

2009

Local government planning responses to the physical impacts of climate change in New South Wales, Australia

Nadine E. White
Southern Cross University

Publication details

White, NE 2009, 'Local government planning responses to the physical impacts of climate change in New South Wales, Australia', *The International Journal of Climate Change: Impacts and Responses*, vol. 1, no. 2, pp. 1-16.

The abstract and pdf of the published article reproduced in ePublications@SCU with the permission of the International Journal of Climate Change: Impacts and Responses

Local Government Planning Responses to the Physical Impacts of Climate Change in New South Wales, Australia

Nadine E. White, Southern Cross University, New South Wales, Australia

Abstract: Effective policy responses of governments to the impacts of unavoidable climate change require effective adaptation plans. This paper presents the results of original research conducted in New South Wales, Australia, on the planning response of local governments for adapting to the physical impacts of climate change. Local government is the level of governance that is at the 'coal face' of dealing with sea level rise, coastal erosion, increased storm events, increased flooding, increased drought and other physical impacts of climate change in Australia. The study investigates the perceptions of local government planners regarding the actions taken within their local government area to plan for the physical impacts of climate change, the effectiveness of that response, and what further actions they perceive should be undertaken in the future. This applied evaluation research is conducted within a postpositivist paradigm and is analysed through the theoretical framework of adaptive management. The results of the study indicate that more needs to be done to plan for the physical impacts of climate change, including conducting risk assessments, policy development and collaboration between councils.

Keywords: Climate Change, Adaptive Planning, Local Government, New South Wales, Australia

Background to the Study

CLIMATE CHANGE IS an increasingly important issue. Early scepticism has been replaced with near consensus that humanity is facing major global climatic change (Garnaut, 2008). Some of the most significant impacts of climate change identified and agreed upon by numerous scientists across the globe include rising temperatures, changes to precipitation, rising sea levels, increased coastal erosion, and an increase in the frequency and intensity of extreme weather events (IPCC, 2007).

Australia has been identified as one of the most vulnerable of all industrialised nations to the impacts of climate change. This is due to the particularly high risk of significant impacts on hydrology, ecosystems, coastal zones, and human health and settlements (IPCC, 1997). The Intergovernmental Panel on Climate Change (IPCC) has high confidence that Australia is already experiencing impacts from recent climate change, evident in increasing stresses on water supply and agriculture, and changed natural ecosystems (Hennessy et al., 2007). These current impacts create urgency for Australia's communities to plan for further impacts of impending climate change.

In 2005, the Australian Federal Government stated that governments have an important role "in implementing adaptation action in partnership with the private sector and communities" (AGO, 2005, p. 3). There are three levels of government in Australia: federal, state and local. Each has responsibility for implementing climate change policies. Local government

is considered to be the level of government at the ‘coal face’ of dealing with climate change impacts (Lyster, Lipman, Franklin, Wiffen & Pearson, 2007). Recently many local governments in NSW have become cognisant of their legal obligation to plan for the physical impacts of climate change (PICC), and to take into account the risks that may be relevant to the physical, social and economic landscape of their Local Government Area (LGA) (LGSA, 2006).

The challenge for local governments is to identify climate change vulnerabilities and reduce the risks (Burton & Dredge, 2007). These vulnerabilities may include infrastructure, water resources, agriculture and human health (Curson, 1996; Gössling, 2006; IPCC, 2007; Mount, 1994; Turner, Pearce & Bateman, 1994; Zilberman, Liu, Roland-Holst & Sunding, 2004). Therefore, local governments face a considerable challenge. As Nursey-Bray (2008, p. 4) argues, the costs of addressing climate change are “likely to fall disproportionately on local government, industries, communities and workers”. Therefore, for local governments in the Australian state of New South Wales (NSW), which is the location of this study (see Figure 1), it is important and timely to consider whether the actions taken at local government level to plan for the PICC are effective. This research seeks to discover NSW local government planners’ perceptions of current action on climate change planning in their LGA.



Figure 1: Location of New South Wales showing Planning Regions, (Adapted from Defence Reserves, 2008; NSW Department of Planning, 2008)

Local Government Climate Change Planning in NSW

The Australian Constitution of 1901 created a federal system of government where powers are distributed between a national government and its six states (the three territories have self-government arrangements) (Commonwealth of Australia, 2008). However local government is not mentioned in the Constitution (Jenkins, 2000; Stein et al., 1998). Local government is entirely subordinate to the state and not sovereign (Ratcliff, 2000). Stein et al. (1998, p. xxxix) assert that this must be “kept firmly in mind” when considering the powers, functions and responsibilities of local government.

