in their urban equivalents.

### *The future*

Finally, respondents in ‘high activity’ organisations were asked to consider the future. Specifically, they were asked whether they were considering any further planning, and what factors, developments or issues might encourage them to do this. The latter question, then, was designed to elicit further possible drivers of, and barriers to, adaptation planning.

Typically, further planning being considered involved extending previous work, rather than doing something quite distinct from previous planning. For example, one was considering further research on the impacts of climate change. Another was focusing on ongoing improvement to land-management practices. One intended to improve training and safety

practices by learning from each new emergency event. Another recognised the need to review flood management strategies if the frequency of floods changes.

Some prospective initiatives, however, involved a more substantial escalation of adaptation planning. Two respondents recognised that they would have to start planning heatwave-management strategies, in response to the extreme heat experienced in south-east Australia in early 2009. Another, similarly, was considering actively planning for more extreme weather events, when hitherto planning had been more a reaction to external stakeholder pressures. Another considered that the organisation would have to start redesigning infrastructure based on more recent data. Another, was investigating opportunities for sharing its planning experience with similar institutes internationally.

When asked what factors, developments or issues might encourage them to pursue these ideas, respondents suggested the following:

- better communication of, and education and training in, climate change issues, especially with people working ‘on the ground’
- more resources for planning, including both money and people
- State government providing better leadership on climate change
- planning policies keeping up to date with climate change research, to restrict development in areas increasingly prone to bushfires and floods
- easier access to government funding for small organisations
- more research into technologies that might assist adaptation
- clarifying responsibilities among levels of government
- accessing case studies that document the planning that other organisations have done.

These ideas, then, further illustrate both drivers and barriers.

An interesting contrast emerged around the question of whether more extreme weather events would catalyse further planning. One respondent proposed that this would raise awareness and therefore facilitate the perceived need for planning. Conversely, another argued that, if climate change impacts grow more extreme, adaptation itself would become more difficult.

### **‘Low activity’ organisations**

This section discusses the findings from the eight interviews with ‘low activity’ organisations. The question format for this group differed in focus from the format used for ‘high activity’ organisations. Questions started with the barriers that had impeded adaptation planning, with a secondary consideration of possible drivers. In other respects, questions for both groups were very similar. Of particular interest, therefore, is whether the same drivers and barriers exist for both groups, but to different extents, or whether qualitatively different drivers and barriers exist for each group.

#### *Barriers to activity*

Since organisations in this group had been pre-classified as ‘low activity’, and since the survey informing this classification had been conducted a few months previously, the first task in the interviews was to ask respondents to confirm that their organisations had not yet done much

planning to adapt to future climate changes. This was largely confirmed, with respondents typically acknowledging the existence of climate change, but noting that their organisations had not formally evaluated the risks, and/or that they were just starting internal discussions on how to respond. Two organisations had made a little more progress. One had commissioned a flood mitigation study, while another had established a climate change task force, which was drafting an action plan.

What barriers, then, had impeded these organisations? Why were they not convinced of the need for adaptation planning to the same degree as the previous group? Here, seven barriers emerged, and again some of these overlap conceptually:

- Climate change is not seen as immediate or urgent
- Organisation is not seen as being vulnerable to climate change
- Scepticism
- Cultural conservatism
- Lack of information
- Lack of resources
- Waiting for others to lead

#### **Climate change not seen as immediate or urgent**

The most commonly cited barrier, present among five ‘low activity’ organisations, was the perception that the threat of climate change is not as immediate or urgent as other organisational priorities. For these organisations, climate change is real, but it is something that will happen in the future, to be dealt with when there are not more pressing tasks.

One respondent, for example, argued, ‘*We’re busy – other stuff is more urgent*’, while another described climate change adaptation as a ‘*future need*’. For a third, planning for the future is rare, because ‘*We battle to do things day-to-day*’. Another observed that, until the impacts are felt more closely, climate change is seen as a marginal issue. In the meantime, ‘*Other things get in the way*’ as people are caught up in day-to-day issues. For another, climate change is not seen to be an issue because it is not visible, and is thought unlikely to be visible for some time: ‘*People in this industry expect to be dead before climate change affects them*’.

#### **Lack of perceived vulnerability**

Related to the idea that climate change is not an immediate or urgent threat is the belief, cited by four respondents, that climate change is not particularly relevant for the organisation specifically. Again, therefore, climate change is not denied here, but it is seen as only affecting other people and organisations. Thus, organisations perceive no great need to plan for climate change adaptation themselves.

