

Faculty of Humanities

Curtin University Sustainability Policy Institute

**Adapting to Climate Change in the Coastal Zone in Western
Australia: Meanings, Dimensions, Effectiveness and
Shortfalls of Collaborative Coastal Adaptation Planning**

Chiara Danese Galano

This thesis is presented for the Degree of

Doctor of Philosophy

of

Curtin University

August 2017

Declaration of Originality

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number HR129/2010.

Chiara Danese

Friday 10 March 2017

Abstract

In Australia, the coast is an important ecological, cultural, economic and community asset. The potential impacts of climate change on the coast is a critical issue for local councils who, as the closest level of government to the community, are required to play a key role in coastal adaptation planning. To meet the challenges of implementing such complex, complicated and resource intensive processes, and to overcome the inadequacy of traditional governance systems, collaborative arrangements between central and local governments in the form of voluntary partnerships have become a popular means to plan for coastal adaptation. However, the important role of collaborative governance warrants closer examination in the academic literature; the pitfalls of technical approaches to coastal adaptation planning are the current focus. Thus, while collaboration has been instrumental in improving climate risk knowledge and progressing coastal adaptation decision making, the meanings, dimensions, effectiveness and shortfalls of collaborative coastal adaptation planning needs further analysis. The present study explores the features of and key challenges to collaborative coastal adaptation planning in Western Australia. Through a multiple case study approach, two Western Australia partnership arrangements, the Geraldton Coastal Vulnerability and Risk Assessment Partnership and the Peron Naturalist Partnership, are examined and compared with a third partnership arrangement from Tasmania which has been widely recognised for its pioneering work in coastal adaptation planning through strong collaborative efforts. A set of governance principles is collated from the literature on governance for climate adaptation, governance for sustainability, risk governance, transition governance and collaborative governance; these are tested through in-depth interviews, workshops and participant observations in the case studies. The results are then used to further refine a set of principles of good governance specifically aimed at guiding a collaborative approach to coastal adaptation planning. Each principle examines the role that collaboration plays in addressing coastal adaptation issues such as scale mismatches, poor leadership, lack of shared understanding, inadequate policy integration and coordination, poor policy learning and so on. The findings suggest that in Western Australia coastal adaptation planning partnerships have been instrumental in progressing coastal adaptation planning. However, the informal nature of these collaborative governance arrangements make them more vulnerable to changes in government leadership, political agendas and funding regimes, hence less effective at reducing the gaps in institutional responsibilities of existing governance arrangements for identifying and managing coastal hazard risk. The present study also shows that collaborative efforts across jurisdictional boundaries are stronger at the initial stages of a coastal adaptation planning process, for sharing information and resources and for advocating for policy change, but weaker at the implementation stage. This result highlights the inadequateness of existing governance systems for supporting policy implementation at the local level and for enabling more consistent, coordinated and cross-boundary coastal adaptation decision-making approaches.

Acknowledgements

I would like to express my gratitude to my advisors Associate Professor Laura Stocker and Dr Garry Middle for the continuous support of my Ph.D. study, for their patience, motivation, and immense knowledge.

Besides my advisor, I would like to thank my colleagues and friends Ashley Robb, Ben Preston, Carolyn Hofmeester, Peter Howard, Ann Larson, Maria Fiocco and David Wood for their insightful comments and encouragement.

Last but not the least, I would like to thank my partner Brett, my mum and dad, my baby soon to be born and my loyal dog Pancho for patiently supporting me throughout writing this thesis.

Niza, my baby angel, this work is dedicated to you.

Table of Contents

1	INTRODUCTION	9
1.1	<i>Aim of Thesis</i>	9
1.2	<i>Motivation for the Study</i>	9
1.3	<i>Background</i>	10
1.4	<i>Significance of Thesis</i>	14
1.5	<i>Research Questions and General Approach</i>	14
1.6	<i>Structure of Thesis</i>	15
2	THEORETICAL FRAMEWORK	17
2.1	<i>Coastal Adaptation Planning Under Different Conceptual Lenses</i>	17
2.2	<i>Key Barriers to Coastal Adaptation Planning</i>	21
2.3	<i>Good Governance for Coastal Adaptation</i>	25
2.3.1	Governance for Sustainability	28
2.3.2	Adaptive Governance	31
2.3.3	Collaborative Governance	35
2.3.4	Governance of Transition	42
2.3.5	Risk Governance	43
2.4	<i>Principles of Good Governance for Coastal Adaptation</i>	48
3	METHODOLOGY	58
3.1	<i>Research Approach</i>	58
3.2	<i>Case Study Methodology</i>	60
3.2.1	Multiple Case Studies	60
3.2.2	Participant Sampling and Recruitment in Case Studies	62
3.3	<i>Methods</i>	63
3.3.1	Desktop Analysis	63
3.3.2	Interviews	64
3.3.3	Participant Observations	65
4	COASTAL ADAPTATION PLANNING AND GOVERNANCE (BACKGROUND)	67
4.1	<i>Introduction</i>	67
4.2	<i>Coastal Adaptation Governance in WA</i>	67
4.2.1	Coastal Adaptation Planning in WA	70
4.2.2	Partnerships for Coastal Adaptation Planning in WA	71
4.3	<i>Coastal adaptation governance in Tasmania</i>	71
4.3.1	Coastal Adaptation Planning in Tasmania	75

4.3.2	Partnerships for Coastal Adaptation Planning in Tasmania	75
5	CASE STUDIES	77
5.1	<i>Introduction</i>	77
5.2	<i>Case Study 1: The CVRAP Partnership</i>	77
5.2.1	The Geraldton coast	77
5.2.2	Coastal Governance	80
5.2.3	The CVRAP Partnership	81
5.3	<i>Case Study 2: The Peron Naturaliste Partnership (PNP)</i>	85
5.3.1	The PNP Coast	85
5.3.2	Coastal Governance	87
5.3.3	The Peron Naturaliste Partnership	88
5.4	<i>Case Study 3: The TCAP Partnership</i>	95
5.4.1	The Clarence Coast	95
5.4.2	Coastal Governance	96
5.4.3	The TCAP Partnership	97
6	COMPARATIVE ANALYSIS	103
6.1	<i>Introduction</i>	103
6.1.1	Principle 1: Shared understanding, goals and priorities	103
6.1.2	Principle 2: Policy integration and coordination	108
6.1.3	Principle 3: Long-term political commitment and leadership for adaptation	113
6.1.4	Principle 4: Clear, coherent and flexible policy directions	121
6.1.5	Principle 5: Embracing complexity and uncertainty through innovation, experimentation and reflexivity	125
6.1.6	Principle 6: Uptake and use of evidence and value-based knowledge in adaptation decision making	133
6.1.7	Principle 7: Scale matching	143
6.1.8	Principle 8: Adequate funding for adaptation	147
6.1.9	Principle 9: Shared responsibility and decision powers	152
7	DISCUSSION	157
7.1	<i>Introduction</i>	157
	Shared understanding, goals and priorities	157
	Policy integration and coordination	158
	Long-term political commitment and leadership for adaptation	158

Uptake and use of evidence and value-based knowledge in adaptation decision making	158
Adequate funding for adaptation	159
7.2 <i>Revised Principles for Good Governance for Coastal Adaptation</i>	159
7.2.1 Principle 1: Shared understanding, goals and priorities in coastal adaptation planning are mutually supportive/constitutive with collaboration	159
7.2.2 Principle 2: Collaborative approaches are crucial for the successful integration of coastal adaptation objectives into policy and into every day decision making processes, and for effective coordination across multiple levels of government	166
7.2.3 Principle 3: Leadership and long-term political commitment are crucial for supporting collaborative coastal adaptation planning and collaboration can support effective leadership	174
7.2.4 Principle 4: Collaboration is instrumental in developing and implementing adaptive policy, improved policy dialogues and policy learning	183
7.2.5 Principle 5: A collaborative and transdisciplinary approach promotes better uptake and incorporation of evidence and value-based knowledge into adaptation decision making	195
7.2.6 Principle 6: Collaborative approaches to coastal adaptation planning improve spatial and temporal scale matching	207
7.2.7 Principle 7: Collaboration helps generate adequate, consistent, coherent and diversified sources of funding which are necessary for coastal adaptation planning	214
7.2.8 Principle 8: Collaboration increases shared responsibility and shared decision powers for coastal adaptation	220
8 CONCLUSIONS	226
8.1 <i>Limitations of the research and recommendations for future work</i>	240
BIBLIOGRAPHY	245
APPENDIX A	278
<i>Coastal Adaptation Planning: From Global to Local (background)</i>	278
APPENDIX B	283
<i>Copyright Authorisation Forms</i>	283

1 INTRODUCTION

1.1 Aim of Thesis

This thesis aims to explore the meanings, dimensions, effectiveness and shortfalls of collaborative coastal adaptation planning in response to climate change with a particular focus on two case studies in *Western Australia*.

1.2 Motivation for the Study

I started my career in coastal zone management in Italy in 2002. In 2005 I moved to Western Australia (WA) and worked in coastal zone management and planning for a range of state and local government agencies and not-for profit organisations, mostly based in regional areas. Both in Italy and in WA the coast is highly valued and many coastal settlements are at threat from coastal hazards such as erosion and inundation exacerbated by climate change impacts. In both countries the coastal governance systems are multi-leveled, fragmented and poorly coordinated.

The first factor that motivated the research undertaken in this doctoral research was the general lack of understanding among scientists, coastal managers and policy makers about coastal processes and vulnerability of the WA's coasts to climate impacts. WA regional coastal areas in particular seemed to suffer from poor management and planning due to lack of in-house coastal expertise, lack of guidance from state government, lack of appropriate monitoring regimes and limited financial support for adaptation planning studies and implementation.

The second factor was the inadequacy of the WA coastal governance system in dealing with climate hazard risk. At the state government level, a lack of leadership and guidance was acting as a blockage for coastal adaptation planning at the regional and local level. At the local government level, a lack of priority placed on coastal adaptation issues, concerns over potential liability, and limited extent of political powers was inhibiting coastal adaptation planning initiatives. It also important to note that at the beginning of my research coastal adaptation planning was still a fairly unknown concept and process in WA and it was not a policy requirement.

The third motivational factor was the increase in popularity of collaborative arrangements for coastal adaptation planning not just in the eastern states of

Australia but also in other countries like the United Kingdom (UK). 'Coastal adaptation planning partnerships' had become popular governance mechanisms for enacting coastal adaptation planning at that time where no one else was taking responsibility for ensuring that climate hazard information was effectively embedded into existing decision making frameworks.

The fourth factor was my direct involvement in a coastal adaptation partnership formed between a local government authority, the City of Greater Geraldton (CGG), a state government authority, the Geraldton Port Authority (GPA) and a not-for-profit organisation, the Northern Agricultural Catchments Council (NACC) for conducting a coastal vulnerability and risk assessment process. The partnership embarked on a pioneering journey with limited knowledge and support and because of this it encountered many difficulties. It was evident from the beginning that the capacity to undertake this project was not just influenced by the structure of and dynamics within the collaboration but also by the overall coastal governance system in which the partnership operated. As the partnership coordinator, I felt that in order to better assist the project partners I needed to learn more about how coastal adaptation planning is achieved and the governance contexts in which the new knowledge is generated.

My involvement in this partnership work as a researcher-practitioner enabled me to study a current and practical issue that is of concern to many coastal communities in Australia and still poorly addressed. On the one hand, as a practitioner with an active leadership role in the coastal management and policy arenas and among WA coastal communities, I was able to deepen my knowledge about the challenges that governments face in assessing and managing climate change risks in the coastal zone. On the other hand, undertaking a postgrad research on such as highly topical issue enabled me to deepen my understanding of emerging theoretical concepts and approaches that are key to adaptation governance. It also enabled to share my knowledge with the partnership members and other research participants for the duration of the partnership.

1.3 Background

The coast is one of Australia's greatest assets. It is highly diverse, containing a wide range of natural habitats, diverse biological communities and landforms (Harvey and Woodroffe 2008). It is also one of the most urbanised coasts in the world with approximately 80% of the population living within 50 km of accessible, uncrowded

and unspoilt beaches (Gurran 2008). However, the impact of climate change (particularly sea level rise) on existing coastal hazards combined with population growth and increased human activity are bringing significant changes to Australia's coasts (Kenchington, Stocker and Wood 2012b, Stocker et al. 2012b). Low-lying coastal settlements, established during a period of relative landform stability, are today extremely vulnerable to coastal erosion, inundation or both (Department of Climate Change 2009). Coastal and marine ecosystems of high ecological, cultural, social and economic value are also significantly at risk from coastal erosion and inundation hazards (Church et al. 2006, Department of Climate Change 2009, Hemer et al. 2008, Voice, Harvey and Walsh 2006).

Hence, climate change brings another dimension to the already difficult task of managing population pressure while protecting natural ecosystems and cultural values in the coastal zone (Gurran, Stocker et al. 2012c, Wood and Stocker 2009). Managing the coast sustainably, while taking effectively into account the threats that climate change poses, requires a better understanding of how human and natural systems operate and interact (Kenchington, Stocker and Wood 2012b, Stocker et al. 2011). This can be difficult because environmental processes, events and consequences are uncertain, highly dynamic and non-linear (Duit et al. 2010). Furthermore, values, impacts and appropriateness of responses are not equally experienced everywhere by everyone (Hofmeester et al. 2012) and can be different at different scales in space and time (Adger, Arnella and Tompkins 2005, Dovers and Handmer 1992, Klein et al. 1998, Klein, Nicholls and Thomalla 2003).

Coastal adaptation planning, a term adapted from climate adaptation planning to refer to adaptation actions specifically in the coastal zone (Nelson, Adger and Brown 2007), refers to the process of assessing the consequence of coastal erosion and inundation impacts (and how such hazards are exacerbated by projected climatic changes) on people, property, economic activity, social wellbeing and the environment, and to determine appropriate adaptation planning activities (Baker & McKenzie 2011, England 2007, Füssel 2007a, Glavovic et al. 2014, Mimura et al. 2014, Preston, Yuen and Westaway 2011).

Coastal adaptation planning is therefore understood as a set of adaptation projects, short- and long-term adaptation strategies, and decision making processes "undertaken to maintain the capacity to deal with future change or perturbations to a social-ecological system" (Nelson, Adger and Brown 2007, p.396). Like climate

adaptation planning, coastal adaptation planning is also about facilitating communication, cooperation and collaboration among and between relevant organisations, business, civil society, and decision makers, and other stakeholders (Mimura et al. 2014).

Typically coastal adaptation planning involves a series of consequential steps based on a risk management framework: the assessment of exposure and sensitivity of the coast to coastal processes under different climate scenarios; a risk assessment phase whereby future risks to coastal assets from coastal hazards are identified; and the development and implementation of most technically and economically feasible adaptation measures (Australian Government 2006, Standards Australia, Western Australia Planning Commission 2014). However, despite the proliferation of frameworks developed to assist statutory decisions makers particularly at the local level and the number of studies undertaken to assess coastal vulnerability and risk, the translation of scientific evidence into adequate policy responses in Australia has been either poor, or poorly explored (Clarke et al. 2013, Eakin and Patt 2011, Preston, Westaway and Yuen 2011).

In Australia, coastal adaptation is enacted mostly through land use planning (Macintosh 2013) and should be a shared responsibility across levels of government and between the public and private sector (Amundsen, Berglund and Westskogô 2010, Biesbroek, Swart and Van der Knaap 2009). Having said that, responsibility for coastal adaptation planning has been increasingly devolved to local governments despite primary responsibility for coastal land use planning still resting with state governments.

The literature shows that while local government can exercise some specific coastal adaptation responsibilities through land-use planning, development approvals and asset management, the expectation that individual councils can alone respond to the effects of climate change on the coast effectively and in a timely fashion has proven to be unrealistic (Gurran, Squires and Blakely 2005, Wescott 2009). Limited resources, lack of and poor access to information, conflicting community expectations and inadequacy of legislative frameworks are just some of the challenges faced by local governments in pursuing adaptation planning in the coastal zone (Patt, Klein and de la Vega-Leinert 2005, Tompkins, Few and Brown 2008, Torresan et al. 2008).

The proliferation of voluntary partnership arrangements, particularly among local government authorities, throughout Australia reflects the need of government agencies to orient themselves to the challenges of climate adaptation and to foster better collaboration for coastal adaptation across government tiers and organisational boundaries (Karpouzoglou, Dewulf and Clark 2016). This trend supports claims in the academic literature that governance systems that are more adaptive and collaborative are better equipped than conventional approaches for dealing with complex and uncertain societal problems like coastal adaptation (Amundsen, Berglund and Westskogô 2010, Ansell and Gash 2008, Bulkeley and Betsill 2005, Corfee-Morlot et al. 2010).

Although collaboration is considered to be crucial to adaptation governance (Burch 2010, Clarke et al. 2013, Emerson and Gerlak 2014) little is known about the conditions for and successful elements of adaptive and collaborative governance specifically for coastal adaptation planning. Further, little is known on the role that coastal adaptation planning partnerships play in the delivery of adaptation planning processes and how this role is influenced and influences the broader system of governance that mediates institutional decision making (Corfee-Morlot et al. 2010, Costanza et al. 1998).

For example, in WA most of the adaptation planning work has been conducted through local government partnerships, however only a few adaptation planning processes have been actually completed. This may be attributed to the difficulties encountered by the partnerships or to the influence that governance systems have on how a coastal adaptation planning process should be conducted and implemented. Preston, Westaway and Yuen (2011) argue that, firstly, governance has a profound overarching influence on the ability to conduct hazard assessment and adaptation studies including scope, methodological approaches, funding mechanisms and engagement of external stakeholders.