Acts of law provide the core legal framework for planning in NSW. Since 1963 central control of planning by the State Government has been in the hands of either a statutory authority or of a government department (Lyster et al., 2007). There are 152 local government councils in NSW and their responsibilities and powers are derived predominantly from the *Local Government Act 1993* (LG Act) and the *Environmental Planning and Assessment Act 1979* (EP&A Act) (LGSA, 2007).

One of Council's functions as outlined in the LG Act is that of environmental responsibility and ecologically sustainable development (ESD). ESD has been defined in the *National Strategy for Ecologically Sustainable Development* as "using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased" (Commonwealth of Australia, 1992, p. 1). The EP&A Act also requires application of the principles of ESD and appropriate management of the environment.

Local government's charter, as detailed in the LG Act, to protect, restore, enhance and conserve the environment, have regard for the long term effects of its decisions and to effectively manage its assets, implicitly obligates local governments in NSW to plan for the PICC in their LGA. There are examples of local governments in NSW that are proactive in planning for the PICC. Pittwater Council is an example of a council using current information to plan for the PICC. The council adopted a staff recommendation that all management plans and flood studies be reviewed to accommodate the IPCC climate change predictions. They found that a higher incidence of significant flooding events and elevated flood plain heights for future developments may need to be taken into consideration in the long-term (Pittwater Council, 2008).

Another example of proactive climate change planning comes from the Sydney Coastal Councils (SCC) group, a coalition of 15 councils formed in 1989 to "promote coordination between member councils on environmental and natural resource management issues relating to the sustainable management of the urban coastal environment" (SCC, 2008, p. 1). The SCC have partnered with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and research bodies to determine their key vulnerabilities and capacity to adapt to and manage climate change issues at a regional level.

The councils of the Hunter region have also collaborated to form Hunter Councils Inc. which in 2004 established an Environment Division, which in turn developed the Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS). The HCCREMS program facilitates a collaborative approach to ecologically sustainable development and a key theme of the strategy is climate change (Hunter Councils Inc., 2008). HCCREMS have partnered with the University of Newcastle to conduct a research project which aims to identify the likely impacts of climate change in the region.

Many other examples of proactive local government climate change planning exist, particularly through the Federal Government's Local Adaptation Pathways Program (see Department of Climate Change, 2008). While these examples of proactive climate change planning are important, this study seeks to obtain a broader perspective on the actions of local governments across all of NSW in terms of planning for the PICC.

Methodology

This research used mixed methods (predominantly quantitative and some qualitative) to gather survey data. The Adaptive Management Framework (AMF) has been utilised as a conceptual framework for this research (Figure 2). The AMF is by definition a management framework that is dynamic and adjusts appropriately to a complex and continually changing world (Arvai et al., 2006; Hughes et al., 2007). Successful management of complex systems requires “governance structures and institutions that are flexible, with the capacity to respond and adapt to change” as conceptualised in the AMF (Hughes et al., 2007, p. 586). This framework is therefore a useful conceptual model with which to analyse the flexibility and adaptive capacity of the planning system of local government in NSW.

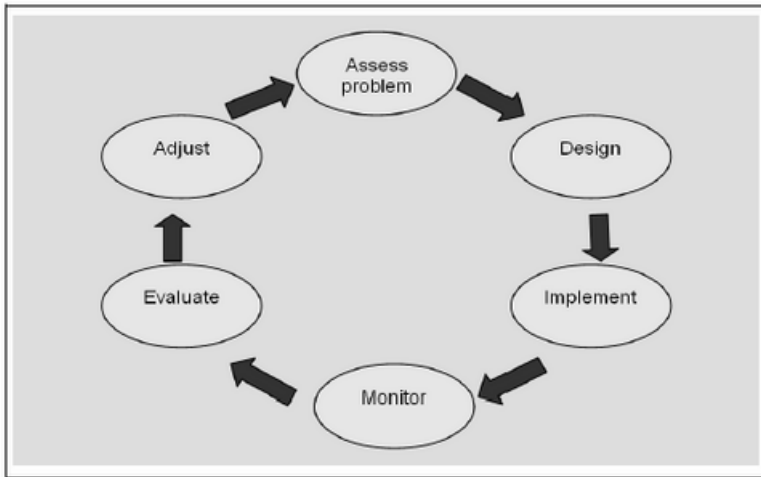


Figure 2: Adaptive Management Framework, (*Adapted from Miller, 2005*)

In this study, within the AMF, the management problem that was assessed (i) was planning for the PICC at local government level in NSW. The local government plans that have been designed (ii) and implemented (iii) to address this problem represent the next two steps of the AMF. The questionnaire used in this study was conceptualised as a method to monitor (iv) the plans for the PICC, from the perspective of those people who enact those plans, that is local government planners. The outcomes from this monitoring process, which are essentially the results of this study, have been evaluated (v) and presented in the following results section. Recommendations to adjust (vi) the existing planning system that would commence the next iterative cycle of the AMF are presented in the discussion.