For one respondent from a minerals exploration company, underground working conditions allow for ambient temperatures, regardless of weather, so climate extremes are not considered to present a problem. Another commented that their organisation was confident that no climate change impacts would fall outside existing managerial capabilities, although it is not clear how this confidence can be reconciled with the acknowledgement that the organisation had not formally assessed its vulnerability. A third argued that there is no sense of a need to plan because, compared to other states ‘*We don’t get much severe weather*’. Another respondent seemed to equate climate change with natural disaster events, rather than with extended periods

of ‘extreme’ weather. Therefore there is no impetus for planning because ‘*Flooding is the last thing people think about in the middle of a drought*’.

### **Scepticism**

While the first two barriers imply some level of scepticism regarding organisations’ need to plan for climate change adaptation, they fall short of explicit climate change scepticism. However, three respondents did suggest that some explicit scepticism exists in their organisations. Two noted that some in their organisations simply would not be convinced that climate change is a reality. The third described himself as a ‘*fence-sitter*’ regarding climate change science. He proposed that ‘*We all have a degree of scepticism within us*’, and argued that all weather is cyclical, the important question being ‘*How long is a cycle?*’.

### **Cultural conservatism**

Reinforcing the scepticism within individuals, some organisations appeared to have a propensity towards cultural conservatism that resists change. Just as one of the ‘high activity’ respondents found an ‘*institutionally entrenched infrastructure of thinking*’ to inhibit change, one respondent noted that his organisation’s actions were delimited by the policies of its member bodies, some of which are quite conservative. Another proposed that her organisation had a culture of reaction and recovery, not change and adaptation. A third described his industry’s culture as very conservative, indeed as ‘*ancient and venerable, old-fashioned, rigid and unchanging*’. The implication, he added, is that there is simply no place for rational discussion of climate change issues.

### **Lack of reliable information**

Five respondents had found lack of information to pose a significant barrier. For two respondents there was a sense that their level of information, knowledge or expertise was inadequate. As one put it: ‘*I’m concerned that I don’t have as much knowledge or expertise as I would like*’. Another, similarly, felt ignorant of the relevant issues, and thus poorly positioned to take action.

Deeper discussion, however, suggested that the problem may be not lack of information *per se*, but lack of reliable and readily-available information. One, for example, commonly felt confused, finding it difficult and time-consuming to work out the implications: ‘*It’s hard to get your head around what you should be doing... No one’s got the answers*’. Another, similarly, yearned to have all information accessible from one trustworthy place that had gathered information from various sources. He suggested CSIRO as such a place, and particularly wanted to know:

- What are the facts about climate change?
- What are the confidence levels for any forecasts?
- What are the potential consequences for his industry/sector?

For one, an association representing Indigenous communities, the information on likely impacts or possible adaptation strategies is all too vague and intangible. The problem, then, is that ‘*You can’t make a contribution if you don’t know what’s going on. You can’t plan if you don’t know what you’re planning for*’. The organisation feels further ‘*out of the loop*’ by being excluded from state consultation and information sessions on climate change. Noting that the Garnaut review devoted only one section in one chapter to Indigenous issues, the respondent identified a



need for a ‘*Garnaut-style report*’ on the impacts of climate change specifically on Indigenous land, health and human rights.

### **Lack of resources**

As well as finding lack of reliable information to be a barrier, four organisations found lack of resources more generally to present a barrier. Two considered their organisations to be too small to undertake adaptation planning. As one commented, ‘*We wouldn’t regard ourselves as capable of doing this – we’re only a small council*’. For another, the problem was not only an inadequate level of information, but also the cost of obtaining such information, implying that the cost is perceived as prohibitive. For a third, a key problem was lack of access to the technology that might otherwise facilitate planning.

### **Waiting for others to lead**

Perhaps related to the view of being insufficiently resourced to undertake adaptation planning is the notion expressed by four respondents that others, particularly government, should lead the way. Three respondents expected government (federal and/or state) to provide better policy direction, and felt unable to plan without this stronger direction. Another, meanwhile, as a local council, expected the Local Government Association to initiate any climate change action, with the council then responding and implementing recommendations.

### *Drivers of activity*

Some of these barriers, then, mirror those experienced by ‘high activity’ organisations. However, the latter seem better able, or more motivated, to strive to overcome barriers. As discussed, ‘high activity’ organisations appear to be driven firstly by a sense of being directly vulnerable, secondly by a growing awareness of climate change, and thirdly by external pressures. To shed further light on the differences between the two groups, participants in ‘low activity’ organisations were asked to reflect on possible or potential drivers of adaptation planning. Was there anything that had prompted them to do some planning, but that perhaps had not been convincing enough?