Secondly, governance plays an important role in using the information sourced through the vulnerability, risk and adaptation assessment to inform decision making processes. Thirdly, governance can play a critical role as an enabler of incentives for adaptation, policy reforms and institutional change (Keskitalo 2010). At the same time partnership arrangements can have a profound impact on the governance systems in which they operate (Shaw, Danese and Stocker 2013, Vickery and Danese Galano 2013).

Two case studies from WA and one case study from Tasmania were chosen to examine different approaches to coastal adaptation planning through partnership arrangements, although the focus of this thesis is the coastal adaptation governance system of WA.

1.4 Significance of Thesis

This thesis makes a significant contribution to new knowledge both by making a contribution to the academic literature in building coastal adaptation theory and by providing insights and recommendations about improving collaborative governance of coastal adaptation.

Academic significance: The thesis makes a unique contribution to the academic literature by developing and elaborating a set of principles of good governance for coastal adaptation drawn from the literature about contemporary approaches to governance. This literature is diverse and covers a range of related and intersecting frameworks which I analyse and then synthesise into single framework of principles.

Governance significance: while collaboration is a promising trend in coastal adaptation planning in WA, the conditions for and successful elements of adaptive and collaborative governance specifically for coastal adaptation planning are far from clear. Furthermore, better understanding is needed of the important role that local government can play in the delivery of adaptation planning processes and outcomes through partnerships, and the limitations on this role. This thesis makes a contribution to coastal adaptation governance by identifying how and in what ways collaborative arrangements can improve coastal adaptation through the application of the set of coastal adaptation principles elaborated from the literature.

1.5 Research Questions and General Approach

This thesis poses the following research questions:

- 1. What are the current features of coastal adaptation planning in WA?*
- 2. What are the key challenges to collaborative approaches to coastal adaptation planning in WA?*
- 3. How can collaboration improve coastal adaptation planning in WA, and what lessons can be learnt from other collaborative approaches?*

4. What set of governance principles can be established to guide collaborative approaches to coastal adaptation planning?

In answering these questions, the present research draws evidence from two cases of locally driven partnership arrangements for coastal adaptation planning which were among the first established in WA: the Geraldton Coastal Vulnerability and Risk Assessment Program Partnership (CVRAP), and the Peron Naturalist Partnership (PNP). The CVRAP case study exemplifies the challenges of a small-scale partnership lead by a non-government organisation whilst the PNP is an example of a partnership among several local government authorities across a wider coastal region. The Geraldton partnership arrangement was examined through an action research approach to increase the depth of understanding of partners' perceptions, perspectives and attitudes towards climate hazard adaptation issues. A third case study, from Tasmania provides insights into a successful collaborative partnership arrangement for coastal adaptation planning established between government and non-governance authorities which has been widely recognised for its strong collaborative efforts, community participation and decision making outcomes. The case study results are analysed through the application of a set of coastal adaptation principles drawn from the academic literature.

1.6 Structure of Thesis

In Chapter Two I examine the literature on adaption governance and I identify a set of principles that describe good governance for coastal adaptation.

In Chapter Three I outline the methodology used to undertake this research study.

In Chapter Four I examine how coastal adaptation decision making occurs in WA and Tasmania. The evolution of coastal adaptation planning from broad national assessments to what is now is summarised in Appendix A.

In Chapter Five I explore each partnership model from the three case studies and the role that each partnership plays in initiating and progressing coastal adaptation planning in their area. Then I explore how each partnership sit within the broader coastal governance system, and describe how governance influences the way the three partnerships operate and vice versa.

The case studies are then analysed in Chapter Six for their collaborative and adaptive efforts using the set of governance principles developed from the literature on sustainable, adaptive and collaborative governance and described in Chapter three. The principles are then tested through the multi-case study analysis. The multi-case study provides an in-depth analysis and comparison of the three collaborative governance arrangements for coastal adaptation planning.

Finally, in Chapter Seven I refine the principles for good coastal adaptation governance and provide an analysis of the successful characteristics that collaborative governance should have to enable adaptation in the coastal zone. The principles, built upon practical examples, can be used as overarching guiding principles by policy makers, decision makers and researchers for evaluating and improving existing and potential governance arrangements in order to achieve adaptation in the coastal zone more effectively.

It is important to note that exploring and understanding the multi facets of adaptation governance in complex social–ecological systems requires transdisciplinary knowledge (knowledge across multi disciplines). For this reason, this study may not fully explore each aspect of governance for coastal adaptation. The aim is to identify a set of features of coastal governance that are most likely to influence adaptation planning processes and outcomes.

Further, this study does not aim to explore the effectiveness of partnership arrangements to the implementation of adaptation strategies, nor it aims to assess if coastal adaptation planning processes are the most effective mechanisms for the reduction of societal vulnerability to coastal hazards.

2 THEORETICAL FRAMEWORK

2.1 Coastal Adaptation Planning Under Different Conceptual Lenses

Coastal adaptation planning can be interpreted through different conceptual paradigms. Through a positivist perspective coastal adaptation planning is interpreted as a compendium of analytical and empirical studies from which ecosystem vulnerability and climate risk can always be quantified and objectively assessed (Esbjörn-Hargens 2010a, Kuhn 1962, O'Brien et al. 2007). Ecosystem vulnerability, hazard modelling and risk calculations are responsibility of governments who typically (due to lack of in-house expertise) contract out external expertise to engineers, geographers, geologists and economists (Vickery and Danese Galano 2013).

External expertise is often sought to develop and fully cost management options (commonly based on quantitative economic techniques) which are then provided to coastal managers for implementation (Vickery and Danese Galano 2013). Since the 1980's probabilistic hazard lines have been chosen as a preferred tool for communicating data on coastal areas projected to be at risk from coastal hazards over a certain planning timeframe (Wainwright et al. 2014). However, hazard lines developed through simplistic methodologies have demonstrated to be of little help to decision makers who demand more defensible and accurate information on hazards (Cooper and Pilkey 2004, Gordon 2015, Kinsela and Hanslow 2013).

In a traditional positivist view of the world, coastal hazard assessments are an instrument for evaluating the validity of findings (to get to the 'truth') and for developing 'a solution' to the problem (Gidley 2016). A positivist approach means that decision makers rely almost exclusively on advice from people who have technical knowledge while dismissing the views of non-scientists (Dryzek 1997). This, combined with the importance of economic considerations in influencing decision making processes, has led to engineering type interventions (coastal protection) becoming the most common solutions to mitigate the impacts of climate change in the coastal zone (Kamphuis 2010, Nicholls 2011). The engineering approach to coastal management has been prevalent worldwide for the past two centuries but it has been broadly criticized from the perspective of social justice (Cooper and McKenna 2008).

Moreover, it is now widely accepted that the high degree of uncertainty of hazard science and representation methods (hazard lines) makes decision making processes based only on this information highly debatable and contested, and often not rigorous or objective (Gordon 2015, Thomsen, Smith and Keys 2012). Finally, a positivist approach does not support community interpretation and engagement around the meaning and consequences of coastal hazards and adaptation.

Climate adaptation planning can be otherwise interpreted as socially constructed knowledge (Adger, Arnella and Tompkins 2005, Funtowicz and Ravetz 1991) requiring the consideration of the different levels of consciousness, worldviews, backgrounds and values of the actors involved, including those impacted by the problem such as community (De Marchi and Ravetz 1999, Funtowicz and Ravetz 1994b). Under this approach to knowledge, non-state actors are considered crucial for the formulation of climate change policy, for example, in a risk assessment stage the determination of risk tolerance and acceptability is ultimately a social phenomenon. In this view, 'non-analytical' components such as cultural and social contexts and values and the integration of local and traditional knowledge are critical aspects of an adaptation planning process (Stocker and Kennedy 2009).

Further, under a constructivist view there is no single perfect solution to a clearly delineated problem; rather, different decision making pathways exist for addressing complex issues. Hence, the development and implementation of adaptation pathways depends on actors' ability to understand the issue, interpret the scientific information at hand, and on actors' background, professional experience and values. However, scholars have argued that a decision making process that relies too strongly on subjective interpretations and less on scientific findings can compromise the effective translation of scientific information into policy (Haas 2004). Others have pointed out that trying to source different types of evidence without a clear framework as to how to use this information can be an expensive and in some instances an ineffective exercise for improving decision making (de Groot et al. 2010, Godschalk 2004).

While there is a widespread acceptance that new ways of understanding change are needed, linear and rational planning instruments which strongly rely on a positivist approach to knowledge are still common mechanisms for guiding adaptation decision making in the coastal zone (Macintosh 2013). For many local governments having to make decisions in an environment characterised by diversity of interests

and views, ambiguity of policy and uncertainty of science is a still huge challenge (ARTD 2010, England 2007, Hoppe, van den Berg and Coenen 2014). Thus, the complexity and transdisciplinary nature of adaptation decision making and the failure of traditional decision making mechanisms requires a move beyond the epistemological antagonism between 'objectivist-positivist' and 'subjectivist-constructivist' paradigms and therefore beyond the just empirical (just science) or just social (human interaction) approaches to climate adaptation. Post-constructivism (Schwandt 2000, Schwandt 2003), relationality (Slife 2004) and integralism (Esbjörn-Hargens 2010b) are alternative paradigms that can help theorise and explain society, science and nature together, rather than to leave these in their individual domains (Asdal 2003).

According to a post-constructivism approach multiple realities and different human and non-human elements must be incorporated into the process of making those realities effective. Climate change seen through an integralist lens is an object that not only is perceived in many different ways (*epistemological pluralism*) but that actually *is* many different things (*ontological pluralism*), depending on how it is approached and performatively enacted (*methodological pluralism*) (Esbjörn-Hargens 2010a, Esbjörn-Hargens 2010b, O'Brien and Hochachka 2010).

An integral policy response to climate change enables us to better understand the different perspectives on climate change, the importance of cultural, social and other values and brings together ethical and social considerations to assist with management of risk with an extended peer community peer review and dialogue to ensure quality control (Turnpenny, Jones and Lorenzoni 2011). Climate adaptation planning must therefore take into consideration the different levels of consciousness and worldviews among those involved and the multiplicity of perspectives, views and knowledge but also requires effective incorporation of non-values information (De Marchi and Ravetz 1999, Funtowicz and Ravetz 1994b).

Under this view, coastal adaptation planning combines a traditional approach to science with an open, inclusive and ongoing process which takes into consideration the plurality of perspectives and views of the actors involved including the broader community. A normal science approach is applied to data collection, hazard analysis and mapping; whilst interpretative skills, values and local knowledge are incorporated in the risk assessment process, and the two combined are used in the adaptation planning and final implementation stage.

Under these post-modern approaches to coastal adaptation planning, central and local governments should prioritise the community's interests, and funding should be adequate particularly to assist local governments who are then more accountable to central government (Bell and Hindmoor 2009). Collaborative planning and community engagement processes should be encouraged (Gunder 2010). Adaptation planning should be grounded in a concern for the common good, an appreciation of social values, while being held accountable through regulatory interventions by government institutions (Warber 2008).

During the last thirty years, however, post-modern approaches to climate adaptation have been challenged by neo-liberal ideology. This has meant that the traditional role of government (particularly central government) as the 'provider' or 'mediator' or 'coordinator' is now challenged. Neo-liberal practices tend to favour economic development and a stronger role of the private sector in policy making (Fieldman 2011, Gunder 2010). Neoliberal theory promotes smaller government and the devolution and decentralisation of government responsibilities, functions (and risks) to lower levels of government who are closer to community interests (Fieldman 2011). In practice, responsibility for developing and implementing planning policies are often allocated to local governments without commensurate financial or technical resources (Wright and Cleary 2012).

For these reasons, post-modernists argue that by encouraging solutions that favour the private sector, minimising subsidies and incentives, prioritising property rights and economic development, current neoliberal rationales present a barrier to effective adaptation planning and policy outcomes (Adger et al. 2003, Fieldman 2011). According to Adger (2003) policies developed in a neoliberal context are more likely to support adaptation measures that benefit wealthy individuals rather than the broader community. By delivering policies that are more flexible and that give less specific direction to local government a neoliberal approach provides more certainty and predictability to developers (Wright and Cleary 2012).

According to Fieldman (2011) the influence of neoliberal perspectives can significantly alter the capacity of planning policy to facilitate adaptation by changing the institutional context in which planning operates and the underpinning principles and goals (e.g., urban development and growth). McClure and Baker (2013) argue that the weakening of the role of state government in climate adaptation, the

devolution of responsibilities to the lowest level of government and a stronger reliance on individuals' responsibility and ability to adapt brought by neoliberal influences, can actually lead to maladaptation.

In Australia, land-use planning is strongly influenced by neoliberal views (Gleeson and Low 2000). Scholars have suggested that neoliberal approaches to adaptation, which encourages individual responsibility and marked self-regulation, have not been particularly conducive to adaptation (McClure and Baker 2013) often leading to maladaptive processes and outcomes (Granberg and Glover 2014). Hurlimann and March (2012) and Bruce (2008) argue that over the past three decades land use planning has failed to facilitate adaptation and sustainable development outcomes as evidenced by the heightened urban sprawl and intensification of development on vulnerable coastal areas as a consequence of poor enforcement of risk mitigation policies. Gunder (2006) argues that planning seems to have failed particularly in the policy implementation phase.

Instead, adaptation scholars argue that effective adaptation planning depends on the ability of governance systems to adopt principles that support ongoing collaborative, flexible and participatory processes and provides opportunity for social and policy learning (Adger, Lorenzoni and O'Brien 2009, Britton et al. 2011, Emerson and Gerlak 2014). Collaboration and participation in land use planning are considered essential ingredients for successful adaptation (Burch 2010, Clarke et al. 2013, Middle 2010, Wood and Stocker 2009, Wood and Mills 2008).

For example, Granberg and Glover (2014) and Middle (2010) argue that individual agents are less likely to have the same access to knowledge and the necessary resources to understand the risks, develop and implement effective adaptation strategies. Further, planning authorities and policy makers who aim to effectively pursue adaptation under the current neoliberal policy model must give regard to broader social and environmental values rather than focusing just on economic ones (Granberg and Glover 2014).

2.2 Key Barriers to Coastal Adaptation Planning

Coastal adaptation planning is a long journey that involves many steps along the way. Each step of this process presents a range of challenges (but also opportunities) that can influence peoples' behaviour and motivation to continue on a

certain path and that ultimately influence adaptation decision making outcomes.

Literature suggests that coastal adaptation planning processes, adaptation responses and reduction of societal vulnerability are not necessarily consequential or interrelated. Easterling W.E., Hurd and Smith (2004), Adger and Vincent (2005) and Preston, Westaway and Yuen (2011) argue that although coastal adaptation planning processes (or frameworks) can contribute towards increasing general awareness of climate risks, adaptation needs and options, such awareness does not always translate into adaptation actions. Others argue that adaptation outcomes may not necessarily lead to a reduction of societal vulnerability to climate change (Measham et al. 2011, Thomsen, Smith and Keys 2012).

Thomsen, Smith and Keys (2012) distinguish the concept of maladaptation from the concept of manipulation, the former meaning that unintentionally the process of adaptation leads to adverse consequences, the latter describing a lack of intention to adapt. Furthermore, not all adaptation actions are necessarily driven by an adaptation planning process per se (Preston, Stafford-Smith and Flagship 2009). Macintosh (2013) argues that many actions taken to prepare for or respond to global warming actually increase the social costs of climate change instead of achieving sustainable outcomes.

In essence, the incorporation of coastal hazard considerations into local government operations through a relatively new and untested risk management and adaptation planning approach inevitably presents itself as a fresh challenge to all parties involved but particularly for local governments who are increasingly left alone at the coalface of adaptation in the coastal zone. Numerous inquiries, public submissions and studies have described and testified the critical barriers faced by local government in undertaking the four key phases of the adaptation process, namely: establishing the context; assessment of risk; adaptation planning; and implementation from different perspectives (Measham et al. 2011, Mukheibir, Gero and Herriman 2012, O'Toole and Coffey 2013, Productivity Commission 2010a).

Literature shows that during the initial stages of an adaptation planning process, the lack of, or uncertainty surrounding, coastal hazard information is one of the key barriers to adaptation action particularly for smaller, less resourced local governments (Productivity Commission 2010a, Rollason 2012). Reports based on workshops and research interviews show that local governments are still grappling

with the level of detail useful for local planning and decision making (Measham et al. 2011, Vickery and Danese Galano 2013). Another key concern is the inconsistency and inadequateness of financial assistance from the state and federal governments to help local government carry the burden for larger scale assessments.

According to Mukheibir, Gero and Herriman (2012) issues with data inconsistency and uncertainty is exacerbated by poor leadership (across the three tiers of government), confusions over statutory obligations and legal responsibilities, lack of expertise and lack of technical guidance. Studies have shown that regional councils are more likely than urban councils to have a higher level of scepticism among staff and elected members on climate adaptation issues which typically translate into a lack of financial commitment towards data collection, projects, and also training for staff and elected members (Danese Galano 2012). Another important barrier at the local level, as identified by Measham et al. (2011), is the existence of competing priorities which can be legitimate, although in some instances driven by political agendas and influenced by different perspectives and attitudes.

In exploring the tensions, challenges, and implications associated with the creation, exchange and use of knowledge in coastal adaptation planning O'Toole and Coffey (2013) suggest that the information provided to local governments by external providers is often fragmented, complex and complicated (i.e., it represents complex information as well as being complicated in its representation and interpretation). Further, they argue that local governments by relying on external sources for expertise can be the cause of legitimacy issues. While some consultants are widely respected and trusted, in some circumstances this very trust can become a disadvantage by reducing innovation and competition and by increasing dependence on their judgment. According to Scally and Wescott (2011) coastal adaptation science uptake should be facilitated by 'honest brokers', who do not have a vested interest in the decision outcomes.