The data collection tool was a voluntary, anonymous questionnaire posted to each of the 152 local government areas (LGAs or councils) in NSW in June 2008 with a covering information sheet requesting that a planner employed by council complete the questionnaire. A total of 56 questionnaires were completed and returned, representing a response rate of 36.9 percent of the original sample. This is a satisfactory response rate however given the small size of the population (all planners from 152 councils) and sample (152 planners, one from each council), the results should be applied with caution to the broader population of NSW local government planners.

Categorical questions required a number corresponding to a series of options to be circled. Continuous data responses were obtained from one question that asked the participant to indicate a rating by making a mark on a visual analogue scale (VAS), also known as a semantic differential scale (McDougall & Munro, 1994) or a graphic rating scale (Zikmund, 2003). The VAS is used as a form of cross-modality matching where the length of the line up to the respondent’s mark on the scale is the response continuum that can be used to establish numeric values as ratio scale measures (Gould, Kelly, Goldstone & Gammon, 2001; Price, McGrath, Rafii & Buckingham, 1983). The VAS consisted of a pair of bipolar adjectives (see Figure 3) that can be used to measure respondents’ attitudes across a continuum (McDougall & Munro, 1994). These are concept variables that can be measured as continuous variables rating from zero, at the left hand side of the scale, to 100, at the right hand side of the scale.



Figure 3: Example of a Visual Analogue Scale (VAS) Response

Results

The first question asked respondents to indicate the NSW planning region that their council belonged to, which allowed for regional comparison of responses to other questions. There were six regions nominated on the survey at Question 1, based on the NSW Government Department of Planning regions (NSW Department of Planning, 2008). These regions are illustrated in Figure 1. The number of responses, as well as the response rate of each region, was calculated and compared to the total responses and the number of councils in NSW (Table 1).

Table 1: Responses Relating to NSW Planning Region

Region	No. of Responses	No. of LGAs in region	Response rate within region (%)	Regional responses (%)	Percentage of all LGAs in NSW (%)
Sydney East	8	25	32.0	14.3	5.3
Sydney West	5	16	31.2	8.9	3.3
Hunter	7	14	50.0	12.5	4.6
Northern	11	25	44.0	19.6	7.2
Southern	13	29	44.8	23.2	8.6
Western	12	43	27.9	21.4	7.9
TOTAL	56	152			36.9

The highest number of responses identified their council as belonging to the Southern region (13 responses, or 23.2 percent of all responses). However the highest response rate was received from the Hunter region (50 percent of sample).

In Question 2, respondents were asked ‘What steps, if any, do you think your Council has taken to plan for the physical impacts of climate change?’ There were 55 valid responses to this question. The respondents were offered nine steps, and asked to circle as many steps as were relevant. The nine steps are outlined in Table 2, as well as the total number of respondents who thought their council had taken a particular step and the representative percentage of the total number of responses. The ‘other’ option also provided respondents with a space to describe what other step(s) they thought their council had taken.

The most selected step was ‘Collaborated with other council(s)’ (45.5 percent of valid responses). Crosstabulations were conducted on these data and notable results were that of the seven responses from the Hunter region, six respondents had selected this step. This ratio (six selected the step: one not selected) was much higher than any other region (next was Sydney East with 4:4, then Northern with 5:6). This result reflects the collaborative efforts of the Hunter councils as described earlier. The Sydney East planners’ response is also reflective of the collaborative efforts of the Sydney Coastal Councils (SCC) group.

Table 2: Steps Respondents Thought Their Council had taken to Plan for the PICC

Rank	Step description	No. who thought their council had taken this step	Valid percentage
1	Collaborated with other council(s)	25	45.5
2	Prepared report(s)	18	32.7
3	Created new task(s) within existing role(s)	17	30.9
4	Other	13	23.6
5	Conducted risk assessment(s)	12	21.8
6	Developed policy	11	20.0
7	Created new role(s) within council	8	14.5
Eq8	Developed management plan(s)	7	12.7
Eq8	Altered Environmental Planning Instrument(s) and/or other planning policy	7	12.7

The next most selected step was ‘Prepared Report(s)’ (32.7 percent). In the results of the crosstabulations the Western region was found to be the only region where all respondents (n=12) indicated they thought their council had not prepared reports. The next most selected step was ‘Creating new task(s) within existing role(s)’ (30.9 percent). The next most selected step was the ‘other’ response. Qualitative data obtained from the ‘other’ option consisted of five responses and three emergent themes were identified: changes to environmental policy (two responses); financial support sought (one response); and actively increased knowledge base (one response).