Three respondents cited a driver that could be likened to the first driver among ‘high activity’ organisations – a sense of being directly vulnerable to the impacts of climate change. One indicated that ‘*rural communities are really suffering*’ from a crisis in the Murray-Darling system. Another noted that the region had recorded its highest-ever temperature in the most recent summer. Another, meanwhile, perceived that the area had recently experienced several extreme weather events, specifically floods, heatwaves, and coastal inundation.

Four respondents also sensed external pressures, although the source of these perceived pressures varied. One sensed a need to act when someone had stood up at an annual general meeting, asking what the company was doing about climate change. Another was aware that equivalent organisations in other states are further advanced in planning for climate change adaptation. The third was concerned that failure to adapt could leave the organisation open to legal charges of negligence. The last noted that adaptation might mitigate some of the additional costs likely to be incurred through increasingly frequent extreme weather events.

None of these potential drivers, however, had yet proven sufficiently persuasive to overcome the perceived barriers. For two respondents, meanwhile, nothing had particularly prompted them to do any planning.

### *Internal resources*

Although organisations in this group had done little or no adaptation planning, they were asked what skills or resources were available to the organisation, and what might help with planning in the future. This enables us to consider whether a correlation exists between available resources and planning activity. Do ‘high activity’ organisations tend to be better resourced than ‘low activity’ organisations?

Since none of the ‘high activity’ organisations had employed someone specifically to plan for climate change adaptation, it is not surprising that none of the ‘low activity’ organisations did either. The distinction, though, seems to lie in the finding that, while ‘high activity’ organisations at least had identifiable staff responsible for adaptation planning, even if not exclusively, this was generally not true of ‘low activity’ organisations. No organisation had specialist expertise in this area, and in many cases responsibility was dispersed among several staff. Furthermore, in some organisations, this responsibility rested not with environmental or planning professionals, as was the case with most ‘high activity’ organisations. Rather, responsibility rested with engineers, risk management staff and emergency management staff.

Thus, findings from this small sample suggest that ‘high activity’ organisations tend to be better resourced than ‘low activity’ organisations. However, we cannot say whether a causal relationship exists between resourcing and adaptation activity.

### *External resources*

When considering external resources, respondents in ‘high activity’ organisations were asked to identify what help outside organisations had actually provided, with a supplementary question about what further help could be useful. ‘Low activity’ organisations, in contrast, were asked only to identify any outside organisations that might have helped, or that could help, and how they could help.

Despite this emphasis on potential help, two respondents actually reported that they did not feel the need for more help. Other external resource suggestions are presented in Table 16.

Table 16: External resources suggested by 'low activity' organisations

Type of organisation	Type of help
State government departments	<ul style="list-style-type: none"> <li>• listening more to our needs and concerns</li> <li>• providing more flexibility in policy</li> <li>• closer engagement</li> </ul>
Government agencies	<ul style="list-style-type: none"> <li>• providing reports on climate change</li> <li>• demonstrating greater willingness to discuss innovative solutions</li> <li>• closer engagement</li> </ul>
CSIRO	<ul style="list-style-type: none"> <li>• sharing research findings</li> <li>• conducting research applicable specifically to our industry</li> <li>• enabling input into research projects</li> </ul>
Universities or other research institutions (e.g. CRCs)	<ul style="list-style-type: none"> <li>• sharing research findings</li> <li>• conducting research into technological solutions for adaptation</li> </ul>
Industry associations	<ul style="list-style-type: none"> <li>• engaging more on training and employment opportunities that adaptation might provide, drawing on Indigenous cultural knowledge</li> </ul>
Sister organisations (i.e. other organisations in the same industry)	<ul style="list-style-type: none"> <li>• advising on business processes</li> </ul>

### *Comparisons with similar organisations*

As before, respondents were asked to compare their organisations with others in the same industry or sector, in terms of the extent of adaptation planning that they had done.

Of the eight respondents, five acknowledged that their organisations were probably doing less than others. This supports their classification as relatively 'low activity' organisations. The explanations given reflect the barriers reported, and include:

- Similar organisations are more exposed to severe weather
- Similar organisations are much larger, and have greater access to skills, data and resources
- Similar organisations have someone passionate and persuasive on this topic
- We are confused by the information
- We have had a lot of climate change sceptics in this organisation.