During the risk assessment phase local governments have to be clear on risk assessment methodologies, objectives and assumptions. This can be quite challenging given that some methodologies are still fairly untested and their application within the policy framework unclear (Smith et al. 2008a). During this phase local governments are required to gather information on community values and attitudes towards risk (Rollason 2012). To do so they have to find best ways to communicate risk information to their constituents. Challenges typically include how

and when to best engaging with the local community.

According to Clarke et al. (2013), Hartz-Karp and Stocker (2013) and Kenchington, Stocker and Wood (2012a), involving the community is crucial but if not done properly (too early, too late or unprepared) it can cause high community expectations in the ability of the local government authority to resource the adaptation plan (Preston et al. 2008). Vickery and Danese Galano (2013) argue that in some instances community can feel empowered to be part of the decision making process without fully comprehending that the formal responsibility for decisions ultimately resides with the Council and that final decisions can be very different from those developed through a collaborative process.

According to Rollason (2012) the key concern associated with communicating hazards and risk information is the potential impact on property values and development rights and the consequential fear of legal repercussions. Because of this, it is not uncommon for local governments to decide not to release the information or to postpone community engagement processes until 'more accurate' information is available. On the other hand, if information is withheld from the public altogether, this course of action could lead to climate and legal risks. The resultant dilemma can lead to a 'decision paralysis' and/or to conflictive situations.

The adaptation planning phase (development of adaptation options or pathways) typically requires governments to effectively integrate information about social, cultural, economic and environmental values previously gathered. Decision analysis techniques such multi-criteria analysis that allow the integration of non-economic values into the adaptation planning process are becoming increasingly popular. However, combining new methodologies with more traditional ones such as cost-benefit analysis has proven difficult in a coastal adaptation planning context where values and benefits are still poorly defined.

The adaptation planning phase also requires governments to acknowledge that it is not possible to provide complete certainty about 'if and when' an impact will occur and that for this reason coastal adaptation decisions carry a degree of uncertainty (Productivity Commission 2010a). Difficulties in the preparation of adaptation strategies can include unwillingness to consider alternative adaptation options because they clash with existing management approaches, or because there is a fear that they may encounter resistance from the constituents. A strong political

influence on coastal adaptation planning outcomes often leads to short-term fixes rather than long-term integrated approaches (Measham et al. 2011).

Once adaptation options are developed numerous barriers to implementation exist. Additionally, due to lack of funding and political commitment, another key barrier may be the lack of specific guidance as to how statutory measures can be implemented within an existing planning framework (e.g., how to implement retreat, notifications on title, etc.) (Macintosh, Foerster and McDonald 2013).

Implementation can also be hindered by vested economic interests or other interests in assets (e.g., infrastructure and/or private assets in areas potentially at-risk) that conflict with the recommendations in the adaptation plan, especially where policy fails to address conflicts over property owners' loss of land and built structures (Thom 2012). Key issues associated with the implementation phase are in determining who benefits from an adaptation strategy (public/private benefit ratios) and therefore who should pay it. Adequate funding strategies for addressing the costs of protecting community values and private property (SGS Economics & Planning 2012a) is something that local governments are still grappling with.

2.3 Good Governance for Coastal Adaptation

Coastal adaptation planning is not just a compilation of studies for understanding and developing adaptation responses to coastal hazard risk but it is also the combination of processes, mechanisms and policy instruments that facilitate decision making for adaptation (Shaw, Danese and Stocker 2013, Vickery and Danese Galano 2013).

The ability of government to enact adaptation policies and measures, in fact, does not depend solely on a risk assessment process per se, but rather on the various systems of governance that mediates institutional decision making for the coastal zone (Corfee-Morlot et al. 2010, Costanza et al. 1998, Preston, Westaway and Yuen 2011). The influence of such governance systems on adaptation planning in Australia is evidenced by the lack of implementation of adaptation plans and support for adaptation action at the local level (despite the proliferation of hazard assessment studies and adaptation planning tools) (Ansell and Gash 2008, Preston, Westaway and Yuen 2011).

The issue of inadequacy of current coastal governance systems has been highlighted in countless government inquiries and reports (HRSCCCWEA 2009, Productivity Commission 2010a). Despite this, major governance challenges still persist. This is because over the past twenty years coastal adaptation planning has been focussing primarily on the science and technical knowledge related to coastal erosion and inundation. However, insufficient attention has been given to the ability of governance systems to deal with uncertainty, abrupt change and complexity brought by the interaction between natural processes, climate impacts and human interventions (Folke et al. 2005, Harris 2007, Levin 2002).

Coastal adaptation planning in Australia is framed and therefore guided by a coastal adaptation governance system that encompasses adaptation law and policies, adaptation planning frameworks and land use planning. A broader coastal governance system that encompasses other components such as environmental legislation and management of the coastal environment plays also a role. Both systems influence the way information on climate hazards and risks are acquired (Preston, Danese and Yuen 2011, van Asselt and Renn 2011) and how this information is used within the existing planning and legal frameworks (Preston, Danese and Yuen 2011, van Asselt and Renn 2011).

According to recent scholarship, governance for adaptation is not just a combination of formal government processes and institutions but includes (to varying degrees): collaborative and participatory decision making processes (Preston, Danese and Yuen 2011); formal and informal networks with multiple and diverse views (Jordan 2008, McFadden 2007) and different means of knowledge production and uptake (Leith et al. 2012). Governance for adaptation also involves interactions across multiple spatial and temporal scales (Adger, Lorenzoni and O'Brien 2009, Schultz et al. 2015, Stocker et al. 2013).

According to this interpretation, coastal adaptation governance can be described as a complex adaptive system characterised by non-linear and multi-level interactions, complex feedback mechanisms and limited predictability (Costanza et al. 1998, Duit et al. 2010, Peters and Pierre 2006). Such systems are able to improve their problem-solving capacity, therefore are more adaptive and more conducive to adaptation (Adger, Lorenzoni and O'Brien 2009, Costanza et al. 1998, Kemp, Rotmans and Loorbach 2007, Peters and Pierre 2006). However, different

governance types can handle processes of change differently (Duit and Galaz 2008).

The distinction between the terms ‘adaptation’ and ‘adaptive’ (in the governance context) is an important one to make. Adaptation (as a noun) refers to the process of deliberating change in anticipation of or in reaction to stress (IPCC 2007). Adaptation is both the process and the outcome. The term adaptive (as an adjective) refers to the ability to show adaptation or to facilitate adaptation (Schultz et al. 2015).

Typically the term adaptive is used in the literature to describe a governance system (Chapman 2009, Emerson and Gerlak 2014, Folke et al. 2005, Gunderson and Light 2006, Schultz et al. 2015), a process (Alterman 1988, Giordano 2012, Lawrence, Bennett and Barchiesi 2004, Strangert 1977, Tompkins 2005), an ecosystem (Armitage and Plummer 2010, Castrejón and Charles) or a population (Adger and Vincent 2005, Armitage and Plummer 2010, Folke et al. 2002).

For example, Schultz et al. (2015, p.7369) define adaptive governance as “flexible and learning-based collaborations and decision making processes involving both state and non-state actors, often at multiple levels, with the aim to adaptively negotiate and coordinate management of social–ecological systems and ecosystem services across landscapes and seascapes”.

The importance of improving governance systems so they are better equipped to facilitate adaptation has been widely discussed in the literature. A series of policy paradigms such as *sustainable governance* (Costanza et al. 1998), *adaptive governance* (Folke et al. 2005), *reflexive governance* (Voss et al., 2006), *collaborative governance* (Ansell and Gash 2008) and *transition governance* (Brown, Furneaux and Gudmundsson 2012, Foxon, Reed and Stringer 2009, Kemp and Loorbach 2006, Rotmans and Loorbach 2009, Voß, Smith and Grin 2009) help identify common requisites of good governance for adaptation and can be used by governments to steer towards sustainability and adaptation. Although some differences exist between these paradigms they all convey the same message; climate adaptation requires governance systems that are structured around a core set of mutually agreed principles that support adaptive, collaborative and participatory processes and provide opportunity for social learning (Funtowicz and Ravetz 1994b, O’Brien and Hochachka 2010, Saloranta 2001).

These key policy paradigms and their significance in a coastal adaptation context are briefly described below.

2.3.1 Governance for Sustainability

Governance for sustainability rests on an understanding of both the substantive objectives of sustainability and the appropriate governance processes for achieving those objectives.

Typically the concept of sustainability in the coastal context is used to refer to the conscious integration of “social, cultural, ecological and economically productive dimensions of the coast” (Stocker et al. 2012d, p.25). The term “sustainable development (SD)” is used to describe a “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1990, section 4).

For several years, in Australia, the equivalent term was ‘ecologically sustainable development (ESD)’ defined 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” (Australian Government 1992, Part I). Each level of government in Australia was required to develop policies and make changes to governance arrangements consistently with these core objectives.

More recently, sustainability in the coastal context has been associated with land use planning and adaptation planning practices (Karrasch, Klenke and Woltjer 2014, Robinson 2004). The majority of coastal planning policies and climate change adaptation policies in Australia are underpinned by principles of SD such as the precautionary principle, inter-generational equity, conservation of biological diversity and ecological integrity, improved valuation, pricing and incentive mechanisms (UNCED 1992, United Nations 1992). Other principles that support a sustainable approach to coastal planning include: evidence-based risk assessment; natural resource management; community engagement and collaboration to promote the sustainable development; and management of the coastal zone (Norman 2009).

Despite this, interpreting and implementing the principles of sustainable development in Australia is still quite challenging. The complexity of technical,

societal and governance issues often inhibits the application of such principles (Beder 1996). The key challenge, according to sustainability scholars, is to integrate these principles effectively into the current neoliberal systems of governance where the influence of economic paradigms is strong (Burke 2012, Thomsen, Smith and Keys 2012). It is now generally accepted by scholars that approaches to sustainability governance based on economic values only are inadequate and can lead to maladaptive outcomes (Granberg and Glover 2014, Macintosh 2013, Thomsen, Smith and Keys 2012).

Hence, governance plays a central role in the integration of sustainability principles in decision making frameworks (Costanza et al. 1998, Dietz, Ostrom and Stern 2003, Duxbury and Dickinson 2007). To be effective sustainability objectives must be embedded in government policies, in private development objectives and also in communities and individuals choices of living and decisions. Applying sustainability objectives to coastal management and development signifies committing to a paradigm shift from which development occurs with little regard to potential environmental and social impacts to one where interventions benefit the broader community and future generations.

Several scholars such as Costanza et al. (1998), Duxbury and Dickinson (2007) and Loorbach (2007) propose a set of governance for sustainability principles which are summarised below and elaborated throughout the thesis in the context of coastal adaptation. First, governance for sustainability must first recognise and accept that decision making regarding hazards in the face of uncertainty is complex and contentious (Loorbach 2007, Redclift 1992).

Scientific information plays an important role in informing decision making processes, but does not resolve all difficulties and uncertainties (Merkel 1998, Von Winterfeldt 2013). Furthermore, systems thinking is an essential part of schooling for sustainability (Checkland 1985); sustainability requires appropriate information to be collected with the system as a whole in mind not just parts of it (Costanza 1992). Sustainability goals also require sourcing the most accurate information at the scale most useful to decision making (Duxbury and Dickinson 2007). On the importance of scale matching, Costanza et al. (1993) argue that socio-ecological problems present themselves across different scales. Thus, finding the appropriate scale of governance is a key to sustainable decision making outcomes.

Responsibilities for current and future access to, and use of, environmental resources should be carefully assessed. Environmental resources should be used in an “ecologically sustainable, economically efficient, and socially fair manner” (Costanza et al. 1998, p.198). Individual and corporate responsibilities and incentives should be aligned with each other and with broad social and ecological goals. This is particularly important for the ESD principle of equity, which requires “the present generation to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations” (Australian Government 1999, Section 3A).

Governance for sustainability requires better integration between disciplines, policies and actors as well as improved institutions and decision making mechanisms (Costanza et al. 1998). Funding should be adequate and consistent (Costanza et al. 1998). Given that policies, although informed by scientific evidence, can be considered as a social construct (Davos 1998), governance for sustainability should aim to increase cooperation of all relevant stakeholders and include multiple viewpoints and values. Stakeholder awareness and participation increase the credibility and legitimacy of a decision making process.

Sustainability also means achieving internalisation of environmental costs into decision making and full-cost accounting (Costanza et al. 1998). Hence, environmental factors should be included in the valuation of assets and services. Full-cost accounting is particularly complex and a contentious issue in coastal adaptation planning. In this context costs and benefits associated with the use of ecosystem resources or associated with hazard mitigation options are not always properly assessed or taken into consideration (Stocker et al. 2013, Vickery and Danese Galano 2013). However, sustainability-informed accounting does not necessarily mean collapsing all values into economic costs and benefits; rather the integrity of different kinds of data can be maintained through mixed methods (Burke 2012).

According to Loorbach and Rotmans (2006) in order to solve persistent societal problems, governance for sustainability must support structural transformations (or ‘transitions’). Loorbach and Rotmans (2010) and (Voß and Kemp 2006) argue that transition to sustainability require the support of multi-level governance and adaptive management approaches. Hence, coastal adaptation planning must be supported by a governance system that is able to provide tools and instruments to adequately

initiate, stimulate, support, monitor and implement transitions and system innovations (Loorbach and Rotmans 2010, Voß and Bornemann 2011).

Further, the effectiveness of adaptation policies relies on appropriate capacity of a governance system to address implementation. Governmental policy capacities are a key to the effective integration of SD principles into policy (Lafferty 2004). These include effective policy design, effective implementation and effective stakeholder support.

Finally, the complexity and uncertainty of sustainable development demands governance systems and policies to be adaptive (Hallegatte et al. 2013, Swanson et al. 2010).

2.3.2 Adaptive Governance

The concept of *adaptive governance* incorporates and extends the concepts of sustainable development (Archibugi and Nijkamp 1989, Beder 1996, Cash et al. 2003, Lafferty 2004, Munasinghe 2003), adaptive management (Dietz, Ostrom and Stern 2003, Iles 1996, Lawrence, Bennett and Barchiesi 2004, Lessard 1998, van der Brugge and van Raak 2007, Walker et al. 2004) and adaptive planning (Alterman 1988, Giordano 2012, Iles 1996, Strangert 1977, Swanson et al. 2010).

Over the last 40 years adaptive management has been a popular approach for managing environmental resources sustainably in an environment characterised by uncertainty and complexity (Holling 1978, Strangert 1977, Walters 1986). Adaptive management is an operating tool for Integrated Coastal Zone Management (ICZM) (Ballinger et al. 2010).

According to an adaptive management approach the management of uncertain, complex and dynamic ecosystem processes and functions requires that adaptive methodologies, practices and policies be designed to adjust to the unexpected, and to recognise the diversity of social and cultural factors affecting natural resource use (Holling 1978, Iles 1996, Walters 1986). Kato and Ahern (2008, p.548) identify four key features of adaptive management: (1) management actions are conceived as experiments; (2) plans/experiments are conducted at once for fast learning; (3) monitoring; and (4) learning by doing.

Adaptive management relies upon the continuous collection of information on

ecological, social and economic values with the aim to integrate them into decision making frameworks (Costanza et al. 1998). It also requires flexibility in policy making and implementation (Armitage 2009). Furthermore, risk and uncertainty are not avoided but are embraced as an opportunity to build new understanding (Smith and Smith 2006). According to Gallagher (2010) adaptive management is a mechanism which enables governments to check the progress of sustainability initiatives. Folke et al. (2002) and Folke (2006) argue that an adaptive management approach helps build resilience in social-ecological systems and achieve the goal of sustainable development which is to create and maintain prosperous social, economic, and ecological systems.

Adaptive planning is a concept underpinned by the same principles and objectives as those of adaptive management. It embraces three key stages: adaptive strategic planning (Macintosh 2013, Mirfenderesk and Corkill 2009, Wilson 2006); adaptive policymaking (Kato and Ahern 2008, Swanson and Bhadwal 2009); and adaptive implementation and administration of strategies and policies (Giordano 2012, Kato and Ahern 2008, Middle 2010, Mirfenderesk and Corkill 2009). Adaptive planning incorporates the requisites of innovation, experimentation, flexibility and learning in policy development and implementation.

Strategic planning and policy making processes that incorporate adaptive management principles are: more equipped at dealing with anticipated and unanticipated conditions in spite of complexities and uncertainties (Walker, Rahman and Cave 2001); have built-in monitoring and evaluation mechanisms to allow for regular reviews and adjustments (Swanson et al. 2010); and foster multi-stakeholder engagement and collaboration in policy development and implementation (Dovers 2005, Nursey-Bray and Harvey 2013). An adaptive management approach to planning encourages policies to be conceived as experiments and to rely on a diversity of policy responses (Borrá 2011, Dovers 2005, Hascic, Johnstone and Kalamova 2009, Walker, Rahman and Cave 2001, Walters, Gunderson and Holling 1992). It also supports ongoing policy learning (Borrá 2011, Busenberg 2001, Iles 1996, Nursey-Bray and Harvey 2013, Walker, Rahman and Cave 2001).