The next most selected step was ‘conducted risk assessment(s)’, selected by 12 respondents (21.8 percent). This result is supported by the finding of a previous study which found that 80 percent of local government respondents indicated that their council had not undertaken any form of risk assessment relating to the impacts of climate change (LGSA, 2006). Seven

of the 12 responses from the current study came from the Sydney regions. Sydney West had the highest ratio of selection for this option (3:2) followed by Sydney East (4:4). Therefore more Sydney region respondents thought their councils had conducted risk assessments than not (7:6). This was found to be very different to the results for regions outside of Sydney.

The last noteworthy result to emerge from analysis of the crosstabulation of data was from the ‘developed management plan’ option. Notably, the Northern and Southern regions’ respondents indicated they thought no management plan had been developed (0:11 and 0:12 respectively). An analysis of the frequencies of the total numbers of steps taken was also conducted (see Table 3).

Table 3: Frequencies of the Number of Steps Respondents Thought Their Council had taken to Plan for the PICC

Rank	No. of steps respondents thought their council had taken	Frequency	Valid percentage	Total no. of steps believed taken
1	0	14	25.5	0
2	1	12	21.8	12
3	2	8	14.5	16
4	4	7	12.7	28
5	3	6	10.9	18
Eq6	5	4	7.3	20
Eq6	6	4	7.3	24
Eq8	7	0	0	0
Eq8	8	0	0	0
Eq8	9	0	0	0
TOT		55		118

These results indicate that the majority of councils surveyed have done little to plan for the PICC, with 61.8 percent of councils believed to have taken less than three steps to plan for the PICC. The highest ranking response was zero steps taken, that is, 25.5 percent of respondents did not indicate that they believed their council had taken any of the nine steps listed. The reason this result is described in this way is because the ‘zero’ result was assigned when there was non-response to the question, therefore there is a chance that the question may have been accidentally skipped by the respondent, rather than indicating that they believed their council had done nothing to plan for the PICC. However, the following question, which asked respondents to rate how effective they thought the steps had been, has acted to somewhat confirm this result through equivalence validity (Neuman, 2006), in that all individual non-responses to this question were reflected as non-responses in the following question. Therefore, it can be safely assumed that one quarter of all councils surveyed were believed, by a planner at that council, not to have taken *any* steps to plan for the PICC, which is the most salient result from this question. The next highest frequency was one step taken (21.8

percent of responses), followed by two steps (14.5 percent). No council was believed to have taken more than six steps.

In a further investigation of the regional crosstabulations, it was found that the Sydney West region had a notably higher average number of steps selected per respondent (4.0) compared to the other regions (2.0), as detailed in Table 4. The mean across all regions was 2.4 which is higher than the mean number of steps per respondent identified from Table 3 (2.1), as the mean was affected by rounding and 14 respondents who indicated zero steps.

Table 4: Mean Number of Steps Believed to Have Been Taken Per Respondent

Region	Sydney East	Sydney West	Hunter	Northern	Southern	Western
Total no. of selected steps	22.0	20.0	16.0	20.0	24.0	16.0
Respondents (n)	8	5	7	11	12	12
Mean no. of steps per respondent	2.8	4.0	2.3	1.8	2.0	1.3

These results comprehensively illustrate the steps that planners thought their councils had taken to plan for the PICC. Again, the most salient result is arguably that 25.5 percent of respondents thought their council had taken no steps at all to plan for the PICC. Furthermore, 61.8 percent of councils are believed to have taken less than three steps to plan for the PICC, and the most selected step was collaboration with other council(s). The respondents' perceptions of the effectiveness of these steps were sought in the next question.

Question 3 asked respondents 'If your council has taken steps (indicated in the previous question) please rate how effective you think these steps combined have been in developing a plan for the physical impacts of climate change'. They were asked to rate the effectiveness on a VAS ranging from 'not at all effective' (numerical rating of 0) to 'very effective' (numerical rating of 100). There were 41 valid responses. Of the 15 invalid responses, 14 had indicated zero steps taken at Question 2. The mean rating was 41.3 and the median was 43.5. This mean rating indicates a low to mid range rating for the effectiveness of steps taken by LGAs to plan for the PICC as perceived by planners at the councils that responded. A comparison of the means displayed by region is presented in Table 5.