Among the remaining three respondents, one considered that similar organisations were also not doing much planning for climate change adaptation. Another did not know how the organisation compared with others. The third proposed that, while the organisation had not done much planning, its staff were more convinced about climate change than others, and were thus more committed towards action – when the barriers can be overcome.

### *The future*

Finally, respondents were asked to consider what factors, developments or issues might encourage planning in the future. Again, this was intended to shed further light on barriers and drivers of adaptation planning. Factors cited were:

- more evidence that vulnerability to extreme weather events is likely to increase; ‘harder evidence’ of climate change
- financial incentives – either more funding, or rising costs of not adapting
- more accessible advice on responding to climate change, with practical tools
- stronger government leadership and clearer policy direction
- more government support, or encouraging innovation and good practice
- legal obligation to adapt
- greater internal resource capacity.

These findings, then, largely reinforce the barriers and drivers identified above. It is notable that five of the eight respondents proposed that they needed stronger evidence of climate change to encourage their organisations to plan. This need for information is particularly consistent with the first two barriers– that climate change is not immediate or urgent, and that the organisation is not especially vulnerable – and it more generally reflects the third barrier, climate change scepticism. Clearly, there are several areas to be addressed if these organisations are to be supported, encouraged, or persuaded to plan for climate change adaptation.

## 4. CONCLUSIONS

Survey results indicate that although most businesses recognise the challenge posed by climate change, and accept that both mitigation and adaptation are important, the nature and extent of adaptation activity was highly variable. Only 59% of surveyed organisations have conducted a formal vulnerability assessment, and less than 40% have implemented any specific planning for adapting to future climate changes. Other specific findings of interest are:

- There is a degree of confusion between mitigation and adaptation. Many respondents described mitigation activities when asked about adaptation activity, even after formal definitions of both adaptation and mitigation had been given to them.
- Adaptation activity appears to be linked to knowledge and beliefs about climate change issues. Organisations that rated climate change, adaptation and (to some extent) mitigation as more important, and those with higher knowledge of adaptation and mitigation, were more likely to have conducted vulnerability assessment and adaptation planning.
- Adaptation activity appears to be more likely to occur in organisations with longer planning horizons. There is also some indication that larger organisations (in terms of annual turnover and staff numbers) were somewhat more likely to have conducted vulnerability assessment and adaptation planning than smaller organisations.
- Adaptation activity appears linked to contact with outside organisations. Respondents who reported contact with outside organisations (including the DCCEE and CSIRO) were more likely to have conducted vulnerability assessment and adaptation planning.
- Once vulnerability assessment has been conducted, especially if it indicates that the organisation's vulnerability is high, subsequent adaptation planning is more likely. This finding suggests that prompting organisations to conduct vulnerability assessments may be expected to have flow-on impacts on levels of adaptation planning.

State and federal government entities typically incorporate climate adaptation within a broader climate change framework, rather than having separate policy directed at adaptation. Further, the major area of activity related to adaptation was gathering more information, suggesting that adaptation planning is still in its early stages within these government entities. Commonly cited barriers to adaptation activity were lack of information, lack of clear responsibilities and coordination across jurisdictions, and uncertainty regarding funding, although this latter issue was more often identified by state/territory entities. Federal entities also cited lack of community engagement and climate scepticism as barriers to adaptation planning.

In-depth interviews of some specific organisations that reported particularly low or high levels of adaptation activity indicated a range of drivers and barriers to adaptation activities. Drivers of adaptation activities were identified as:

- a sense of the organisation being directly vulnerable,
- a more general growing awareness of climate change
- a response to external pressures from stakeholders including government and the public.

## CONCLUSIONS

Barriers to adaptation activities included:

- climate change not seen as immediate or urgent
- the organisation is not seen as being vulnerable to climate change
- general scepticism about climate change
- cultural conservatism within the organisation
- a lack of information and/or resources for adaptation
- a sense of waiting for others to lead.

Drivers and barriers for adaptation activity involved similar content in organisations that had (and had not) undertaken substantial adaptation activity. This finding suggests that shifting the balance of existing drivers and barriers may be enough to encourage many organisations to increase their adaptation planning.

It is noteworthy that the conceptual framework that acted as a guide for this research has received a substantial degree of support from the data. The pathway, drivers and barriers outlined in the model were largely supported by both the quantitative survey findings and the qualitative interview results. It appears that adaptation planning is more likely to occur if an organisation:

- has more knowledge of climate change in general
- has conducted formal vulnerability assessment
- has prior experience with longer-term strategic planning
- has contact with external organisations to provide information and assistance.