In a climate change adaptation context, the distinction between adaptation planning and adaptive planning is an important one to clarify. Adaptation scholars argue that, to be effective, an adaptation planning process should help identify, implement and evaluate robust adaptive policy responses as a key strategy for adaptation. This

means that a strategy for adaptation must be also adaptive (Mirfenderesk and Corkill 2009). Further, to foster adaptive approaches, the governance framework should be equally adaptive (Mirfenderesk and Corkill 2009). This is one of the key challenges to climate change preparedness. For some public institutions adaptive management and planning principles may still be a new notion. Further, transitioning to a new state, which allows adaptive management objectives to be incorporated into traditional planning processes, is even more challenging (Mirfenderesk and Corkill 2009). Hence, understanding how adaptive governance needs to be applied is paramount (Armitage and Plummer 2010, Brunner and Lynch 2010, Brunner et al. 2005, Burch 2010, Chaffin, Gosnell and Cosens 2014).

The concept of adaptive governance was first introduced by Dietz, Ostrom and Stern (2003) and since then the literature offers a plethora of definitions and interpretations (Brunner and Lynch 2010, Brunner et al. 2005, Folke et al. 2005, Gunderson and Light 2006, Lei et al. 2015, Munaretto, Siciliano and Turvani 2014, Nelson, Howden and Stafford Smith 2008, Nicholson-Cole and O'Riordan 2009, Schultz et al. 2015) linked to other theoretical and empirical contributions such as resilience (Folke et al. 2005, Olsson, Folke and Berkes 2004, Walker et al. 2004) and the governance of transition (Olsson et al. 2006).

Adaptive governance is a form of environmental governance that is established to deal with complexity and uncertainty associated with rapid global environmental change (Brunner and Lynch 2010). The term refers to both formal and informal governance mechanisms created specifically to adjust to changing conditions for and management of complex socio-ecological systems. Schultz et al. (2015, p.7369) argue that adaptive governance “rests on the assumption that landscapes and seascapes need to be understood and governed as complex social–ecological systems rather than as ecosystems alone”.

To be adaptive a governance system should: support policy flexibility and experimentation (Schultz et al. 2015); rely on social networks and cross-level and cross-scale interactions (Chaffin, Gosnell and Cosens 2014); encourage participation and a culture of learning across a multilevel governance structure (Brunner et al. 2005); and lastly, support the coordination at a scale at which the governance structure best fits ecological function. Nicholson-Cole and O'Riordan (2009) identify eight key conditions for adaptive coastal governance: strong science; common visions and goals; political will; coordination and integration of policy; social

justice and learning; adequate financial support; and collaboration. Collaboration among actors, according to scholars, is a key to facilitating the emergence of adaptive governance (Olsson, Folke and Berkes 2004).

The concept of *adaptive learning* is an important requirement in adaptive governance and several definitions have been presented, particularly in the adaptation context (Folke et al. 2005). Lee (1993a, p.9) defines adaptive management as “an approach to natural resource policy that embodies a simple imperative: policies are experiments; learn from them”. Adaptive learning can be classified into social learning and organisational learning (Smith et al. 2009). Technical learning, a component of organisational and social learning, is also a crucial aspect of coastal adaptation planning.

Reed et al. (2010, p.542) define social learning as “a change in understanding that goes beyond the individual to become situated within wider social units or communities of practice through social interactions between actors within social networks”. In this definition social learning encourages a change in understanding about an issue within individuals either at the surface level, for example through the uptake of new information, or at a deeper level, for example through change in attitude and behaviour. It involves not only citizens, but also scientists, environmental managers, consultants and institutions (Smith and Lazarow 2006); hence wider units or groups within society. Lastly, social learning occurs through interactions between actors within social networks improving participants’ capacity building, adaptive expertise and ability to deal, flexibly, with new situations (van de Kerkhof and Wiczorek 2005).

The challenge in social learning as described by Daniels and Walker (1996, p.74) “is not to resolve or eliminate conflict: rather to learn about complex issues in an inherently conflictual environment”. The importance of social learning in coastal adaptation planning is discussed by several scholars such Daniels and Walker (1996), Nursey-Bray (2015) and Lawrence, Bennett and Barchiesi (2004) who argue that social learning is crucial to enable the effective implementation of adaptation policy responses and foster positive attitudes to change.

Learning is also particularly relevant in adaptation policy making (Folke et al. 2005). Learning in policy making occurs when information on public values, risk attitude and potential conflicts are gathered and used for future public choices (Rist,

Campbell and Frost 2013). The concept of ongoing learning is often used as an introductory message in coastal adaptation participatory processes to highlight to participants the uncertainty of science and the need to view adaptation strategies and policies as ongoing learning experiments that need to be monitored, evaluated and adapted over time.

Organisational learning is also a crucial element of governance for adaptation Smith et al. (2009). Organisations involved in adaptation planning must embrace learning in their day-to-day practices. This can be achieved through proactively seeking new and relevant information, being open to change and supporting learning across organisations and networks (Berkhout, Hertin and Gann 2006).

While the concept of adaptive management is relatively straightforward, it is difficult to evaluate the extent to which it has been applied successfully (Giordano 2012, Rist et al. 2013). Jacobs, Garfin and Lenart (2005) identify some key challenges for the application of adaptive management principles that are quite common within an adaptation context. These include: organisational culture and structure that restrict experimentation and learning; lack of commitment and leadership in support of long-term visions; and lack of resources for implementation.

Rist, Campbell and Frost (2013) suggest that where decision makers fear future liability and ongoing responsibility there is a reluctance to invest in alternative management approaches. According to Iles (1996) adaptive management approaches are often incompatible with many pre-existing institutions of policy and governance. Smith, Gilden and Steel (1998) argue that where management is dominated by “issue-specific focuses” there is usually a lack of commitment towards social learning and collaboration. In the coastal adaptation context governments are called to adopt adaptive planning approaches but in practice this is poorly achieved because the (spatial) planning process is inherently poor at dealing with uncertainty (Middle 2010).

2.3.3 Collaborative Governance

The need for new forms of governance that enable more meaningful and effective collaboration across levels and scales follows a trend that has gained momentum since the 1980s due to the inefficiencies of governance in dealing with complex socio-environmental issues. This trend is also reflected in the evolution of the term

'governance' in the public sector context.

Although many definitions and interpretations of the term governance exist, in a traditional sense, governance is referred to as "the act or manner of governing that involves setting the rules for the exercise of power and settling conflicts over such rules" (Hyden 1999, p.18). Public sector governance has been defined as the set of laws, rules and administrative practices that regulate the provision of publicly supported goods and services through formal and informal relationships with agents in the public and private sectors (Hyden 1999). Hufty (2011, p.405) describes governance as "the processes of interaction and decision making among the actors involved in a collective problem that lead to the creation, reinforcement, or reproduction of social norms and institutions".

In the traditional definitions of governance the central *government* is the key actor in the decision making process (Bell and Hindmoor 2009). From the 1980s the definition of governance have broadened its meaning to include the role of non-government actors. More modern definitions also focus on resource sharing, multi-level arrangements and learning among policy actors (Choudhury and Ahmed 2002, Kjer 2004). Some scholars understand modern governance not as a decline in state authority but rather as a process of state transformation where more attention is given to collaboration with a variety of non-governmental actors (Bell and Hindmoor 2009).

Also the concept of 'collaborative governance' refers to a relatively new and emerging field and many interpretations exist. Agranoff and McGuire (2003) describe it as a decision making framework that, through collaboration, aims at solving problems that cannot be solved by an individual organisation or entity. According to Emerson, Nabatchi and Balogh (2012, p.2) collaborative governance occurs across multiple sectors and levels of government and the private sector; "the processes and structures of public policy decision making and management that engage people constructively across the boundaries of public agencies, levels of government, and/or the public, private and civic spheres in order to carry out a public purpose that could not otherwise be accomplished".

For Ansell and Gash (2008, p.544) collaborative governance is "a governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision making-process that is formal, consensus-

oriented, and deliberative and that aims to make or implement public policy or manage public programs or assets". This definition limits collaborative governance to formal, state driven collaborative initiatives and governance arrangements where collaboration occurs between government and non-governmental actors.

Ansell and Gash (2008) argue that to be collaborative a governance arrangement has to respond to some key requisites: it has to be initiated by public agencies; it has to involve more than one government agency (or more than one level of government); and it must engage non-state actors in a collective decision making process that is formal, consensus-oriented, and deliberative regarding a public good/issue/policy. Non-state actors are directly involved in decision making processes and outcomes (or at least their input) should be "closely linked to decision making" Ansell and Gash (2008, p.548).

Literature distinguishes several forms of collaborative governance arrangements in the public policy domain depending on: scope; structure; resources availability; activities undertaken; and the impact on decision making, policies and scale of collaboration (Considine 2005, Emerson, Nabatchi and Balogh 2012, Wanna 2008).

Collaborative governance as a means of achieving public policy goals can take the form of: *multi-partner governance arrangements* which can include partnerships among the state, the private sector, civil society, and the community, as well as joined-up government and hybrid arrangements such as public-private and private-social partnerships and co-management regimes (Emerson, Nabatchi and Balogh 2012); *community-based collaborative initiatives* (Berkes, Berkes and Fast 2007, Christopher et al. 2008); *informal multi-agency collaborations* (Lowndes and Skelcher 1998) and *private-public partnerships* (Langford 2002). In most cases multi-stakeholder partnerships are not meant to replace decision making authorities but operate within and complement them (Folke et al. 2005). On this, Wanna (2008) distinguishes between internal (to the decision making process) and external drivers of collaborative governance.

Literature also shows that collaborative governance can be enacted through specific organisational constructs such as a coalition or partnership. Himmelman (2002) examines the role of *coalitions* as the organisation of organisations working together to achieve a common goal. (Considine 2005, Considine and Hart 2006, Parker 2007, Provan and Kenis 2007, Sørensen and Torfing 2005) emphasise the role that

public-private partnerships, as a form of *policy network*, play in enabling co-production of knowledge, flexibility in policy development and improved relationships between different actors including citizens.

Emerson, Nabatchi and Balogh (2012) and Ansell and Gash (2008) identify the key features of collaborative governance: the active involvement of multiple stakeholders (thus views, knowledge and perspectives); high interdependence between the parties involved; and flexible procedural and institutional arrangements. Partners are committed to developing a shared understanding to achieve common goals and to share leadership roles. Fair and adequate returns (or benefits) to partners are also a key prerequisite.

O'Flynn and Wanna (2008, p.9) make a distinction between the benefits that collaboration in public policy brings to government partners as opposed to non-government partners: "for public officials engaged in policy formulation, it can be either a way of genuinely opening up the policy process to wider ideas and suggestions or a way of road-testing ideas and collating responses before implementation. For non-government players, it allows them to understand better the thinking and practices of government and to exert some influence on policy determination or amendment".

Extensive literature exists that emphasises the importance of collaboration to better govern for adaptation (Clarke et al. 2013, Considine 2005, Considine 2006, Davidson and Lockwood 2008, de Loë et al. 2009, Emerson and Gerlak 2014, Folke and Rockström 2009, Stojanovic and Barker 2008, van de Meene, Brown and Farrelly 2011) and in particular in adaptation planning (IPCC 2007, IPCC 2014, Rissik and Reis 2013). Collaboration among a range of actors facilitates experimentation and learning making the governance system more resilient, more flexible and less vulnerable (Renn, Klinke and Asselt 2011, van Asselt and Renn 2011).

Governance systems that facilitate collaboration amongst different government and non-government actors including the private sector and community are better placed to drive collective and shared action and support public and private participation in public policy development. Ultimately this translates into greater traction in the community (Crosby and Bryson 2010, Himmelman 2001, Wanna 1991, Wanna 2008).

The notion of partnership, as a collaborative governance arrangement, is closely relevant to the present research (Ansell and Gash 2008). Partnerships can consist of formal or informal arrangements. Formal processes may involve legal agreements, are typically initiated by government authorities, have a formal governance structure and are operational over a long-term period (Davidson and Lockwood 2008). Formal collaborations offer greater transparency and accountability over the collaborative process and the overall goal is to reach decision making consensus over a contentious public issue.

Informal partnerships have a looser governance structure, limited decision making powers and typically have a shorter (or uncertain) life span, depending on funding availability (Ansell and Gash 2008). Usually the goal of informal partnerships is to share resources and knowledge and develop a shared approach with the aim to improve decision making (directly or indirectly). Central governments like to seek input from informal partnerships on certain issues to increase legitimacy while maintaining full command and control of decision making functions (Adam, James and Wanjira 2007).

The final governance structure depends on the degree of commitment (Himmelman 2001), clarity of goals (Poncelet 2001) and degree of interdependency (Vogel et al. 2007). Typically informal partnerships form in response to the inefficiency of hierarchical governance systems in dealing with complex societal problems or where traditional command and control governance systems pose barriers to effective multi-level governance. Heavily top-down governance systems, where the state government is the pivotal point for decision making, are slower at gathering feedback from society, have limited capacity to respond effectively to this information, have limited flexibility and less capacity to stimulate collaboration across levels and sectors (de Loë et al. 2009). The role that partnerships play in influencing adaptation outcomes at the regional or local level and the broader governance in which they operate is poorly examined in literature.

A partnership does not necessarily imply that the goal of collaboration is always achieved. This distinction is important particularly in the present research. According to Himmelman (2002) the strategy of a partnership can either be networking, coordinating, cooperating, and collaborating. The goal of multi-agency collaborations for example can span from sharing resources to achieving integrated policy action across jurisdictional boundaries. This will depend on the level of

commitment, resources and regulatory support within the legal framework in which the partnership operates.

Collaboration is the strongest of the bond between partners who trust each other, share resources, and also risks. Partners, through the process of collaboration, enhance each other's capacity for mutual benefit and a common purpose. Jointly owned solutions, developed through meaningful participatory processes, are more likely to be accepted and implemented by society (Ansell and Gash 2008). A similar view of collaboration, occurring across a continuum of strategies and which depends upon the level of trust between parties and the ability to enhance each other's capacities, is described by Twyford (2012). These strategies include commitment to co-define the problem, commitment to co-design a process, commitment to co-design solutions and commitment to co-deliver actions.

Scholars also argue that collaboration (as either formal or informal partnerships or other type of collaborative governance arrangements) is important particularly in a *multi-level governance* context where there is limited integration between levels, or where divisions of responsibility and authority between different levels are not clear or where parties are unwilling to take on responsibility (Dąbrowski, Bachtler and Bafoil 2014).

Scholars such as Bauer and Steurer (2014) and Lockwood et al. (2009) emphasise the importance of collaboration to address multi-level governance issues such as adaptation to climate change. Collaboration can generate better opportunities for negotiation and improved outcomes across multiple government levels (Bauer and Steurer 2014, Peters and Pierre 1998). Strong inter-agency collaboration can be effective at ensuring legitimacy and credibility of a decision making process and increase transparency. However, having the responsibility for decision making shared across multiple agencies or organisations can lead to accountability issues, excessive fragmentation of decision making processes and high costs associated with participatory processes (Castaños and Lomnitz 2009, de Loë et al. 2009).

Bache and Flinders (2005, p.4) argue that collaboration in multi-level governance is particularly important where there is a risk that the "dispersion of central government authority both vertically to actors located at other territorial levels, and horizontally, to non state-actors" may lead to a decentralization of responsibilities and reduced central government control. Too much decentralization of powers may inhibit

collaboration across multiple scales and levels and reduce accountability.

The attention that collaboration is receiving could lead us to think that collaborative governance approaches are always successful in advancing sustainability and adaptation at the local level (Davidson and Lockwood 2008, Shaw, Danese and Stocker 2013, Stojanovic and Barker 2008, Vickery and Danese Galano 2013). Himmelman (2002) raises the issue of collaborative inertia and the difficulty of collaborating in practice. Stojanovic and Barker (2008) identify a series of internal and external constraints that affect the effectiveness of 'informal' partnerships in improving sustainability outcomes at the regional and local levels and their contribution to the broader coastal governance. Among these: the non-statutory role in the broader framework for planning and management; the inability to effectively engage different constituencies; and the focus on short-term objectives rather than long-term.

Other scholars argue that informal collaboration can cause blurred boundaries in regard to liability, legitimacy and accountability of governance (Davidson et al. 2008, Liebrecht and Howes 2006). Some scholars argue that partnerships created in response to the increased level of responsibility over certain issues combined with a weakening in baseline support from central government agencies can be less effective and in some instances be detrimental by raising false expectations among the community (Considine 2006, Liebrecht and Howes 2006). These initiatives can be, in fact, less representative, less democratic and without formal processes and structures and therefore less legitimate (Jones 2001a).

The importance of organisational culture and desire to address a complex issue in the lack of more effective traditional means was discussed by Liebrecht and Howes (2006). Considine and Hart (2006) argue that unless the partnership is prepared to be reflexive and to foster innovations and experimentation, the effectiveness of partnerships in generating broader systemic institutional change is compromised. Wanna (2008) describes a series of disadvantages or barriers to collaborative governance such as the difficulties of ensuring political or ministerial buy-in to the collaborative decisions.

Collaboration can blur lines in regard to responsibilities and accountability. This ultimately raises questions about who is responsible for what and who is ultimately accountable for decisions taken in the case of coastal adaptation responsibility in

perpetuity. This is a major concern for decision makers. Collaboration can also increase expectations particularly within the community. Governments can also have ulterior motives for apparently supporting collaboration without being entirely genuine in collaborative engagements. For example, this tactic can be used by governments to avoid doing the work themselves or to test government policy. Such examples can undermine trust in government and in the collaborative process more generally.