Table 5: Effectiveness of Steps Taken by Council

Region	Valid responses (n)	Mean	Standard deviation
Sydney East	7	36.6	18.8
Sydney West	4	57.5	16.8
Hunter	7	44.7	17.0
Northern	8	43.5	12.1
Southern	9	33.9	15.2
Western	6	40.4	23.1
TOTAL	41	41.3	17.4

An ANOVA was conducted and there was found to be no statistically significant difference between regions ($p = .309$). However there are interesting differences observable from Table 5. Sydney West rated the highest with a mean effectiveness rating of 57.5. This result may be as a consequence of the higher number of steps believed to have been taken (from Question 2), compared to other regions. The higher number of steps, and perhaps the greater potential synergy of combined steps, may make Sydney West LGAs' plans for the PICC more effective than those of other regions.

The last question (Question 4) asked 'What, if any, of the following steps do you think your council should take within the next five years to plan for the physical impacts of climate change?' The steps given as categorical options in the question are listed in Table 6 along with the total number of respondents that thought their council should take a particular step over the next five years and the representative percentage of the total number of valid responses. As can be seen from the table, each step received a high rate of selection. Most respondents (82.1 percent) thought that their council should conduct risk assessment(s) over the next five years to plan for the PICC. The next highest response rates were to develop policy, selected by 75.0 percent of respondents, and collaborate with other council(s), selected by 73.2 percent of respondents.

Table 6: Steps Respondents Thought Their Council Should Take to Plan for the PICC

Rank	Steps description	No. of respondents who thought their council should take this step	Valid percentage
1	Conduct risk assessment(s)	46	82.1
2	Develop policy	42	75.0
3	Collaborate with other council(s)	41	73.2
4	Develop management plan(s)	36	64.3
5	Alter Environmental Planning Instrument(s) and/or other planning policy	32	57.1
6	Prepare report(s)	28	50.0
7	Create new task(s) within existing role(s)	23	41.1
8	Create new role(s) within council	17	30.4
9	Other	9	16.1

In analysing the regional crosstabulations, some interesting results emerged. In regards to ‘Prepare reports’, Sydney East, Sydney West, Hunter and Northern all had greater selection than non-selection response rates. However the Southern and Western regions had fewer selections than non-selections (3:10 and 4:8 respectively). In revisiting Question 2, it was noted that the Western region was the only region where all respondents had indicated that their council had not prepared reports. It is interesting that the region where councils had apparently not prepared any reports also had a high number of respondents (eight out of twelve) who thought they should not prepare reports in the next five years, which may explain the lack of reports prepared.

Similarly the Southern region had the next lowest ratio of prepared reports to not prepared reports (4:8) at Question 2, which is not dissimilar to the response here (3:10). If further research were to be conducted in this area, it would be interesting to interview these respondents and ask whether the reason their council had not prepared reports was because they did not think they should. Of course, there may be other factors involved that are not evident in this study.

In a further analysis of the regional crosstabulations, an interesting result emerged regarding ‘Alter Environmental Planning Instrument(s) and/or other planning policy’. Four regions had higher selection rates than non-selection rates: Sydney West 4:1; Sydney East 3:1; Western 9:3; and Northern 6:5. In contrast, the other regions had lower selection rates than non-selection rates: Hunter 3:4; and Southern 4:9. This indicates that most regions’ respondents would be more likely than not to alter EPIs and/or other planning instruments; however the Southern region respondents would generally not make alterations.

Qualitative data obtained from the “other” option consisted of eight responses, the majority from the Southern region, within four emergent themes, which were: implement consistent/standard/holistic approach (three responses); state/federal government to take responsib-

ility (three responses); acceptance of liability (one response); and one response indicated that despite having the will, means were an issue.

The frequencies of the total numbers of steps respondents thought their council should take to plan for the PICC over the next five years are presented in Table 7. The highest ranking response rate (16.1 percent) was that council should take two steps to plan for the PICC over the next five years, followed equally by four steps, six steps and seven steps (14.3 percent each). The total number of steps respondents thought council should take was 269: a mean average of 4.8 steps per respondent, more than double the number of steps that were thought to have been taken (2.1 steps per respondent).