Conversely, it appears that adaptation planning may be less likely if the organisation:

- is waiting for someone else to take responsibility for adaptation planning
- has an organisational culture that does not support change
- has a lack of information or physical resources (money, staff, time)
- has a degree of scepticism about climate change in general.

### **Potential limitations**

#### **Sample representativeness**

Although the sample was selected randomly, the sub-samples collected for most specific organisational types are too small to provide a convincing assessment of the state of that sector across the whole of Australia. Further, the individual respondent may not be able to accurately reflect the beliefs and actions of the entire organisation (although efforts were made to ensure the respondent was a senior manager who was able to provide such information).

Because of these issues, all survey results need to be viewed as broadly indicative only – this survey provides an indication of adaptation activities across Australian organisations as a whole, but the sample is not large enough to provide an accurate reflection of differences between different types of organisations.

#### **Non-response bias**

Because the telephone survey sought contact with a person in the organisation about climate change issues, it is possible that some people with particularly negative views towards climate

change would be less willing to participate in the survey. This issue can result in a ‘non-response bias’, where people who refuse to participate in the survey are systematically different from those who do participate. For the current survey, if such a bias had occurred, this would mean that the survey responses summarised here are actually an *over-estimate* of the level of actual adaptation activity currently underway in Australian organisations.

### **Response bias**

It is also possible that survey responses were contaminated by individual biases. In surveys of this type, respondents may colour their responses based on their own (positive or negative) beliefs about climate change, or based on their perceptions of what responses were most acceptable to the interviewer. In order to reduce the potential for this bias, the questions focussed on concrete issues: what the organisation has done, or is planning, rather than on questions that evoked an individual opinion. This approach also facilitates the replicability of the survey, since it may be difficult to recontact the same respondent after two years.

### **Future work**

The project is designed to track changes in adaptation activities over time, with a planned repetition of the survey in 2010. Results of this research will enable an initial assessment of the current level of adaptation planning underway in Australia, and will identify ways to assist organisations to develop appropriate plans to prepare for future climate changes.

One specific issue to be considered as this project goes forward involves plans for recontacting the organisation in 2010. There is a possibility that we will be unable to contact the original respondents when resurveying (because individuals have moved on, organisation has changed role or structure, etc). Some degree of such attrition is inevitable over two years. The database maintenance planned for 2009 is designed to reduce the impact of this problem, by keeping updated contact details of the organisation and the individual respondent where possible.

Once the second set of survey data is collected, it will be possible to identify how, and to what extent, organisations in the sample have changed over time. It also will be possible to identify organisations that have changed markedly, and compare them to those who have not changed; this approach will allow a further examination of the factors that encourage or discourage the adoption of adaptation planning in Australian organisations.

## REFERENCES

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- Nelson, R., Kokic, P., Crimp, S., Martin, P., Meinke, H., Howden, M., Devoil, P., McKeon, G. and Nidumolu, U. (unpublished manuscript). *The vulnerability of Australian agriculture to climate variability & change: Part II – Vulnerability assessments that support adaptation*. Submitted to Environmental Science & Policy, December 2008.



## APPENDIX A: TELEPHONE SURVEY QUESTIONS

### INTRODUCTION

#### INTRO 1

*Hello, my name is \_\_\_\_\_, I'm calling from the University of Queensland Social Research Centre. We are conducting a survey for the CSIRO. We would like to speak to the person in your organisation responsible for managing climate change, environmental or sustainability issues. Will that be you?*

1. Yes, I'll get the person
2. Respondent not in – arrange call back
3. We do not have anyone in that position
4. Refused
5. Respondent moved away permanently and is not contactable
6. Terminate for engaged or no answer

[If 1-2]

Go to INTRO 2

[If 4-6]

Interview termination:

*Thank you for your time, goodbye.*

[If 3]

Could I please speak to someone in a senior role who can discuss the organisation's response to climate change issues?