Transition scholars argue that governance systems that are more collaborative, participatory and iterative are better placed to guide society through fundamental changes to social and institutional structures, values and practices. This approach is needed to move towards more sustainable management paradigms (Kemp and Loorbach 2006, Kemp, Rotmans and Loorbach 2007, Olsson et al. 2006, van de Kerkhof and Wieczorek 2005).

2.3.4 Governance of Transition

One of the key barriers to effective climate change adaptation is “the conflict between long-term imperatives and short term concerns” (Voß, Bauknecht and Kemp 2006, p.125). On the coast, for example, management and planning decisions have been made for many years, based on short-term goals, political and personal agendas and conventional approaches. However, the complexity and uncertainty brought by climate change adaptation gives no choice but to adopt longer time frames (in order to anticipate long-term systemic effects), develop alternative trajectories and trial innovative approaches (Sondeijker et al. 2006).

Sustainability scholars argue that climate adaptation should be viewed as a transition management process (Loorbach and Rotmans 2010, Rotmans, Kemp and van Asselt 2001, Rotmans and Loorbach 2009, Shove and Walker 2007, van de Kerkhof and Wieczorek 2005, Voß and Bornemann 2011). The key elements of transition management as described by Loorbach and Rotmans (2006) and Loorbach and Rotmans (2010) are particularly useful for dealing with wicked problems of society which are characterised by uncertainty, complexity, and ambiguity.

According to transition management scholars there is no immediate and easy solutions or ‘complete’ knowledge to complex societal problems (Kemp and

Loorbach 2006, Loorbach and Rotmans 2010, Rotmans and Loorbach 2009). Adaptation requires governance to favour long-term transformation processes with the goal of achieving sustainability benefits (Voß and Bornemann 2011). In addition Goffman (2006) argues that governance for adaptation should encourage open public deliberation on important public issues; shifting the attention away from immediate political concerns towards longer term issues.

A transition management approach also means that each step of an adaptation planning process provides a learning opportunity for all parties involved and empowers them to use innovative and strategic thinking to transform existing practices and structures (Loorbach and Rotmans 2010, van de Kerkhof and Wieczorek 2005, Voß and Bornemann 2011). *Transition pathways* (or *adaptation pathways* or *sustainable pathways*) are developed through a process of 'learning by doing' and 'doing by learning' (Kemp, Rotmans and Loorbach 2007, Wise et al. 2014). Partnerships or '*transition arenas*' play a key role in facilitating this process by providing an open and dynamic platform where actors can share views, experience and knowledge. Such a transformative and challenging process provides actors with the opportunity to reflect on how their structures and patterns of action contribute to persistent problems (Voß and Kemp 2006).

Another key feature of governance for transition is reflexivity. A reflexive governance approach means that governance does not just govern a system but it is itself part of the dynamic system that is governed (Kemp and Loorbach 2006, Voß and Bornemann 2011, Wood and Stocker 2009). Hence, an adaptation planning process must provide space for reflexivity at all stages: at the strategic phase through discussions, vision sharing, and goal formulation; at the tactical level through networking and collaboration; and at the operational level through trials and implementation. Goffman (2006) warns that reflexivity in policy making can be difficult to achieve and these difficulties can cause governments to revert back to more traditional, linear practices and that sustainable development discourses may thereby become superseded by dominant discourses about economic growth at the expense of sustainable ones.

2.3.5 Risk Governance

Broadly speaking risk governance involves the application of the principles of good governance to the identification, assessment, management and communication of

risk (IRGC 2009). Originally the term risk governance was used almost exclusively for decision making concerned with natural disasters. Today this term includes other domains such as climate and non-climate risks and environmental degradation (Aven 2011, IRGC 2009). In the adaptation context risk governance refers to a body of scholarly work on how to deal with public issues (such as climate hazards) characterised by uncertainty, complexity, and ambiguity (Aven 2011, IRGC 2009, Renn, Klinke and Asselt 2011, van Asselt and Renn 2011).

In the literature, risk governance is described as “the totality of actors, rules, conventions, processes and mechanisms concerned with how relevant public risk information is collected, analysed and communicated, and how and by whom management decisions are taken and implemented” (IRGC 2009, p.4). The notion of risk governance provides a framework for managing multiple risks at multiple scales and timeframes (Beliaeff and Pelletier, De Marchi and Ravetz 1999).

Risk management is a commonly used term in the literature to describe the process, by which risk is assessed, evaluated, communicated and treated (Department of Climate Change 2009, IPCC 2009, Woodroffe et al. 2012). Today, most sectors of society, including government and individuals, are expected to identify, manage and communicate risks inherent to their particular range of activities (COAG 2013). Risk management is particularly useful in planning for climate change. In Australia, risk management frameworks are used across public and private sector organisations for integrating climate change impacts into risk management and strategic planning activities.

Since the first frameworks in the early 1980s, risk management has experienced two major paradigm shifts. The first paradigm shift occurred when risk management was linked to climate adaptation (around the late 1990s), an area where there is significant uncertainty about future impacts. Risk management changed from being based purely on climate forecasts and response methods to being based on multiple scales, multiple scenarios and objectives; hence more effective at managing uncertainties and limitations (Jones 2009).

The first climate adaptation specific risk management frameworks were almost exclusively based on technical, quantitative and economic evaluation techniques and driven primarily by economic considerations rather than public values (Renn, Klinke and Asselt 2011). These methods soon proved their limitations in managing

complex environmental risk such as climate risks.

More recently, the second paradigm shift involved the new generations of risk management frameworks being linked to sustainability. These frameworks aim to address social, economic and environmental factors to ensure effective and sustainable outcomes (Munasinghe 2003) through both economic analysis techniques and qualitative ones (Jones and Preston 2011). A sustainable development approach to risk reduction does not solely focus on hard infrastructure risk reduction measures but allows a broader range of considerations to be developed that takes account of adverse impacts on the environment, economic or social factors. Furthermore, it focuses controls for positive as well as negative impacts (Gray and Wiedemann 1999). For example, the Coastal Hazard Risk Management Adaptation Planning (CHRMAP) process in WA requires the assessment of adaptation options through a combination of cost-benefit analysis and multi-criteria analysis so that social, cultural and environmental values are taken into consideration and where possible these are quantitatively estimated (Western Australian Planning Commission 2013b).

It is noteworthy, however, that combining qualitative information with quantitative estimates or assigning monetary benefits to non-economic values is not as easy as it seems particularly in the coastal adaptation context (ACIL Tasman 2013, Anning 2012, Marre 2014, Turner, van den Bergh and Brouwer 2003).

Hence, over the recent years risk management for climate adaptation has been gradually evolving into a more comprehensive and participatory process that considers not only environmental and economic aspects to risk but also societal attitudes to risk, and that incorporates stakeholders' knowledge and values (Department of Environment and Water Resources 2007, Jones 2001b, Lorenzoni et al. 2000, Lorenzoni, Pidgeon and O'Connor 2005, Saloranta 2001). This fundamental change in the way risk management is interpreted and conducted to incorporate uncertainties, complexity and subjectivity is reflected in the evolution of definition of risk (IPCC 2007, Standards Australia, Standards Australia).

Although risk management has become a ubiquitous and taken-for-granted practice in government and corporate sectors (Jones and Preston 2011), Preston, Westaway and Yuen (2011) argue that risk assessments are still complex and complicated processes which can be quite diverse with respect to problem framing and analytical

approaches. While overly complex risk management frameworks have been criticised for implicating resource and methodological issues, simple methods have been also criticised for being unable to deal with the range of scenarios and management situations and for not providing information detailed enough to support local adaptation decision making (Jones and Preston 2011). Jones and Preston (2011, p.3) argue that a shared understanding of the system of interest, of the resources required and of the most suitable assessment process is needed to avoid that risk assessment outputs may raise more questions than they answer, thereby clouding the decision process”.

For van Asselt and Renn (2011) it is a mistake to make risk management frameworks routine. Instead, actors and institutions involved have to continuously reflect on what they are trying to achieve in their own context. Another aspect to consider is that coastal hazard risk management assessments are often presented as a sequential step-by-step process (Standards Australia, Western Australia Planning Commission 2014). However, scholars suggest that management of risk cannot be linear, but must be a dynamic, fit for purpose process based on interlinked and iterative processes (van Asselt and Renn 2011).

Furthermore, the ability to understand and make use of the information acquired through a risk assessment process depends on the quality of the information provided and on the level of expertise of the end user which in the coastal adaptation field is still quite limited. Jones and Preston (2011) argue that lack of experience in these types of assessments often means that decision makers expect a relatively straightforward process or simple answers.

Another important aspect, which only recently has started to receive attention, is the integration of information regarding the community’s attitude and tolerance towards risk. Patt and Schröter (2008) describe how behavioural factors influence risk perception and therefore positive or negative attitudes towards risk management assessments and mitigation measures. Corfee-Morlot et al. (2010) suggest that in order to manage climate risk effectively, the public needs to be included in understanding how climate change may place them at greater risk. Through better information the public can play a large role in helping to design the strategies to respond to risks (SGS Economics & Planning 2012a).

The relationship between risk governance and risk management is an important one

to define particularly in the context of coastal adaptation planning. Risk governance introduces governance processes and mechanisms to reduce risk (De Marchi and Ravetz 1999) whilst risk management identifies, quantifies, and evaluates risk in part to determine where more or less governance is appropriate (De Marchi and Ravetz 1999, Measham and Lockie 2012). While these two concepts are obviously interrelated, they are not always synchronous and are sometimes in tension. The principal difference is that risk management is essentially framed by a technical worldview and is usually executed as a technical process (Kastenhofer 2011), whilst risk governance is framed by a more adaptive and reflexive worldview (Renn, Klinke and Asselt 2011). While classically management is about implementing governance (de Loë et al. 2009) in the case of adaptation to risk, risk management outcomes should be feeding back into the governance processes and improving reflexivity and adaptivity.

If this synergy is not achieved scholars suggest that two major issues could arise. On one hand governance may rely too strongly on risk management processes and technical knowledge, especially where such processes do not engage with the governance system in which these assessments are to be implemented (Preston, Danese and Yuen 2011, Vickery and Danese Galano 2013). In fact, where problems are highly complex and policy is ambiguous (like in the case of coastal adaptation), governance tends to become more dependent on the trustworthiness of risk management assessments (Danese Galano 2012).

On this issue, De Marchi and Ravetz (1999, p.74) warn that “there is a need for transparency in content and procedures in the management of risks, to protect governance themselves from errors”. Hence, to be effective risk management processes must strive to be consistent with current policies and procedures and be aware of the governance context in which they are produced. On the other hand, poor governance may inhibit science uptake and the effective use of new information to inform policy and on-ground decisions (Preston, Danese and Yuen 2011). Risk governance must therefore strive for innovation, science uptake, continuous improvement of risk management frameworks and ensure that boundaries for assessment and management are appropriately set and adhered to (Measham et al. 2011, Preston, Danese and Yuen 2011).

Adaptation scholars argue key aspects of risk governance include: coordination and integration across governance levels; strong political support; long-term

commitment; and strong leadership (Berrang-Ford, Ford and Paterson 2011, Eakin and Patt 2011, Renn, Klinke and Asselt 2011, van Asselt and Renn 2011). Integration refers to the need to include in the risk analysis, in addition to quantitative information on risk, also values such as attitudes, tolerability and equity (Aven 2011). This is so a value is attached to the risk and decisions can be more informed and legitimate. Values cannot be assumed and must be gathered through public deliberation and meaningful discussion with those affected. Integration also refers to the uptake of local knowledge and indigenous knowledge (Kenchington, Stocker and Wood 2012b, Stocker and Kennedy 2009, Von Winterfeldt 2013, Wise et al. 2014, Wolf, Aliche and Bell 2013).

van Asselt and Renn (2011) suggest that risk governance is underpinned by three key principles: communication; inclusion; and integration. Other key risk governance principles include reflexivity, flexibility and innovation (Urbano 2015, van Asselt and Renn 2011). Effective governance of risk must strive for innovation and continue improvement of risk management frameworks and ensure boundaries for assessment and management are appropriately set and adhered to (Measham et al. 2011, Preston, Danese and Yuen 2011). Effective risk communication is essential to risk governance (Melkonyan 2011, van Asselt and Renn 2011, Von Winterfeldt 2013, Wachinger et al. 2013). It should provide stakeholders with information about hazards and risks and generate discussions on solutions and implications. Poor consultation and inclusion can make the risk assessment process illegitimate as the process has incorrect information on risk attitude and tolerance (Thomsen, Smith and Keys 2012).

2.4 Principles of Good Governance for Coastal Adaptation

Although some key governance challenges and deficits can be drawn from other governance areas (Aven 2011, Barton, Krellenberg and Harris 2015, IRGC 2009, Lei et al. 2015, Voß and Bornemann 2011), coastal adaptation governance presents unique and unprecedented challenges which require specific considerations. Specific principles are therefore needed to identify what good governance for coastal adaptation means and to provide decision makers with a tool that enables to reveal fundamental deficits in their current governance processes.

The following principles aim to describe the key features of good governance for coastal adaptation. These principles are adapted from the principles for sustainable governance (Costanza et al. 1998, Duxbury and Dickinson 2007), adaptive

governance (Dietz, Ostrom and Stern 2003, Folke et al. 2005, Nicholson-Cole and O'Riordan 2009, Olsson et al. 2006), collaborative governance (Ansell and Gash 2008, Emerson and Gerlak 2014), transition governance (Loorbach and Rotmans 2010, Rotmans and Loorbach 2009, Wood and Stocker 2009), risk governance (IRGC 2009, Renn, Klinke and Asselt 2011) and the broader principles for good governance, namely legitimacy, credibility and salience (Cash et al. 2006, Corfee-Morlot et al. 2010).

The principles incorporate and build on existing understandings of collaborative governance which the literature shows is key for successful adaptation planning.

Principle 1: Shared understanding, goals and priorities.

Climate adaptation increasingly places emphasis on improving the capacity of government agencies, not-for-profit organisations, the private sector and citizens to work together to address a common problem through joint effort and resource sharing (Adger, Arnella and Tompkins 2005, Füssel 2007a, Pinkse and Kolk 2012, Schmidt-Thome and Klein 2013). The key to a more integrated, coordinated and collaborative approach to coastal adaptation is the development of a shared understanding of the problem and a shared vision and goals (Ansell and Gash 2008, Considine 2006, McClelland 2002, Sullivan and Skelcher 2002). Shared goals and priorities increase project ownership, enhance commitment to the process of joint working and reduce the possibility of conflicts (Tett 2005) which ultimately increases efficiency (Bernstein 2004, Stocker et al. 2013). Long-term collaborative arrangements are more likely to foster mutual support and trust among actors, strengthen communication, improve information sharing and the equal distribution of responsibilities (McClelland 2002). A high level of interdependence favours goal convergence (Considine and Hart 2006). Further, transparency and legitimacy are higher when the shared vision aligns with the vision of the community (Kearney et al. 2007). To be effective, collaborative arrangements for climate adaptation must be directly or closely linked to decision making and generate opportunities for implementation and change (Ansell and Gash 2008, McClelland 2002).

Principle 2: Policy integration and coordination.

Coastal adaptation requires the effective incorporation of climate adaptation objectives into existing or new policies and into the every-day decision making processes of public institutions (Urwin and Jordan 2008). Effective integration of adaptation objectives and measures in spatial planning is key to coastal adaptation

(Hamin and Gurran 2009, Macintosh 2013). In the context of sustainable development coastal adaptation must also achieve the integration of economic, social and environmental interests into policies (Kemp, Parto and Gibson 2005). Policy integration between different policy areas (horizontal integration) and across different policy making levels (vertical integration) increases policy consistency, which ultimately improves credibility of and the ability to implement policy measures (Meijers and Stead 2004, Wescott 2009, Wren 2002). Better policy integration and coordination is needed where high-level policies clash with attempts to adapt at more local scales or vice versa. Policy integration and coordination requires adequate governance arrangements that support the achievement of integrated outcomes. These include strong commitment to a shared vision for integrated working arrangements (Lafferty 2004). Poor institutionalisation for adaptation, lack of clear and consistent policy objectives and political constraints can inhibit policy interplay and lead to a fragmented approach to adaptation (Munasinghe 2003). The benefits of policy integration can sometimes not be realised because of poor policy coordination or difficulties in implementation. Coordination of policy favours the accomplishment of joint outcomes (Jordan 2008, Meijers and Stead 2004, Munasinghe 2003, Serrao-Neumann et al. 2014). Policy coordination helps prevent redundancy or gaps in interventions and services (Peters and Pierre 1998). Intra- and inter-agency collaboration for adaptation can facilitate policy integration and coordination by improving knowledge uptake and the advancement of common policy objectives (Ansell and Gash 2008). Collaboration on complex cross-cutting policy issues requires institutions to be more flexible, adaptive and reflexive (Goffman 2006, United Nations 2015). Collaboration also improves political capacities to include and moderate demands from different parties affected by policy implementation (Meijers and Stead 2004). Collaborative approaches to coastal adaptation can favour coordination of adaptation policies between government agencies, departments and jurisdictions which ultimately can improve policy consistency and the effectiveness of policy.

Principle 3: Long-term political commitment and leadership.

