

CLIMATE CHANGE ADAPTATION: MEASURING INDIVIDUAL COMMUNITY RESPONSE IN COASTAL AUSTRALIA

MAJOR FINDINGS AND OUTCOMES:

With climate change and its impacts accepted by the scientific community and majority of society alike (Clark 2011; Mummery 2011; Philp *et al.* 2011, Nelson *et al.* 2007), focus is now shifting toward action (Hedger *et al.* 2008). One approach to attenuating the impacts of climatic change is through 'adaptation' and the development of policies that promote 'adaptation'. With over 85% of our population living within the coastal region (DCC 2009), it is argued that adaptation to climate change for coastal Australian communities is not desirable, but *vital*. Many coastal communities are heeding this warning by developing strategies to attenuate the impact of future changes to our climate. What remains a fundamental gap in our knowledge however is the level to which coastal communities have adapted and/or complied with adaptation plans. This research attempts to address this gap by developing an adaptation evaluation matrix for coastal communities in an attempt to highlight comprehensive approaches to adaptation and identify areas of inaction.

Through a review of published adaptation plans, and coastal adaptation theory, a collection of adaptation measures were defined and categorized by impact sector. A metric was then linked to each individual measure and combined to develop an evaluation matrix. The viability of the matrix was tested through an application to two Australian communities exhibiting varying degrees of adaptation. The Western Australian City of Bunbury, lacking an adaptation plan, demonstrated the matrix's use as a first pass or baseline assessment, whilst the Victorian City of Greater Geelong, highlighted compliance to an adaptation strategy already in place.

Although the City of Bunbury has not yet implemented a formal adaptation strategy, autonomous adaptation is occurring through bottom-up action. Bunbury's highest sector score was in Education indicating that action at a local scale to communicate climate risks and measures of attenuation are present. Bunbury's overall adaptation score of 20% indicated a low level of adaptation, however as a baseline assessment is a positive result.

The City of Greater Geelong scored an overall result of 52% in their current state with their Greenhouse Response in place. With numerous community engagement and education activities present, the highest sector score calculated was Education with 66%. Further, their yet-to-be implemented Adaptation Strategy was evaluated in a 'future state' assessment and gained an overall score of 85%. The levels of assessment for Geelong indicated high adaptation to the impacts of climate change in both a current, and a proposed future state.

Further, this research indicates the flexibility of this evaluation approach and its requirement in the adaptation of coastal Australian communities. Through different levels of application of the Adaptation Assessment Matrix as both a baseline assessment and ongoing monitoring tool, effective adaptation can be quantified.

By its very nature, climate change adaptation poses greater evaluation challenges than other forms of development intervention (Hedger *et al.* 2008), and is currently a contentious issue. Many argue that quantification of adaptation is not possible, given the uncertainty of adapting to a somewhat unknown impact combined with the complexity of addressing the echelon of sectors that require adaptive action. Yet there is no denying that local governments sorely require quantifiable guidance to focus adaptation action effectively (Preston & Kay 2009; Preston *et al.* 2010; Norman 2009). Australia's decentralised three tiered governance system does not adequately facilitate adaptation naturally, autonomous adaptation, without an overarching framework for guidance, lacking integration vertically. Lack of guidance also inhibits horizontal integration which scholars agree is essential for effective adaptation.

SIGNIFICANCE:

The Adaptation Assessment Matrix presented in this research is the beginning of what will be an effective tool to effectively facilitate adaptation. With use as a baseline to evaluate existing adaptation, and to focus ongoing adaptation as an auditing tool, local governments will have access to the guidance that has been lacking. Vertical and horizontal integration will be enhanced and scientific integration facilitated, having been highlighted as limiting factors to effective adaptation action. Lastly, as a by-product in application of this framework, adaptive capacity will be verified, highlighting local government areas lacking the resources of impetus to adapt effectively.

FURTHER RESEARCH SUGGESTIONS:

There is a great potential to improve this research and increase to robustness of the argument presented, the Adaptation Measures Table and the Adaptation Assessment Matrix. The nature of this dynamic field dictates that additional literature and strategies develop regularly, all of which could contribute to the validity of this research. It is proposed by the author that further application of the Assessment Matrix will allow a more accurate scoring system to be developed, due to the qualitative and often subjective nature of the evaluation methodology utilised. Further research into more specific comparison of case studies at similar stages of adaptation is also required. This honours thesis aims at a first attempt of sorely required research, but cannot be fully addressed in such a limited time period. Further time, development and resources are required to improve the veracity and robustness of this research.

REFERENCES:

- Clark, M 2011, "Integrated science for our carbon future", conference paper, *Greenhouse: The Science of Climate Change 2011*.
- Department of Climate change 2009, *Climate Change Risks to Australia's Coasts: A First Pass National Assessment*, ISBN 9781-1-921298-71-4; Available at <www.climatechange.gov.au> [July 2010]
- Hedger, MM, Mitchell, T, Leavy, J, Greely, M & Horrocks, L 2008, "Desk Review: Evaluation of Adaptation to Climate Change from a Development Perspective", a study commissioned by the GEF Evaluation Office and financed by DFID.
- Mummery, J 2011, "Climate change and Australia's coast: integrated science for adaptation", conference paper, *Greenhouse: The Science of Climate Change 2011*.
- Nelson, DR, Adger, WN, Brown, K 2007, 'Adaptation to Environmental Change: Contributions of a Resilience Framework', *Annual Reviews of Environmental Resources*, vol. 32, pp. 395-419.
- Norman, B 2009, "Principles for an intergovernmental agreement or coastal planning and climate change in Australia", *Habitat International*, Vol. 33, pp. 293-299.
- Philp, M, & Taylor, MAP 2011, *NCCARF Position Paper 2: Adapting to climate change-implications for transport infrastructure, transport systems and travel behaviour*, Available from: <<http://www.nccarf.edu.au/settlements-infrastructure/node/52>> [2 March 2011]
- Preston, BL & Kay, R 2009, 'Managing Climate Risk in Human Settlements', pp. 185-196. In: Jubb, Holper, P & Cai, W 2010, *Managing Climate Change: Papers from the GREENHOUSE 2009 Conference*, CSIRO Publishing.
- Preston, BL, Westaway, RM, Yuen, EJ 2010, 'Climate adaptation planning in practice: an evaluation of adaptation plans from three developed nations', *Mitigation and Adaptation Strategies for Global Change*, DOI 10.1007/s11027-101-9270-x.

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