1. Yes, I'll get the person
2. Respondent not in – arrange call back
3. Refused

[If 1-2]

Go to INTRO 2

[If 3]

Interview termination:

*Thank you for your time, goodbye.*

#### INTRO 2

Once appropriate person is on the line

*Hello, my name is \_\_\_\_\_, I'm calling from the University of Queensland Social Research Centre, is that \_\_\_\_\_? We are conducting a survey on behalf of the CSIRO about climate change.*

#### PURPOSE OF THE SURVEY

*The purpose of this survey is to understand the level of planning for climate change that has been done by Australian organisations, and to help identify what further planning is required. The survey will take about 20 minutes to complete and we appreciate your assistance with this study.*

*(If respondent agrees)*

*Before we begin, I would like to inform you that your participation in the study is entirely voluntary and your answers are confidential. You are free to withdraw from the study at any time. If there are any questions that you would rather not answer, you can just say so, that's fine.*

*Contact details*

*If the participant has any additional questions or concerns, or requires any further information about the study they can contact John Gardner at CSIRO on Phone 07 3327 4076 or email: John.Gardner@csiro.au.*

*We begin by asking you about your level of awareness of climate change.*

**Q1. Using a scale of 1 to 5 where 1 – not at all convinced to 5 – completely convinced, how convinced are you that climate change represents a real problem for Australia?**

- 1 Not at all convinced
- 2 Somewhat convinced
- 3 Neutral
- 4 Very convinced
- 5 Completely convinced
- 6 I don't know

**Q2. Using a scale of 1 to 5 where 1 – not at all important to 5 – extremely important, how important is climate change to your organisation?**

- 1 Not at all important
- 2 Somewhat important
- 3 Neutral
- 4 Very important
- 5 Extremely important
- 6 I don't know

**Q3. Can you describe your organisation's priority areas in responding to climate change?**

*(Note for interviewer: This can include both mitigation and adaptation issues, and both their own actions and the actions of other organisations - please list in order they are mentioned)*

*Describe*

**Q4. Using the scale 1 to 5 where 1 – not at all familiar through to 5 – extremely familiar How familiar are you with the notion of mitigation of climate change?**

- 1 Not at all familiar
- 2 Somewhat familiar
- 3 Neutral
- 4 Very familiar
- 5 Extremely familiar
- 6 I don't know

*To clarify, we define mitigation as action that reduces the amount of greenhouse gas in the atmosphere, for example by reducing energy consumption, using lower-emission forms of energy, and reducing waste and land clearing.*

**Q5 On a scale of 1 to 5 where 1 – not at all important to 5 – extremely important How important is it for your organization to reduce its Greenhouse gas emissions?**

- 1 Not at all important
- 2 Somewhat important
- 3 Neutral
- 4 Very important
- 5 Extremely important
- 6 I don't know

**Q6. How familiar are you with the notion of adaptation to climate change on a scale of 1 to 5 where 1 – not at all familiar through to 5 – extremely familiar?**

- 1 Not at all familiar
- 2 Somewhat familiar
- 3 Neutral
- 4 Very familiar
- 5 Extremely familiar
- 6 I don't know

*To clarify, we define adaptation as preparing for the likely future impacts of climate change, for example: by planning for future water shortages; preparing for rising sea levels; changing building designs, preparing for extreme weather events, and changing plans for land use.*

**Q7. How important is it for your organization to prepare for the future impacts of climate change on a scale of 1 to 5 where 1 – not at all important through to 5 – extremely important.**

- 1 Not at all important
- 2 Somewhat important
- 3 Neutral
- 4 Very important
- 5 Extremely important
- 6 I don't know

**Q8. Have you assessed the potential impacts to your organization of future climate changes?**

1. Yes (Go to Q9)
2. No (Skip to Q10)

**Q9. Based on this assessment, how exposed is your organization to future changes to the climate on a scale of 1 to 5 where 1 – not at all exposed through to 5 – extremely exposed.**

- 1 Not at all exposed (Skip to Q11)
- 2 Somewhat exposed (Skip to Q11)
- 3 Neutral (Skip to Q11)
- 4 Very exposed (Skip to Q11)
- 5 Extremely exposed (Skip to Q11)
- 6 I don't know (Skip to Q11)

**Q10. Could you explain why your organisation has not done this assessment?**

*Describe*

*We are also interested in understanding your organisation's current adaptation activities.*

**Q11. Does your organisation have any existing policies, plans or practices that relate to climate adaptation, that is, things that relate to planning for the future impact of climate change? Note: activities that relate to mitigation alone do not count. If uncertain, assume the answer is yes, and continue questions below, for later confirmation**

1. Yes (Go to Q13)
2. No (Skip to Q12)

**Q12. Could you explain why your organisation doesn't have any current activities relating to climate adaptation?**

*Describe*

*(Skip to Q17)*

**Q13. Can you briefly describe this activity (or activities)?**

*Describe*

**Q14. How useful do you think this activity (or activities) will be in preparing for future climate change on a scale of 1 to 5 where 1 – not at all useful through to 5 – extremely useful.**