Political short-termism poses a significant barrier to coastal adaptation (Kemp, Rotmans and Loorbach 2007, Scally and Wescott 2011). Governance for coastal adaptation requires long-term political commitment and leadership in support of adaptation programs, policies and responses (Folke et al. 2005, Uittenbroek et al. 2014). Political leadership for adaptation must occur at all levels of government. At the local level, political leadership enhances community buy-in and facilitates policy

acceptance (Dwyer 1989). A collaborative approach to adaptation that fosters the development of adaptation objectives, that minimises liability risk to government, increases resource sharing across multiple parties and encourages a joint approach to risk mitigation is more likely to foster long-term political commitment (Meijerink and Stiller 2013). However, coastal adaptation does not only require political leadership. Other forms of leadership are necessary to support effective adaptation policy and responses (Avolio, Walumbwa and Weber 2009, Folke et al. 2005, van Nieuwaal et al. 2009). 'Entrepreneurial' or 'transformative' leaders (from either government, non-government organisations and community) have proven their significance in coastal adaptation planning by facilitating discussion on issues at stake, devising policy options, encouraging collaborative approaches and lining up financial support (Mumford and Harvey 2014). Hence, governance for adaptation challenges the traditional top-down leadership paradigm (Meijerink and Stiller 2013) and calls for new models of leadership that facilitate ongoing transformation, innovation, learning and collaboration (Folke et al. 2005, Meijerink and Stiller 2013). In a collaborative process leadership functions can be shared among the partners throughout the project cycles to improve legitimacy and credibility of the process (Considine and Hart 2006, Folke et al. 2005, Meijerink and Stiller 2013, Thom 2012).

Principle 4: Clear, coherent and flexible policy directions for adaptation.

Coastal adaptation decision making, particularly at the local level, must align and comply with high-level government policies and strategic directions (Wescott 2004). Hence, high-level policy guidance should be clear and coherent to enable decision makers at all levels of government and in the private sector to effectively adapt to climate change. Clear policy directions reflect clarity about government rules, regulations and decisions (Corfee-Morlot et al. 2010) and strengthen accountability, transparency and integrity of decision making (Dovers 2000, Dovers, Handmer and Norton 2001). Policy coherency creates synergies for achieving common objectives (Nilsson 2005). At the same time, to effectively support the integration of climate risk considerations into local decision making, policy for adaptation must be flexible so that new information can be incorporated and local policy can be developed taking local needs and contexts into consideration (Armitage and Plummer 2010). Often however, the most difficult policy problems of the modern era ('wicked' problems) are dealt through policies that lack clarity, that present scenarios that are quite different from the reality of implementation or that provide guidance that is not easily applied at the local level (Sharp, Daley and Lynch 2011). Such policies often

do not provide the flexibility needed to deal with a fast evolving knowledge domain. Climate adaptation policy is often characterised by normative and interpretative ambiguity (Renn and Klinke 2013 Richardson, 2002 #2722). However, policy ambiguity is not always considered a negative tract. For sustainability scholars, a degree of ambiguity in climate adaptation policy is necessary as it can provide room for interpretation by those who must put policy into practice. Thus, policy ambiguity can enable the development of contingent strategies of implementation. Hence, while firm and clear rules are still essential to avoid policy failure and decision making paralysis (Davidson and Lockwood 2008), policy for adaptation to climate change must be flexible and innovative (Smit and Wandel 2006). Flexibility is achieved when policy-makers use the best information available and provide mechanisms for periodical review and knowledge uptake as new information becomes available (Smith and Lenhart 1996). Furthermore, as adaptation relies heavily on community engagement for success, policymaking must be iterative and interactive (Costanza et al. 1998, Duxbury and Dickinson 2007, Renn and Klinke 2013, Walker, Rahman and Cave 2001). Governance systems that encourage collaboration among different policy actors can make policy more adaptive and effective by encouraging policy learning, experimentation and innovative thinking (Smith and Smith 2006, Walker, Rahman and Cave 2001).

Principle 5: Embracing complexity and uncertainty through innovation, experimentation and reflexivity.

This principle is about organisations with responsibility for adaptation embracing the complexity of adaptation planning by being open to innovation, experimentation and self-evaluation (Dietz, Ostrom and Stern 2003, Folke 2006, Kemp and Loorbach 2006, Smith and Smith 2006, Smith and Lazarow 2006, Voß, Bauknecht and Kemp 2006, Wood and Stocker 2009). Governance systems that embrace adaptive and reflexive practices are better equipped to cope with expected changes, surprises and uncertainty (Costanza et al. 1998, Dietz, Ostrom and Stern 2003, Duit et al. 2010, Duxbury and Dickinson 2007). Adaptive and reflexive management paradigms, which encourage a culture of learning and experimentation within organisations, are key to good governance for adaptation (Costanza et al. 1998, Duit et al. 2010, Gunderson and Light 2006). Through the adaptive management paradigm climate adaptation is conceptualised as an iterative and cyclical process instead of a staged and linear approach (Costanza et al. 1998, Funtowicz and Ravetz 1994b). Adaptive governance practices and structures are therefore keys to ensuring that the effective support and implementation mechanisms are in place for

complex and ongoing processes which adaptation calls for (Brunner and Lynch 2010). Adaptive approaches enable organisations to embrace risk and uncertainty as a way of building understanding from past management practices, decision processes and outcomes (Nurse-Bray 2015). Collaboration can help managers and policy makers to develop governance practices that support the uptake and implementation of adaptive and reflexive practices (Elbakidze et al. 2010, Folke et al. 2005, Kallis, Kiparsky and Norgaard 2009). Through collaborative means coastal actors are able to exchange views with each other and are therefore more likely to embrace new values and innovative approaches that are necessary adjuncts of adaptive behaviour (de Loë et al. 2009). Collaboration can challenge traditional approaches to decision making, based on current state of knowledge, short-term solutions and fixed rules, by fostering long-term thinking and the development of more equitable and implementable solutions (Dietz, Ostrom and Stern 2003).

Principle 6: Uptake and use of evidence and value-based knowledge in adaptation decision making.

Scientific information alone is not sufficient for the governance of commons (Dietz, Ostrom and Stern 2003). Lack of information on people's values, perceptions, interests and views can lead to poor decision making outcomes (Aven 2011, Dietz, Ostrom and Stern 2003). Decision making about adaptation must be based on a combination of technical and value-based information and on the ability of governance systems to use this information to facilitate policy actions (Duit and Galaz 2008, Folke et al. 2005, O'Brien and Wolf 2010, Stocker and Kennedy 2009).

Value-based knowledge includes information on people's views, experiences and values in regard to the current and potential impacts of climate change on ecological, cultural and economic aspects of the coast (O'Brien and Wolf 2010). However, a value-based approach does not focus only on climate change impacts, but also on governance contexts and institutions, and on the social contexts in which the adaptation planning process occurs (O'Brien and Wolf 2010). Ultimately values have strong influence on the way an adaptation process is carried out and how the information is used (O'Brien and Wolf 2010).

A variety of communication and decision-support tools such as deliberative processes, scenario planning, and participatory mapping techniques can be used to enhance the quality and legitimacy of coastal adaptation planning processes and decision making outcomes (Clarke et al. 2013, Smith et al. 2009, Stocker and Burke

2009). Collaborative arrangements for coastal adaptation help ensure effective uptake of both scientific and value-based knowledge by improving information exchange, sharing resources and facilitating dialogues between managers, researchers and the broader community (Clarke et al. 2013). Collaboration also encourages innovation and experimentation by allowing individuals and organisations to share experiences and explore different ideas about solving problems (Hahn et al. 2006). Boundary organisations such as universities, non-government organisations (NGOs) or associations of councils can play an important role in enabling evidence-based decision making by supporting values studies, facilitating community engagement processes and encouraging greater use of values research evidence in departmental development programs and policy (Corfee-Morlot et al. 2010, Shaw, Danese and Stocker 2013).

Effective integration of value-based knowledge relies on engagement processes that are meaningful, open, transparent, inclusive and explicit about the objectives of the exercise (Fritze, Williamson and Wiseman 2009, Smith, Leitch and Thomsen 2016). These are key requisites of adaptive and collaborative governance (Costanza et al. 1998). To be truly collaborative and effective, an engagement process must involve a broad range of interested parties such as interested individuals, community groups, NGOs and the private sector, not just public agencies (Ansell and Gash 2008). Effective engagement allows organisations to tap into diverse perspectives and new solutions to improve the quality of decisions but this also enables stakeholders to better understand the processes of government.

Meaningful engagement means that participants are more directly engaged to provide input in decision making matters and that the outcomes of engagement are taken into consideration throughout the process (Ansell and Gash 2008, Emerson, Nabatchi and Balogh 2012). Multi-agency collaborations can play an important role in ensuring that engagement processes are more meaningful and effective by ensuring clarity and transparency about the process and final decision making roles and processes by bringing people from different backgrounds and interests together and by co-producing knowledge and pathways forward (Bovaird 2007, Meijer 2012).

Principle 7: Scale matching.

Sustainability and climate change issues arise and are dealt with at a range of spatial and temporal scales (Cash et al. 2006, Gunderson and Holling 2002). The coastal zone, characterised by complex interacting and overlapping interests,

responsibilities and powers, produces a tendency for scale mismatch and cross-scale coordination issues (Biesbroek, Swart and Van der Knaap 2009, Cash et al. 2006, Ford and King 2015, Measham et al. 2011). In particular, spatial mismatches on the coastal zone occur when the scale of ecological change (coastal processes) and the scale of management are not aligned (Cumming, Cumming and Redman 2006, Gunderson and Holling 2002) Adaptation scholars argue that adaptation decision making should occur at the scale that reduces scientific uncertainty while maximizing the understanding of ecological and social processes (Christensen et al. 1996, Cumming, Cumming and Redman 2006, Folke et al. 2007). Climate adaptation also involves multiple scales of knowledge (Ahlborg and Nightingale 2012), and occurs across multiple jurisdictional and political scales. Determining the ‘appropriate’ scale at which decisions on complex societal and environmental should be made is extremely complex (Costanza et al. 1998). Costanza et al. (1998) suggest that the appropriate scales of governance are those that “have the most relevant information, can respond quickly and efficiently, and are able to integrate across scale boundaries” Mukheibir, Gero and Herriman (2012). Collaborative approaches to coastal adaptation planning can help address both spatial and temporal cross-scale issues by aligning different scales and create better links between management and decision making levels (Ansell and Gash 2008, Costanza et al. 1998).

Principle 8: Adequate funding for adaptation.

Adequate funding is necessary to effectively mainstream coastal adaptation planning (Costanza et al. 1998, Stocker et al. 2013). As the tendency is to invest the majority of funding into data collection and engineering responses, adaptation governance should provide up-front and adequate resources for learning, evaluation, experimentation and information sharing activities (Bapna and McGray 2008, Burton 2009). Full costs of adaptation options must be calculated, including social and ecological values (Costanza et al. 1998) and available mechanisms for charging for contributions to the implementation of adaptation measures fully investigated (SGS Economics & Planning 2012a). Funding for adaptation should flow to activities generating direct benefits for local communities or for the protection of public good (Wreford and Moran 2015). Funding for adaptation should be allocated according to the principles of equity, urgency, efficiency, effectiveness, transparency, accountability, sustainability, flexibility and participation (Jones 2009). Given the multi-faceted, transdisciplinary and dynamic nature of coastal adaptation planning, funding should come from a variety of different sources to ensure that

each step of the adaptation planning process is adequately resourced. Collaborative governance can be more effective at securing funding from different sources such as in-kind, financial contributions from the project partners and grants.

Principle 9: Shared responsibility and decision powers.

Collaborative governance is framed by shared responsibilities, and relies on more inclusive and participatory governance frameworks (Pellizzoni 2004, Schön 1994). More inclusive and participatory governance frameworks compel government, non-government stakeholders and community to collectively answer the questions of ‘what is wrong, what needs fixing and how?’ (Castaños and Lomnitz 2009). Shared responsibility also challenges the status quo position that adaptation decision making or action should be fully delegated to one party (e.g., local government or state government or citizens) (OECD 2010). Governance systems that are more adaptive and collaborative can offer mechanisms for sharing responsibility for risk management between citizens and government enabling stakeholders to work together to address mutual objectives (Bergman et al. 2012). Shared public interest in finding solutions to complex problems is also paramount in adaptation governance (Weber and Khademian 2008). Shared governance relies on: effective allocation of decision making responsibilities; equal opportunity to contribute to knowledge; open and synergistic work environment; cohesive goals and objectives; and interdependence of activities and tasks (Swihart and Hess 2014). Scholars suggest that sharing power is imperative to achieving shared responsibility (Barton, Krellenberg and Harris 2015). Coastal adaptation decision making, characterised by overlapping responsibilities and roles, requires clearer and more balanced responsibilities between different government actors and social spheres such as not-for-profit organisations, industry and citizens. Shared responsibility for climate adaptation should be a politics of “collectivism and obligation, of affect over interest, and virtue over rights” (Petersen and Tjalve 2013, p.3). Shared responsibility and powers are critical to the success of adaptation planning partnerships (McClelland 2002).

The above principles derived from literature are revised through the data analysis in Chapter 6 and 7. The principles will be revised taking into consideration the key features of good governance: legitimacy, credibility, inclusiveness and salience (Costanza et al. 1998, Kunseler et al. 2015).

Legitimacy in coastal adaptation planning refers to the way in which the process is

conducted and resulting decision making is exercised, in relation to those with a legitimate interest (which include project partners, key interest groups and the community) (Corfee-Morlot et al. 2010). In coastal adaptation planning, legitimacy reflects the perception that the production of information and knowledge has been respectful of stakeholders' divergent values, beliefs and attitudes (Cash et al. 2003, IEG–World Bank 2007). Legitimacy implies accountability and transparency in the process, decisions and actions; and appropriate regulation through policy and compliance with contractual obligations (McGregor 2003). Sourcing information and advice through appropriate channels ensures legitimacy of the process and trust within the leading organisation/partnership. Accountability reduces the risk of abuse of power and ensures that governing bodies operate effectively and efficiently (IEG–World Bank 2007, Lockwood et al. 2009). Accountability becomes an issue when new knowledge provided by partnerships sits outside formal institution mechanisms (i.e., not endorsed).

Credibility is about whether the information produced meets quality standards (Corfee-Morlot et al. 2010). Collaboration can help developing (or sharing) high quality project briefs to ensure that the most qualified consultant for the job is appointed. This also improves transparency.

Salience refers to the relevance of the information to the user's needs (Stocker et al. 2013). Salience of the results is increased through a meaningful stakeholder engagement process. In coastal adaptation governance a major concern is the extent to which governance mechanisms facilitate the effective participation of stakeholders in decision making and production of new knowledge (Lockwood et al. 2009).

Inclusiveness is therefore an important criterion. It refers to the importance of involving relevant but also diverse participants into an equitable and democratic deliberation process (Costanza et al. 1998). Effective engagement raises stakeholders' awareness, knowledge and skills and therefore increases trust, leadership and collaboration on the process by external stakeholders (Ostrom 2009).

3 METHODOLOGY

3.1 Research Approach

This study uses qualitative research methods to analyse collaborative arrangements and governance structures and processes for coastal adaptation planning in WA. A mixed-method research design was used which involved desktop review, in-depth interviews and participants observation. Qualitative research enables researchers to explore how human beings understand, experience, interpret and act upon climate adaptation issues. It can also be used to explore how climate change debates can generate conflicts and how these conflicts are being addressed.

In this thesis, as discussed above, climate change is conceptualised through an Integralist lens: not only it is understood in many different ways (*epistemological pluralism*); it actually *is* many different things (*ontological pluralism*), depending on how its study is approached (*methodological pluralism*) (Esbjörn-Hargens 2010a, Esbjörn-Hargens 2010b, O'Brien and Hochachka 2010). The underlying methodological premise of this study therefore is that there is no single reality or solution to climate impacts on the coast (Robottom 2012). Instead reality is studied using transdisciplinary approaches and a series of potential solutions developed through collaborative means. In fact, although a positivist approach is useful for assessing coastal hazard risk, its interpretation is still influenced by people's judgments, knowledge and experience and by the methodologies used. As a result, there are often multiple realities and no clear solutions but rather multiple pathways forward, as there are multiple views and methodologies (Esbjörn-Hargens 2010b). Moreover, the pathways forward for coastal adaptation are always the product of negotiations influenced by political and social settings.

Multiple case studies research design was chosen as the qualitative method for conducting this study. Multiple case study research was used to compare three different collaborative approaches to coastal adaptation planning and examine the interactions with the broader coastal governance systems in which each partnership operated. In-depth interviews and participant observations were the main instruments used by the researcher to collect and interpret data.

Multiple case studies is a particular useful methodology to compare cases where boundaries between the context and phenomenon are not well defined and for

comparing organisational characteristics, dynamics and processes (Merriam 1998, Yin 2009). Through multiple case study research this study examines experiences of individuals or groups who are in comparable situations or processes that occur in similar contexts so that some useful generalisations can be drawn on a particular issue (Merriam 1998), Morse (1999).

Morse (1999) states that “if qualitative research is considered not generalizable, then it is of little use, insignificant, and hardly worth doing”. The goal of this study is to provide a deep understanding of the role that collaboration can play in advancing coastal adaptation planning and adaptation decision making at the local level through the intensive study of particular cases which share similar governance contexts, and to develop higher-level concepts and theories that can be applied to other settings (Lincoln and Guba 1986).

The decision to use participant observation as one of the data collection methods was largely based on my professional expertise and involvement in many different coastal management and planning initiatives not just in WA but also in other states such as Tasmania. My professional involvement in coastal adaptation planning enabled me to reach deeper levels of understanding of existing networks and relationships between coastal actors, policies and policy frameworks, decision making processes and values associated with the use of the coast. My aims in taking on this dual role were to ensure that the research process and the research findings would be useful to the stakeholders involved in the process and offer examples from other states of similar approaches and provide valuable insights for improved decision making.