Table 7: Frequencies of the Number of Steps Respondents Thought Their Council Should Take to Plan for the PICC over the Next Five Years

Rank	No. of steps respondents thought their council should take	Frequency	Valid percentage	Total no. of steps should take
1	2	9	16.1	18
Eq2	4	8	14.3	32
Eq2	6	8	14.3	48
Eq2	7	8	14.3	56
5	8	7	12.5	56
6	3	6	10.7	18
7	5	4	7.1	20
8	1	3	5.4	3
9	9	2	3.6	18
10	0	1	1.8	0
		56		269

The regional crosstabulations were further analysed to identify the mean number of steps selected per respondent, by region (detailed in Table 8). It was found that the Sydney West region, as in Question 2, had the highest average number of steps selected per respondent (6.0) compared to the average of the other regions (4.9). The Southern and Western regions were below the total cross-region mean average (5.1) with Southern having the lowest average number of steps selected per respondent (3.8).

Again, the mean across all regions is higher than the mean number of steps per respondent identified from Table 7 (where the mean was calculated to be 4.8), as the mean was affected by rounding and one respondent who indicated zero steps. Most interestingly, the cross-region mean was much higher for this question (5.1) than Question 2 (2.4), indicating that respondents would, on average, like their council to take more steps over the next five years than they have to date.

Table 8: Mean Number of Steps That Council Should Take, Per Respondent

Region	Sydney East	Sydney West	Hunter	Northern	Southern	Western
Total no. of selected steps	42	30	39	57	50	56
Respondents (n)	8	5	7	11	13	12
Mean no. of steps per respondent	5.3	6.0	5.6	5.2	3.8	4.7

Overall, one of the most salient results from this final question was that respondents, on average, thought their council should take more steps over the next five years to plan for the physical impacts of climate change than they have to date. The majority of planners thought that their council should take each of the following steps (each step selected by 50 percent or more of respondents):

- Conduct risk assessment(s)
- Develop policy
- Collaborate with other council(s)
- Develop management plan(s)
- Alter EPIs and/or other planning policy
- Prepare report(s)

Discussion

The first important finding from this study is that collaboration with other council(s) is considered by the planners responding to the survey to be a key step taken to plan for the PICC (refer Table 2: 45.5 percent of valid responses). The regional crosstabulations reflect the collaborative efforts of the Hunter councils and the Sydney Coastal Councils (SCC) group as described earlier. Therefore it is evident that, within the respondent group, collaboration is considered to be a key step by NSW councils in planning for the PICC.

Another important finding is that the effectiveness rating of steps taken was highest from the region that had the highest perceived number of steps taken (Sydney West). This indicates that the higher number of steps taken and/or the synergy of those steps increase the perceived effectiveness of steps taken to plan for the PICC. Therefore it can be concluded that within the respondent group, the more steps taken, the higher the perceived effectiveness.

The next important finding from the results is that nearly 80 percent of planners that responded to this survey indicated that their council had not conducted risk assessments for the PICC. This finding supports the findings of a previous NSW local government survey as mentioned above (see LGSA, 2006). Considering that risk assessments are a crucial step in planning for the PICC (Australian Greenhouse Office, 2006; Commonwealth of Australia, 2007; CSIRO, 2002; Jones, Dettmann, Park, Rogers, & White, 2007; Prabhakar, Srinivasan, & Shaw, 2009) then this is indeed a poor indication of risk planning for PICC in NSW.

In all, the results indicate that the majority of councils appear to have done little to plan for the PICC. One quarter of respondents thought their council had taken no steps at all to

plan for the PICC. By not taking any steps to plan for the PICC, these councils are increasing the vulnerability of their LGA to the PICC by reducing their adaptive capacity (Garnaut, 2008). The adaptive capacity of these LGAs has been reduced through failure to implement effective planning. This increase in vulnerability and reduction in adaptive capacity in turn reduces the resilience of the LGA (Hughes et al., 2007; Walker, 2008).

The 14 LGAs who have taken no action also risk being held liable for environmental damage, damage to third party property or injury to a third party as a result of climate change. Some legal practitioners would not represent a council that had not taken steps to plan for the physical impacts of climate change as they are not perceived to have acted with due care (Pers Comm. M. Down, Partner, DLA Phillips Fox, 7th April, 2008). Civic and public liability claims can bear substantial costs upon councils relative to their revenue stream. These LGAs are also not meeting the obligation of local governments in NSW to plan for the physical impacts of climate change in their local government area. This requirement is implicit in the local government charter as laid out in the LG Act.

In addition to the LGAs that had taken no action, a further 61.8 percent of councils were believed by planners to have taken less than three steps to plan for the physical impacts of climate change, as mentioned above. These councils are also unlikely to be maximising their adaptive capacity and therefore risk increasing the vulnerability of their LGA to the PICC. This finding is supported by the low overall efficacy rating of the steps that planners believed to have been taken (mean rating of 41.3 from a possible rating of 100). As mentioned above, the greater number of steps taken and possibly the greater synergy of combined steps may result in more effective PICC planning.