- |   |                   |
|---|-------------------|
| 1 | Not at all useful |
| 2 | Somewhat useful   |
| 3 | Neutral           |
| 4 | Very useful       |
| 5 | Extremely useful  |
| 6 | I don't know      |

**Q15. Can you give an estimate of the expected financial benefit to your organisation of this activity (or activities)?**

*Record dollar value*

**Q16. Can you explain what prompted the development of this activity (or activities)?**

*Describe*

*We are also interested in understanding any current or previous relationships that your organization has had with other organisations to plan for future climate changes.*

**Q17. Has your organisation been involved in any partnerships or relationships with other organisations to plan for future climate changes?** *Note: relationships that relate to mitigation alone do not count. If uncertain, assume the answer is yes, and continue questions below, for later confirmation*

1. Yes (Go to Q18)
2. No (Skip to Q19)

**Q18. Can you list the organisations that you are(or were) involved with?**

*Describe (include organisation names only)*

*We are interested in any contact that your organisation has had with some specific organisations.*

**Q19. Has your organisation had any contact with the Federal Department of Climate Change (formerly the Australian Greenhouse Office) about planning for future climate changes?**

1. Yes (Go to Q20)
2. No (Skip to Q24)

**Q20. What is (or was) the nature of this contact?**

*Describe (include position name of the contact person, their location, and the topic area of the relationship)*

**Q21. How useful has this contact been in helping you plan for future climate changes on a scale of 1 to 5 where 1 – not at all useful through to 5 – extremely useful.**

- |   |                   |
|---|-------------------|
| 1 | Not at all useful |
| 2 | Somewhat useful   |
| 3 | Neutral           |
| 4 | Very useful       |
| 5 | Extremely useful  |
| 6 | I don't know      |

**Q22. What prompted the development of the relationship?**

*Prompt, can include multiple responses*

1. Someone from your organisation
2. Someone from the Department of Climate Change
3. Something or someone else (specify) or
4. Don't know

**Q23. Has your organisation had any contact with CSIRO about planning for future climate changes?**

1. Yes (Go to Q24)
2. No (Skip to Q28)

**Q24. What is the nature of this contact?**

*Describe (include position name of the contact person, their location, and the topic area of the relationship)*

**Q25. How useful has this contact been in helping you plan for future climate changes on a scale of 1 to 5 where 1 – not at all useful through to 5 – extremely useful.**

- 1 Not at all useful
- 2 Somewhat useful
- 3 Neutral
- 4 Very useful
- 5 Extremely useful
- 6 I don't know

**Q26. Can you give an estimate of the expected financial benefit to your organisation of this relationship?**

*Record \$ amount or comment*

**Q27. What prompted the development of the relationship?**

*Prompt, can include multiple responses*

- 1. Someone from your organisation
- 2. Someone from CSIRO
- 3. Something or someone else (specify) or
- 4. Don't know

*We are interested in understanding your organisation's future plans for responding to climate change.*

**Q28. Could you tell me if your organisation is planning any future work to prepare for the impacts of climate change?**

- 1. Yes (Go to Q29)
- 2. No (Skip to Q30)

**Q29. Can you briefly describe these plans?**

*Describe*

**Q30. Would your organisation be interested in services or programs delivered by outside organisations to help you prepare for changes in climate?**

- 1. Yes (Go to Q31)
- 2. No (Skip to Q32)

**Q31. What sorts of services would interest you?**

*Describe*

*We would like to record some background information on your organisation to assist us in making useful comparisons between different business groups.*

**Q32. What is the name or type of organisation are you from?**

*Describe (might be useful to prompt here for instance, Local Government, Infrastructure Management, Industry Group etc)*

**Q33. What is your job title within the organisation?**

*Describe*

**Q34. What is the annual turnover of your organisation? (i.e. your total income from all sources in the last financial year – an approximate value is fine)**

*Record \$ amount*

**Q35. How many staff are employed by your organisation? (an approximate number is fine)**

*Record number*

**Q36. What is the typical time horizon used for planning in your organisation? That is, how many years in the future does your organisation tend to look when planning new ventures or other changes?**

*Record number in years*

**Q37. Finally, would you be willing to be involved in a more detailed interview about your organisation's planning in response to climate change?**