Literature shows that participant observation is particularly useful when the researcher has been living in an area for an extended period hence, he/she has become known within the community and the professional environment (Spradley 1980). My role as a researcher-practitioner in the WA case studies, is an example of participant observation that arises from an ongoing working situation (the observer is an industry practitioner) (Iacono, Brown and Holtham 2009).

(Marshall and Rossman 1989) define observation as "the systematic description of events, behaviours, and artefacts in the social setting chosen for study". For Spradley (1980) participant observation is process of learning through involvement

in the day-to-day routine activities of participants in the researcher setting. For Sarkissian, Perlcut and Walsh (1994) participant observation is an effective way of collecting information about people's attitudes and values especially where the researcher has been living in the area for an extended period.

Although the researcher participates in a situation to understand a phenomenon within its natural setting and records what is being observed without bringing in any subjectivities (Jorgensen 1989), his/her contribution towards the process itself and the creation of new knowledge should not be underestimated. According to Jorgensen (2015) the interaction between researcher and practitioners while collecting information, is a "unique method for investigating the enormously rich, complex, conflictual, problematic, and diverse experiences, thoughts, feelings, and activities of human beings and the meanings of their existence". The participant is part of the phenomenon under study and for this reason the process of inquiry is inevitably influenced by the researcher's personal beliefs of what is relevant and important. The researcher may in fact ask questions that stimulate new thinking and his/her involvement can play an active part in constructing the interpretation of the information gathered (Shani and Pasmore 1985).

The advantages of being part of the decision-making process include: the opportunities to gain a better understanding of a phenomenon and its context, to explore different perspectives and views on the issue and potential solutions, to engage participants in a mutual learning process and most importantly to introduce change into that process, observe it and analyse the effects of these changes (Baskerville and Wood-Harper 1996). According to Merriam (1988) participation observation is not an issue as long as the researcher explicitly analyses her involvement in discussing the results. Data through participant observation was collected during partnership meetings, workshops and public events.

Ethically, this study was considered low risk by the University. Each person who participated in the study gave permission for the research before the start of interviews and workshops. The study involved only adults who agreed to participate in the study and the respondents were told that their names would not be used in this thesis.

3.2 Case Study Methodology

3.2.1 Multiple Case Studies

This study addresses the five research design components identified in Yin (2009):

- a) research questions
- b) propositions
- c) units of analysis
- d) linking the data to the propositions
- e) criteria for interpreting the findings.

A multiple case study approach (Bentrup 2001) was considered the most appropriate for answering research questions in the form of 'how' and 'what' as discussed early in this chapter.

The 'primary' unit of analysis of this study was the coastal adaptation partnership; the 'secondary' units of analysis were the governance systems in which these partnerships operate.

A purposive sampling technique was used to identify the three most critical and relevant cases for analysis. The three case studies were chosen on the basis that they were of critical importance and 'information reach' for addressing the research aim (Patton M. Q. 2011). The premise is that findings from critical cases are relevant in understanding or explaining more typical cases (Patton, 2002).

The following criteria were used to select the case studies. They must each:

- a) be relevant to Australia's decision making
- b) be a voluntary based partnership establish to conduct coastal adaptation planning
- c) involve one or more local government agencies
- d) be a leading example of local or regional coastal adaptation planning
- e) share similar legislative frameworks and coastal governance contexts
- f) have completed or be in the process of undertaking a local or regional coastal adaptation planning process.

Of the three case studies, two were in WA the *CVRAP* and the *PNP*, and one in Tasmania (the *Tasmanian Coastal Adaptation Planning Partnership* or *TCAP* Partnership). All three case studies were examples of partnerships established to identify and mitigate hazard risks of highly vulnerable coastlines. However, due to the unique nature of collaborative arrangements and the governance systems that they operate in, it was not possible to choose three identical partnership

arrangements. The conditions for the partnerships to form, the partnership arrangements, the results and the interactions with the governance system in which they operated were different across the three case studies.

The CVRAP was initiated and coordinated by a non-government and not for profit organisation (the NACC) in collaboration with a local government authority, the CGG, and two state government agencies, the GPA and the WA Department of Planning (DoP). The PNP was initiated and coordinated by a local government, the City of Mandurah (CoM), in collaboration with other eight local government authorities. The TCAP partnership was initiated by the Tasmanian Local Government Association (LGAT) and two state government agencies (the Tasmanian Climate Change Office, the Tasmanian Planning Commission) in collaboration with four local government authorities: the Clarence City Council (CCC), the Break O'Day Council, the Latrobe Council and the Kingborough Council.

At the time of my research study starting the three partnerships were at different stages of a coastal adaptation planning process. The CoM had just completed a coastal vulnerability assessment and the PNP had just been established. The CVRAP had also just been formed and undertaken the first context studies. In Tasmania, the CCC was leading the way in coastal adaptation planning, having secured funding for the first coastal hazard risk assessment in the country. WA and Tasmania both lack a dedicated coastal protection or management act and there were chosen for the similarities in the coastal governance systems.

3.2.2 Participant Sampling and Recruitment in Case Studies

Patton (1990) recognised that sampling can be based on a combination of several criteria, not mutually exclusive. In each of the three case studies, the participants were one or more of the following:

- a) representatives from the coastal adaptation planning partnership
- b) coastal 'decision makers' either at the local, regional and state level, particularly those involved in coastal adaptation planning
- c) community representatives
- d) key stakeholders involved in the coastal adaptation planning process including individuals from the industry sector, consultants and universities
- e) stakeholders involved in similar initiatives outside of the case studies.

In each case study I used a heterogeneous purpose sampling strategy for selecting a sample of research participants. Participants who could best inform the research questions and enhance the understanding of the phenomenon under study were selected. Participants with diverse characteristics were chosen to provide the maximum variation possible in the data collected. Forty participants in total were interviewed through two rounds of interviews 2 years apart and an additional 40 were involved in workshop activities. The participants were either directly involved in coastal adaptation planning or had experience and knowledge in coastal adaptation governance.

Participants were recruited through two introductory emails. In the emails I explained the study's purpose and asked for a response about their willingness to participate. A similar number and type of participants were chosen for the PNP and the TCAP case study. The action research case study in Geraldton had a slightly higher number of participants due to better accessibility. To gain enough understandings and insights to answer the research questions 2 to 4 people were interviewed from each organisation or group in each partnership, making up a total of up to 20 for each case study.

3.3 Methods

Each case study used multiple sources of information gathered from a variety of data collection methods including in-depth interviews, desktop analysis, workshops and participant observation.

3.3.1 Desktop Analysis

Document analysis was used to investigate:

- the evolution of coastal adaptation planning to date with particular focus on the features of coastal adaptation planning in WA
- coastal adaptation governance in WA and Tasmania
- theory of collaborative governance for adaptation
- examples of collaborative approaches to coastal adaptation planning within Australia (for case study selection)
- methodologies, project outcomes and outputs, decision making outcomes, processes generated as a consequence of collaborative approaches for coastal adaptation planning.

3.3.2 Interviews

Gergen (2009), among others, notes that all knowing is from a perspective. In-depth, semi-structured interviews were used to investigate the nature of the research problem, to reconstruct certain events and to capture the points of view and experiences of the respondents (Patton 1990 and Burgess, 1982 #772). The aim of the semi-structured interviews was to stimulate the participants to talk freely during the conversation, examine the challenges and explore potential pathways forward. The interviews therefore often evolved into open, constructive and reflective discussions (Patton 1990 and Burgess, 1982 #772).

Two sets of interviews were undertaken for this study. The first round was conducted at the beginning of the research project. Approximately 40 interviews were conducted with project officers, coastal practitioners, academics, government officials and politicians to explore and analyse their role in the coastal partnership and role in coastal governance. A set of questions was prepared and emailed to the interviewee prior to the interview date. However, interviews were not restricted to the pre-prepared questions. The respondents were told that the sets were only a guide.

The interviews explored the type of collaborative approach:

- the mandate for the partnership
- the scale at which the partnership operates
- the structure of the partnership including the key responsibilities and the facilitation and coordination roles
- the resources that the partnership has at its disposal
- the level of commitment to achieve a common goal
- the actions and activities that the partnership undertakes
- the key successes and failures
- the type of collaborative process (cyclical or a staged approach/linear/iterative).

The interviews also examined how collaborative and adaptive these partnerships are and how effective they are at influencing adaptation decision making, by testing them against the theoretical principles of good governance for coastal adaptation (Chapter 2). During the interviews, participants were asked to reflect on each governance principle and for each principle comment on:

- the significance of the governance principle for coastal adaptation
- the extent to which the principle is implemented by the partnership
- the extent to which the principle is implemented in the broader coastal governance system
- the key barriers and opportunities for implementation of each principle
- additional principles and key gaps.

Follow-up interviews were conducted two years later with 10 respondents from the previous round of interviews. The respondents interviewed twice were either individuals who played a key role in the coastal adaptation planning process and could therefore provide an update on the process or policy makers who could provide an update on policy development. Each interview was recorded and transcribed into text. Thematic elements were identified using NVIVO to analyse the texts.

A key assumption needs to be made given the timing in which the interviews were undertaken. The evaluation takes into account the maturity of the collaborative arrangement. In young partnership arrangements, for example, the boundary between governance and management is less obvious as they have had less time, staffing and financial resources to establish formal governance mechanisms than have older partnerships. Responsibilities between those who govern and those who manage are less definite and often governing body members are more involved in specific day-to-day management decisions. Hence, for programs/partnerships in early stages (first 2–3 years) the evaluation focuses on the starting conditions of the partnerships rather than the outcomes. For more established programs (over 3 years old) the evaluation focuses on the ability of the program/partnership to influence decision making and policy at the local and state level.

In both states, Tasmania and Western Australia, NRM organisations are non-government organisations.

3.3.3 Participant Observations

Participant observation was used on three occasions:

- a workshop held in Geraldton by the Batavia Organisations of Councils (BROC) on coastal adaptation governance
- a workshop held in Mandurah by the Curtin University Sustainability Policy

- Institute (CUSP) on coastal adaptation planning, using participatory mapping
- a workshop held in Hobart by the CCC to inform community about the TCAP findings and work ahead.

The BROOC Coastal Governance Workshop held in Geraldton in 2011 by the Batavia Regional Group of Councils (BROOC) was a great opportunity for me to collect participant observations and undertake a few more interviews. The workshop explored governance deficits and opportunities for coastal adaptation. It also explored actors' perceptions and views in regard to coastal adaptation planning. A total of 30 participants attended the workshop from local and state government agencies, not for profit organisations, funding bodies and consultants. At this workshop I was present as both a participant and a researcher.

The aim of the participatory workshop held in Mandurah by Curtin University was to discuss with community representatives, government and non-government agencies the key impacts of climate change on the coast and to share information on values for the future development of coastal adaptation pathways. The workshop stimulated discussion about governance deficits, barriers to science uptake and knowledge gaps.

A workshop organized by the CCC was held to inform community about coastal hazard risk and future adaptation opportunities with residents and key stakeholders.

4 COASTAL ADAPTATION PLANNING AND GOVERNANCE (BACKGROUND)

4.1 Introduction

This chapter introduces the key features of coastal adaptation governance in WA and in Tasmania and describes how the institutional and policy approaches, roles and responsibilities, funding and partnerships that support coastal adaptation have evolved over time. These sections also help understand the role that collaboration plays in facilitating coastal adaptation planning played with a focus on WA.

Appendix A aims to illustrate how coastal adaptation planning has evolved from broad 'one size fit all' approaches global coastal vulnerability studies to local specific, more detailed vulnerability, risk and adaptation planning studies. The summary provided clarifies what coastal adaptation planning is and entails trailing and what tools have been developed since the first assessments in the 90's. We need to bare in mind that, at the time of the interviews, the concept of coastal adaptation planning, its evolution and its components were foreign to the majority of the respondents including myself, the coordinator of one of the first coastal adaptation planning partnerships in WA.

4.2 Coastal Adaptation Governance in WA

The WA Planning Minister and WA Planning Commission (WAPC), have the main powers and responsibilities concerning the management (at high levels only), planning and development of the coast including the development of policy for an integrated approach to coastal hazard risks assessment and adaptation planning in the state.

The WAPC is responsible for the preparation, review and amendment of state planning strategies, policies, and regional schemes and for the approval of town local planning schemes and subdivisions. The WAPC has also control powers over some development proposals within areas subject to local planning schemes and has advisory functions concerning the preparation and amendment of local planning schemes. In particular, the WAPC is responsible, with the approval of the Minister, for preparing and reviewing the State Planning Coastal Policy and sets out a regime for the payment of compensation for injurious affection.

In WA the process of assessing coastal hazard risk and develop adaptation plans is referred to as CHRMAP. The CHRMAP is described as “a risk assessment and management planning framework for incorporating coastal hazard considerations into decision making processes” (Western Australia Planning Commission 2014, Section 4). The CHMRAP was introduced in state policy in 2013 after the revision of the State Planning Policy (SPP) 2.6, which before did not address climate hazard risk.

The revised SPP2.6 and accompanying guiding documents (Western Australia Planning Commission 2014, Western Australian Planning Commission 2013a); provide policy guidance to all statutory agencies that influence the use and development of land in the coastal zone such as local governments, state government agencies and the State Administrative Tribunal, to ensure that an integrated approach for coastal planning is adopted. SPP2.6 regulates decision making within the coastal zone on aspects such as water quality protection, the requirement for hazard planning through the CHRMAP process, widths of foreshore reserves, opportunities for infill development, the requirement for coastal protection works and the application of the precautionary principle (Western Australian Planning Commission 2013b).

SPP 2.6 can be incorporated into a local planning scheme as a ‘statutory’ instrument or remain a high order policy document that local government have to have due regard to when preparing or amending local planning schemes. The Coastal Planning Policy Guidelines (the Guidelines) accompanies SPP 2.6 to provide guidance for the application of the SPP 2.6 policy measures.

The use of a risk-management approach to avoid or minimise environmental degradation and hazards is also recommended in the Statement of Planning Policy no. 1 State planning Framework Policy (Variation no.2) which provides a context for decision making on land use and development in WA. Climate adaptation is broadly mentioned in the *Department of Environment and Regulation Adapting to Our Climate Change Strategy* (Department of Environment and Conservation 2012) but this document yields no strategic or tactical guidance on coastal adaptation.

The formal WA planning system is a hierarchical *command and control* governance system where state government is the key actor in the decision making process

involving itself in coastal management and planning through the functions of its agencies. Local governments in WA are however key players in translating state and local policy into on-ground coastal adaptation responses. In the preparation, review and implementation of local planning schemes local governments must have 'due regard' to state planning policy (SPP 2.6 for coastal related matters) including the *Sea Level Change in WA Application to Coastal Planning Position Paper* (Bicknell 2010) and SPP2.6 Coastal Planning Policy Guidelines (Western Australian Planning Commission 2013a).

In broad terms, coastal planning policies require local governments or the relevant state coastal agencies to undertake studies to identify areas susceptible to coastal hazards, taking into account coastal hazard risks. Once coastal hazard areas are identified, policies generally require the state agencies and local government to determine the land use of the hazard areas having regard to the identified risks. The CHRMAP Guidelines is a supporting document specifically designed to assist coastal managers and proponents in assessing potential adverse impacts of erosion and storm surge inundation coastal hazards upon assets in the coastal zone and developing appropriate adaptation measures.

The two state government agencies primarily responsible for the development of the CHRMAP and review of local CHRMAP plans are the DoP and the Department of Transport (DoT). DoP plays a significant role in coastal policy development, coastal management and CHRMAP through the development and review of the SPP2.6, input into the development of coastal strategies and management plans, coastal vulnerability mapping and advice to the WAPC. DoT oversees the Coastal Protection Policy for WA (Department of Transport 2007), an operational policy, which sets out the principles regarding coastal protection works in the state. The DoT and the Minister for Transport provide advice to local governments with regard to coastal engineering, coastal monitoring and coastal protection measures. DoT provides funding for CHRMAP through the CAP grant scheme. Despite the introduction of new policies, both state agencies (DoP and DoT) are significantly under resourced for providing the necessary technical support to local governments with regard to coastal adaptation planning.

Other agencies that play a role in coastal hazard adaptation planning include the Environmental Protection Authority (EPA) and the Minister for Environment which deal with environmental appeals. The other key player in the WA planning system is

the State Administrative Tribunal (SAT).

In 2011, a collaborative effort between the (then) Department of Environment & Conservation (DEC), the Geological Survey of WA (GSWA) and the DoP and DoT produced a classification of the WA coast into coastal compartments and sediment cells based on known geologic features, landforms, ocean processes and sediment distribution (Eliot et al. 2011). The hierarchical classification aims to assist coastal managers with the identification of appropriate scale for vulnerability assessments and support strategic, regional and local coastal planning and management outcomes.

Regional governance plays a minor role in coastal adaptation planning in WA. Despite having no place in the constitutional arrangements, the State is divided in systems of 'regions', which are defined for a variety of purposes each of them producing a different set of boundaries. These include economic development purposes (Parliament of Western Australia 1993), land management (agriculture and conservation), planning (Government of Western Australia 2005), information gathering (statistical and meteorological), and election for political office. Funding for climate adaptation has been provided, although inconsistently, by the regional development commissions through the Royalties for Regions funding program, by NRM organisations through the Caring for Our Country funding program and by the Australian Government through regional collaborative arrangements such as Regional Organisation of Councils.

4.2.1 Coastal Adaptation Planning in WA

The first attempt to assess current and potential vulnerability of highly valuable land to coastal erosion and to establish potential risk to existing key coastal infrastructure was made by the Town of Cottesloe in 2008, with funding from State Emergency Service. This was before the introduction of the CHRMAP process by the WA Government. A 5-step methodology was developed by the appointed consultant specifically for assessing the vulnerability of the Cottesloe's coast, merging international and national best practice in vulnerability assessment available at that time. The project outcomes were made available to the community through the council's website. However there were no actions taken to adapt to the risks identified.