In terms of what councils should be doing to plan for PICC, clear climate change planning recommendations from planners have emerged from the results of this research. Planners, on average, thought their council should take more than double the number of steps over the next five years to plan for the physical impacts of climate change than they have to date. Clearly planners want increased responses implemented in planning for the PICC, starting with conducting risk assessments, development of policy and collaboration between councils. In order to effectively plan for the PICC in NSW, it is crucial that the voices of those that currently use the planning tools in local government, i.e. the planners, be heard. Planners have a thorough understanding of local government planning and, as asserted by Hogwood and Gunn (1984, p.29), “What you would change you must first understand”. The voice of planners in NSW is clear: *more* needs to be done to plan for the PICC.

While there are uncertainties regarding which emissions predictions will come to fruition and thus the scale of climate change, this should not be used as an excuse for inaction (UN-FCCC, 1992). Instead, the precautionary principle, which involves preparing for the worst regardless of any lack of full scientific certainty (ibid), needs to be applied to effectively reduce the risks local governments face in preparing for climate change impacts. It is recommended, as a result of this study, that risk assessments be conducted, policy be developed and collaboration between councils be encouraged in order to plan for the physical impacts of climate change at a local government level in NSW.

References

- AGO. (2005). National Climate Change Adaptation Programme, Department of the Environment and Heritage Australian Greenhouse Office. Retrieved 27/07/2008, from <http://www.climate-change.gov.au/impacts/publications/pubs/nccap.pdf>
- Arvai, J., Bridge, G., Dolsak, N., Franzese, R., Koontz, T., Luginbuhl, A., et al. (2006). Adaptive management of the global climate problem: bridging the gap between climate research and climate policy. *Climatic Change*, 78, 217–225.
- Burton, D., & Dredge, D. (2007). Framing Climate: Issues for local government. *Queensland Planner*, 47(3), 13-15.
- Commonwealth of Australia. (1992). National Strategy for Ecologically Sustainable Development Canberra: AGPS.
- Commonwealth of Australia. (2007). Australia's Climate Change Policy: our economy, our environment, our future. Canberra: The Department of the Prime Minister and Cabinet.
- Curson, P. (1996). Human health, climate and climate change: an Australian perspective. In T. W. Giambelluca & A. Henderson-Sellers (Eds.), *Climate Change: Developing Southern Hemisphere Perspectives*. Chichester: John Wiley & Sons.
- Defence Reserves. (2008). New South Wales. Retrieved 22/09/2008, from http://www.defencereserves.com/asp/contact_nsw.aspx
- Department of Climate Change. (2008). Local Adaptation Pathways Program. Retrieved 26/08/2008, from <http://www.climatechange.gov.au/impacts/localgovernment/lapp.html>
- Garnaut, R. (2008). The Garnaut Climate Change Review: Final Report. Port Melbourne, Victoria: Cambridge University Press.
- Gössling, S. (2006). Tourism and water. In S. Gössling & C. M. Hall (Eds.), *Tourism and Global Environmental Change*. London, United Kingdom: Routledge.
- Gould, D., Kelly, D., Goldstone, L., & Gammon, J. (2001). Examining the validity of pressure ulcer risk assessment scales: developing and using illustrated patient simulations to collect the data. *Journal of Clinical Nursing*, 10, 697-706.
- Hennessy, K., Fitzharris, B., Bates, B. C., Harvey, N., Howden, S. M., Hughes, L., et al. (2007). Australia and New Zealand In M. L. Parry, O. F. Canziani, J. P. Palutikof, P.J. van der Linden & C. E. Hanson (Eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 507-540). Cambridge, UK: Cambridge University Press.
- Hogwood, B. W., & Gunn, L. A. (1984). *Policy Analysis for the Real World*. Oxford: University Press.
- Hughes, T. P., Gunderson, L. H., Folke, C., Baird, A. H., Bellwood, D., Berkes, F., et al. (2007). Adaptive Management of the Great Barrier Reef and the Grand Canyon World Heritage Areas. *Ambio*, 36(7), 586-592.
- IPCC. (1997). *The Regional Impacts of Climate Change: An Assessment of Vulnerability, A Special Report of IPCC Working group II*. Cambridge: Cambridge University Press.
- IPCC. (2007). *Intergovernmental Panel on Climate Change Fourth Assessment Report: Climate Change 2007 Synthesis Report*: IPCC.
- Jenkins, J. (2000). The Dynamics of Regional Tourism Organisations in New South Wales, Australia: History, Structures and Operations. *Current Issues in Tourism*, 3(3).
- Jones, R., Dettmann, P., Park, G., Rogers, M., & White, T. (2007). The relationship between adaptation and mitigation in managing climate change risks: a regional response from North Central Victoria, Australia. *Mitigation and Adaptation Strategies for Global Change*, 12(5), 685-712.
- LGSA. (2006). Responses to Needs Analysis Survey: to identify the climate change adaptation and mitigation needs for local government in NSW. Retrieved 12/04/2008, from http://www.lgsa.org.au/resources/documents/needs_analysis_findings_final_report_climate_change_mitigation_and_adaptation_project.pdf
- LGSA. (2007). Local Government and Shires Associations of NSW. Retrieved 28,11, 2007, from