1. Yes Record name and contact details
2. No (Skip to CONCLUSION)

**CONCLUSION**

*That is all we need to ask you at the moment. Thank you for taking the time to participate in this study. If you have any query about the study, you can contact John Gardner from CSIRO on phone 07 3327 4076 or email [John.Gardner@csiro.au](mailto:John.Gardner@csiro.au)*

## APPENDIX B: STATE AND FEDERAL GOVERNMENT INTERVIEW QUESTIONS

### Background

1. Name
2. Position
3. Length of service with agency
4. Length of service with climate change issues

### Policy and programs

5. What policies or strategic plans relating to climate change adaptation has your agency developed? [*secure copies*]
6. What are the major strategic areas of climate change adaptation program activity for your agency? [*list by sector*]
7. Which of your agency's existing major policy and programs will be affected by climate change impacts? How do you consider they will be affected? [*list by sector*]
8. What do you see are the most significant barriers and limitations to climate change adaptation for your agency?
9. What resources (staff and cash) have been allocated to climate change adaptation activities in the financial year 2008–09?

### Stakeholders

10. Who are the most important stakeholders for climate change adaptation for your agency? [*list by sector*]
11. What steps has your agency taken to engage these stakeholders?

### Future planning

12. Is your agency planning any future activities to address issues of climate change adaptation? (Y/N) If yes, *secure copies*.

### Other information

13. Is there any other information you would like to provide?



## APPENDIX C: IN-DEPTH INTERVIEW QUESTIONS

For the 'high activity' group, questions focussed on the drivers for adaptation planning that had been carried out, with a secondary consideration of the barriers that were overcome in implementing this planning. For the 'low activity' group, questions focussed on the barriers that have prevented adaptation planning, with a secondary assessment of perceived drivers that may exist for the organisation to pursue adaptation planning. Existing responses from the telephone surveys were used as prompts where necessary. The questions below were not necessarily asked verbatim, but were used as a guide, and were adjusted for relevance as the interviews progressed.

### 'High activity' organisations

1. Can you describe briefly the nature of any planning that your organisation has done to adapt to future climate changes?
2. What prompted the organisation to do this planning?
3. Describe anything that made this planning more difficult.
4. How did you overcome any problems?
5. What else might have made it easier?
6. Are you considering any further planning? What would encourage you to do this?
7. What skills or resources do you have in the organisation that have helped do this planning?
8. Did you deal with any outside organisations that have helped? What help did they provide? What further help could you use, and from what organisations? Cite any publications.
9. What is your sense of what other organisations in your industry/field are doing? Are they doing more/less planning than your organisation? If so, why?
10. Are there any other issues that might affect planning for future climate change impacts in your organisation?

### 'Low activity' organisations

1. Can you confirm that your organisation has not yet done much planning to adapt to future climate changes?
2. What has stopped the organisation from doing this sort of planning?
3. Is there anything that has prompted you to do some planning, but that perhaps wasn't convincing enough?
4. Why haven't these things convinced you to act so far?
5. What might persuade or encourage you to do some planning in the future?
6. What skills or resources do you have in the organisation that might help to do this planning in the future?
7. Do you know of any outside organisations that might have helped, or should help? What help could/should they provide?
8. What is your sense of what other organisations in your industry/field are doing? Are they doing more/less planning than your organisation? If so, why?
9. Are there any other issues that might affect planning for future climate change impacts in your organisation?

## APPENDIX D: IN-DEPTH INTERVIEW RESPONDENTS

The table below shows the industry groups that the of the in-depth interview respondents were drawn from. The slight imbalance between the numbers of respondents from different organisation types reflects differences in the numbers of potential respondents available from the telephone survey. Within each organisation type, we interviewed a range of different specific industries. This sample selection was not designed to be representative, but to gather data from a diverse array of perspectives.

<b>Activity</b>	<b>Organisation type</b>	<b>Specific industry</b>
High	Industry groups	Forestry
		Emergency management
		Natural resource management
		Agribusiness
	Local government and related	Urban councils
	Infrastructure management	Water
		Ports
Associations and NGOs	Built environment	
Low	Industry groups	Health
		Mining
		Forestry
		Emergency management
	Local government	Rural councils
		Urban councils
	Infrastructure management	Transport
	Associations and NGOs	Indigenous groups





### Contact Us

Phone: 1300 363 400

+61 3 9545 2176

Email: [enquiries@csiro.au](mailto:enquiries@csiro.au)

Web: [www.csiro.au](http://www.csiro.au)

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