- <http://www.lgsa.org.au/www/html/88-about-the-associations.asp>
- Lyster, R., Lipman, Z., Franklin, N., Wiffen, G., & Pearson, L. (2007). *Environmental and Planning Law in New South Wales*. Sydney: The Federation Press.
- McDougall, G., & Munro, H. (1994). Scaling and Attitude Measurement in Travel and Tourism In B. Ritchie & C. Goeldner (Eds.), *Travel, Tourism and Hospitality Research* (2nd ed., pp. 115-129). New York: John Wiley & Sons, Inc.
- Miller, G. (2005). *Monitoring for a Sustainable Tourism Transition : The Challenge of Developing and Using Indicators*. Wallingford, Oxfordshire, UK: CABI Publishing.
- Mount, T. (1994). Climate change and agriculture: a perspective on priorities for economic policy. In D. H. White & S. M. Howden (Eds.), *Climate Change: Significance for Agriculture and Forestry*. Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Neuman, W. L. (2006). *Social research methods: Qualitative and quantitative approaches* (6th ed.). Boston: Pearson.
- NSW Department of Planning. (2008). *NSW Regional Boundaries Map and Sydney Regional Boundaries Map*. Retrieved 11/06/2008, from <http://www.planning.nsw.gov.au/aboutus/contactus.asp>
- Nurse-Bray, M. (2008). Climate change, coastal communities and governance. *Waves*, 14(2), 4-5.
- Pittwater Council. (2008). *Local Predictions on Climate Change*. Retrieved 6/08/2008, from http://www.pittwater.nsw.gov.au/council/media/news/2007/september/local_predictions_on_climate_change
- Price, D. D., McGrath, P. A., Rafii, A., & Buckingham, B. (1983). The Validation of Visual Analogue Scales as Ratio Scales for Chronic and Experimental Pain. *Pain*, 17, 45-56.
- Ratcliff, I. (2000). *Bluett Local Government Handbook (New South Wales)* (14th ed.). Sydney: LBC Information Services.
- SCC. (2008). *Sydney Coastal Councils Group Inc*. Retrieved 04/09/2008, from <http://www.sydney-coastalcouncils.com.au/>
- Stein, P., Brady, C., & Mahoney, S. (1998). *Annotated Local Government Act 1993 (New South Wales)*. Sydney: Butterworths.
- Turner, R. K., Pearce, D., & Bateman, I. (1994). *Environmental Economics*. Harlow, Essex, England: Pearson Education.
- UNFCCC. (1992). *United Nations Framework Convention on Climate Change*. Retrieved 23/3/2008, from <http://unfccc.int/resource/docs/convkp/conveng.pdf>
- Walker, B. (2008). *A resilience perspective on regional sustainability, Climate Change Professional Development Workshop*. Byron Bay: Ethos Foundation.
- Zikmund, W. G. (2003). *Business Research Methods* (7th ed.). Mason, Ohio: Thomson/South-Western.
- Zilberman, D., Liu, X., Roland-Holst, D., & Sunding, D. (2004). The economics of climate change in agriculture. *Mitigation and Adaptation Strategies for Global Change*, 9(4), 365-382.

About the Author

Nadine E. White

Nadine Elizabeth White is a PhD Scholar and a researcher at Southern Cross University (SCU). Nadine has a Bachelor of Environmental Tourism Management and a first class Honours in the Bachelor of Business in Tourism Management from SCU. She has received several awards for her studies including a Federal Government scholarship to commence a PhD. Nadine recently co-authored the Sustainable Tourism CRC (STCRC) technical report 'Climate Change and Australian Tourism: A Scoping Study', undertaken on behalf of the Tourism and Transport Forum (TTF). She is also involved in a climate change pilot research

project currently being undertaken at SCU. Her main research focus is climate change and tourism, and her other research interests include sustainable development, Indigenous business and regional tourism.