The methodology developed for the Town of Cottesloe was further refined in the *Coastal Zone Climate Change Risk Assessment and Adaptation Plan* commissioned by the CoM in 2009 (Coastal Zone Management Pty Ltd 2009). The Australian Government provided the majority of the funding for this project whereas State Government's support (financial and technical) was minimal. At the time of these first assessments there were no policy, guidelines, nor funding mechanisms developed by the WA Government with regards to coastal adaptation planning. For a combination of reasons (among these the lack of support from state government including policy directions) the project, although innovative, was quite inconclusive.

4.2.2 Partnerships for Coastal Adaptation Planning in WA

After the Town of Cottesloe's initiative a number of councils in WA entered into voluntary partnership arrangements to, collectively with neighbouring councils, build understanding of vulnerability to coastal erosion and inundation and identify pathways for adaptation. Examples of these newly formed partnerships in WA the PNP (2010 - 2016), the CVRAP (2009-2011), the Cockburn Sound Coastal Alliance (2009 - 2016) and the Gingin - Dandaragan Coastal Partnerships (2011-2016). Each partnership arrangement and approach have used different methodologies and encountered a different range of technical, methodological and procedural challenges. Two of the above mentioned partnerships are described in Chapter 5.

4.3 Coastal adaptation governance in Tasmania

In Tasmania state and local governments share jurisdiction over the planning and management of the coastal zone. Most foreshore areas in Tasmania are managed by local government. However some areas parts of the foreshore to the high water mark are crown land managed by Crown Land Services. Other parts of the foreshore to the high water mark are privately owned.

The Tasmanian Planning Commission (TPC) is the peak planning body responsible for the development of planning policies, including the *State Coastal Policy* (1996), and for the final approval of new planning schemes and scheme amendments governed by the Land Use Planning and Approvals Act 1993 (Tas) (LUPAA). The Premier is the Minister responsible for State Policies. The Department of the Premier and Cabinet (DPAC), the Department of Primary Industries, Parks, Water and Environment (DPIPWE), the Department of Police and Emergency Management (DPEM) through the State Emergency Service, the Resource

Management and Planning Appeal Tribunal (RMPAT) and EPA all play a role in coastal hazard management.

The Tasmanian Climate Change Office Adaptation Unit is the main department responsible for setting policy directions and priorities for climate adaptation in the State. The Local Government Association of Tasmania (LGAT) has played a key role for coastal adaptation planning in Tasmania by coordinating the Tasmanian Coastal Adaptation Pathways Project (TCAP) and by working with councils around the State to develop and publish a number of case studies that showcase some of the work some councils have done to mitigate coastal hazard risk.

Like WA, Tasmania does not have a specific coastal legislation. The statutory document to provide guidance in relation to the use, management and conservation of the Tasmania coastal zone is the *State Coastal Policy 1996* (State Coastal Policy) which sits under the *State Policies and Projects Act 1993* (SPPA). There has been a series of attempts over the past decade to review the State Coastal Policy which is dated, and most importantly, does not provide adequate guidance in relation to coastal hazard risk adaptation.

The Tasmanian Coastal Policy has no provisions for incorporation of climate risks into town planning schemes and development assessments decisions. It only vaguely recognises the need for specific policies to deal with the impacts of climate change on coastal hazards in Clause 1.4.3 (Tasmanian State Coastal Policy 1996). The Policy also contains vague terminology which has generated great uncertainty and dispute over future development on vulnerable coastal areas.

The most disputed one is Clause 1.4.2 which states: “development on actively mobile landforms such as frontal dunes will not be permitted except for works consistent with Outcome 1.4.1” (Tasmanian State Coastal Policy 1996, Section 9).

Given the generic nature of the State Coastal Policy town-planning schemes have become the only specific regulatory instruments for guiding coastal hazard risk management at the local level. In preparing town-planning schemes local governments are guided by the State Coastal Policy and by the objectives of the broader planning framework. The *Land Use Planning and Approvals Act 1993* (Tas) (LUPAA) and the *Crown Lands Act (1976)* provide for regulation and control of development in Tasmania. These Acts are guided by the objectives of the *Resource*

Planning and Management System (RMPS) framework which recommends sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations (Resource Planning and Development Commission 2003).

Recently the Tasmanian Government has initiated two key reforms to better assist local governments and private landowners to deal with current erosion and inundation risk. The first one is the review of the Regional Land Use Strategies (RLUSs), one for each regional council body (the Cradle Coast Authority, the Northern Tasmania Development Council Authority and the Southern Councils Authority). Land use strategies contain strategic directions for the management of growth within each regional planning unit.

The Southern Tasmania Regional Land Use Strategy 2010-2030 (SRLUS) (Tasmanian Planning Commission 2013b), the Cradle Coast Regional Land Use Strategy 2010-2030 (CCRLUS) (Tasmanian Planning Commission 2010) and the Regional Land Use Strategy of Northern Tasmania 2010-2030 (NRLUS) (Tasmanian Planning Commission 2013a) do not contain specific regional policy regarding coastal hazards but requires that provisions relating to coastal hazard adaptation planning through the use of *planning overlays* are to be included in planning schemes. Planning schemes must be consistent with, and further the objectives and outcomes of, the region's land use strategy.

Coastal hazard overlays enable to identify areas where new development or intensification of existing development is to be avoided because located on land that is already highly vulnerable to erosion and/or inundation. A *coastal management overlay* prohibits all development in the frontal dune system whereas development within an *erosion hazard overlay* is discretionary. Provisions on how to deal with coastal hazard risk management for future development are provided in coastal hazard codes which are part of a town planning scheme Kingborough City Council (2015). Applicants are required to assess at their own expenses and against appropriate engineering standards and best practice, the suitability of the proposed development and the potential impact of engineering works (protection structures) on coastal processes. Applications must include a report from an engineer that demonstrates that requirements of the coastal hazard code are met. The acceptability of private protective works will depend on the terms of the applicable planning scheme.

The second one is the amendment of the process for assessment of interim planning schemes proposed in the Land Use Planning and Approvals (Tasmanian Planning Scheme) Amendment Bill 2015 (the Bill). With this amendment there is no longer a requirement for the TPC to approve interim planning schemes in preparation for the introduction of a single *standardised Tasmanian Planning Scheme and Model Provisions*. The new Tasmanian Planning Scheme will contain Local Planning Provisions including overlays and maps for each area. While this is being developed, each Tasmanian Regional Council Authority is preparing a regional version of the model planning scheme template that is consistent with the terms of the Regional Land Use Strategy.

The Government has also commissioned the Mitigating Natural Hazards through Land Use Planning and Building Control Project (MNHLUP) (2011) which provides guidance on how to adapt to risks through land use planning mechanisms and building controls. The MNHLUP produced the Coastal Hazards in Tasmania DRAFT Summary Report (Tasmanian Planning Commission 2016) which sets the overarching principles for consideration of natural hazards in the planning systems and the Coastal Hazards in Tasmania Technical Report (Tasmanian Planning Commission 2016) that defines the hazard bands and proposes planning and building controls within each of the hazard bands.

Other state government initiatives include a series of technical projects for improving the understanding of coast vulnerability to erosion and storm surge flooding as a result of sea level rise. The Sharples (2004) and (Sharples 2006) reports: *Indicative Mapping of Tasmanian Coastal Vulnerability to Climate Change and Sea Level Rise: Explanatory Report* (1st and 2nd editions) were the first one to subdivide the Tasmanian coast into landform types and identify shorelines most vulnerable to storm surge flooding and the erosion.

The Tasmanian Government has also produced a series of documents which state key principles, priorities and methodological templates for managing assets at risk from coastal hazards. The *Climate Change and Coastal Risk Management Project* commissioned in 2006 by DPIW provides exceedance statistics for sea level rise and storm surges to be used for the calculation of setbacks (DPIPWE 2008c), coastal assets most vulnerable to storm-surge, erosion and sea level rise impacts (DPIPWE 2008a, DPIPWE 2008b) and a template to assist with the identification of

assets and values in the coastal zone at risk from inundation, erosion and sea-level rise and the steps required to be taken to mitigate those risks (DPIPWE 2008b).

In 2009 the Government released the *Tasmanian Coastal Risk Management Plan: Templates and Guidelines* (DPIPWE 2009), a risk assessment template developed to assist coastal managers to assess all relevant risks, including coastal hazard risks, in relation to the specific asset or development under consideration. The template is based on Australian Standard Risk Management Principles and supported by a suite of technical documents also publically available.

4.3.1 Coastal Adaptation Planning in Tasmania

In Tasmania local governments have been exceptionally proactive in coastal adaptation planning. The CCC in particular has been one of the first local government authorities in Australia to conduct extensive research into coastal hazard risks and develop partnerships with a variety of stakeholders to ensure that such risks are built into the local planning instruments. Section 5.4.1 in Chapter 5 describes the efforts and achievements by the CCC to introduce in the local planning scheme new coastal hazard overlays.

The Kingborough Council has also recently released an interim scheme containing a Coastal Hazards Code based on Clarence Council's new Schedule. Section E16.5.2 of the Planning Scheme (Kingborough City Council 2015) specifies the requirements that applicants may be requested to provide as part of the development application. These may include: (a) a coastal vulnerability report; (b) a site analysis plan identifying any natural or constructed features that could influence, or be influenced by, coastal processes prior to and after erosion events; (c) a coastal works management plan; and (d) an erosion risk management plan; (e) evidence that proposal is either appropriately located and/or any building or works will be designed and constructed to withstand coastal forces from wave run-up and/or erosion events (Kingborough City Council 2015). It is understood that all of the southern coastal Councils will be using a similar Code.

4.3.2 Partnerships for Coastal Adaptation Planning in Tasmania

The first collaborative effort for coastal adaptation planning came about in 2011 when the Australian Government Department of Climate Change and Energy Efficiency (DCCEE) funded, through the CAP, the TCAP.

Project partners included the LGAT, the TTCO (Department of Premier and Cabinet), the TTP and a number of local government authorities within the southern planning region: Break O'Day Council, CCC, Latrobe Council and Kingborough Council. The partnership involved also organisations such as the University of Tasmania (UTAS) and Antarctic Climate and Ecosystems Cooperative Research Center (ACE CRC) and the management body for the Southern Tasmanian Regional Planning Project (STRPP).

The aim of TCAP was to identify feasible adaptation pathways for responding appropriately to potential impacts of sea level rise at the local level. Kingston Beach (Kingborough Council), Roches Beach / Lauderdale, CCC, St Helens (Break O'Day Council) and Port Sorell (Latrobe Council) were chosen as case studies for the project. A series of training modules and resources were developed as part of TCAP to assist councils to develop coastal adaptation plans and undertake a comprehensive community engagement. The involvement of a range of stakeholders, including residents and other users of the study areas was a key funding requirement.

The Tasmanian State Government agreed to come to the table and support the TCAP as long as the project would have a regional significance, comply with the RMPS objectives and build upon the outcomes of Regional Council Climate Adaptation Project (RCCAP). The RCCAP was another Australian Government funded initiative aimed to improve the capability and resilience of Tasmanian councils to manage the risks of climate change and another example of collaborative regional governance in Tasmania. The outputs were Council (Corporate) Climate Adaptation Plans for the 12 southern councils, a Regional Climate Adaptation Strategy and a Climate Adaptation Toolkit for review of Councils Adaptation Plans and extension to Cradle Coast and Northern Councils.

5 CASE STUDIES

5.1 Introduction

This chapter describes three case studies; the CVRAP, the PNP and the TCAP partnerships. A comparative analysis follows in Chapter 6.

5.2 Case Study 1: The CVRAP Partnership

5.2.1 The Geraldton coast

The CGG is located 424 kilometres north of the metropolitan city of Perth, in WA. The CGG has a population of approximately 35,700 (Australia Bureau of Statistics 2011) supporting a diverse range of industries based around mining, agriculture, and fishing. Tourism is not key to Geraldton's economy but it is a growing sector.

The coast of the CGG (also known as the Batavia Coast) extends for approximately 60 Km. Geomorphologically, it is located within the Oakejee Primary Coastal Compartment (Eliot et al. 2011) which stretches from the locality of Drummond Cove in the north to the locality of Bookara in the south (Figure 1). This coastal compartment is divided into four smaller tertiary sediment cells (Damara WA Pty Ltd 2010, Eliot et al. 2011). The urban development occurs along a narrow strip of low-lying sandy coast between the Greenough River and the Chapman River, whereas the southern part of the coast, south of the Greenough River, is undeveloped.

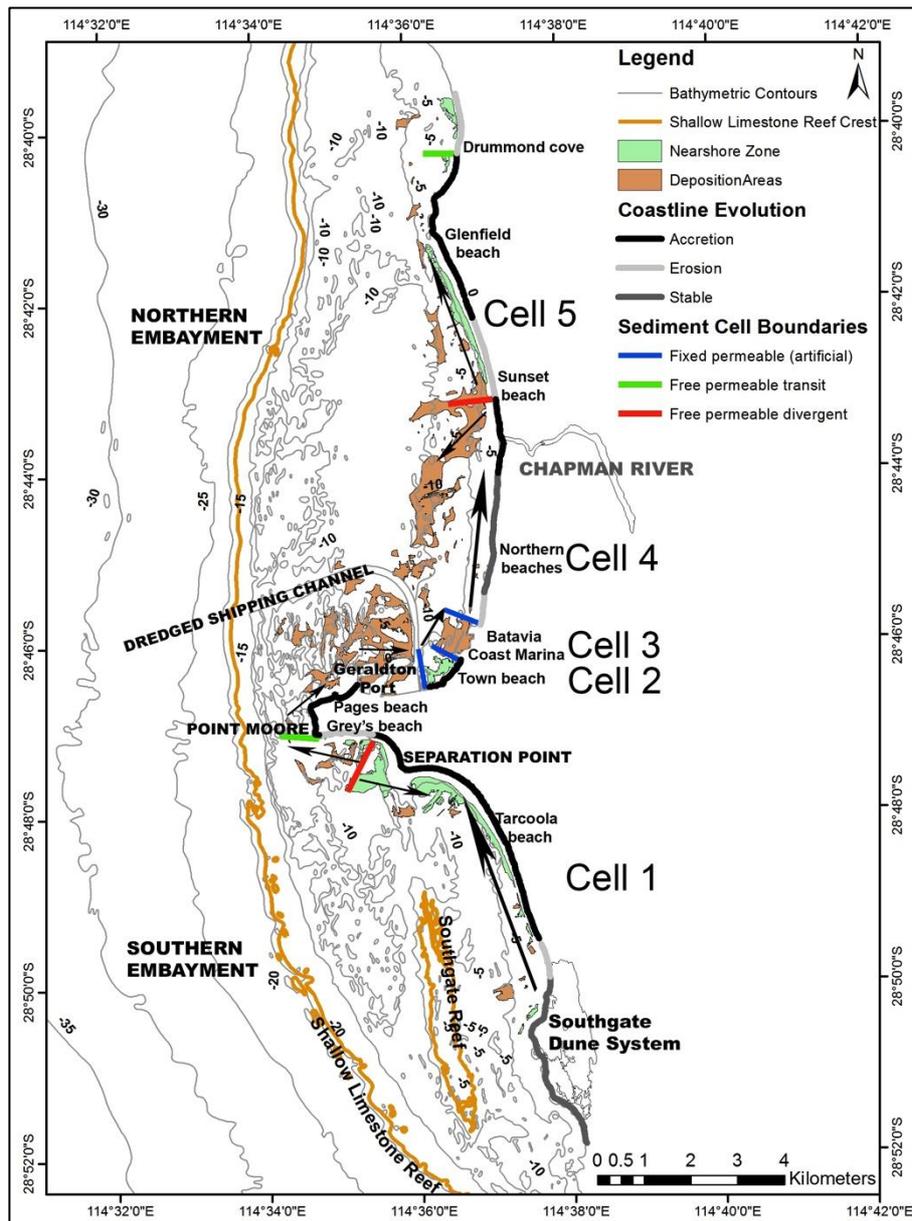


Figure 1: Geraldton coastal compartments and erosion areas. Source: Tecchiato 2015.

Over the years, the Geraldton coast, particularly north of the Port, has experienced increased erosion posing threats to public and private infrastructure such as roads, footpaths and houses. Beach erosion in Geraldton is caused by a complex interactions of factors such as the presence of a natural tombolo at Point Moore preventing sand from moving north and feeding nearby beaches and the presence of a port and a series of hard engineering defences which have altered significantly local sediment transport processes (Figure 2).

A history of poor management practices and engineering design coupled with rapidly changing climatic factors, such as increased storminess and sea level rise (Damara WA Pty Ltd 2010, MP Rogers 2016), have exacerbated erosion processes.

Coastal inundation has had fewer impacts and therefore, over the years, it has been a minor concern for the Geraldton community (Figure 3). However, recent studies confirmed that low-lying areas located behind the major offshore reefs (the Pt. Moore tombolo in particular) are indeed extremely vulnerable to inundation (MP Rogers 2016). These studies warn that the loss of the protective function provided by the offshore reefs as sea levels continue to rise is going to be particularly significant on this coast (Pattiaratchi 2009).



Figure 2: Geraldton coastal infrastructure. Source: Google (2016).

undertaken before the CVRAP initiative) successfully looked at the vulnerability of the entire compartment to coastal hazards and none specifically looked at the potential impacts of climate change on existing coastal hazards. Instead, the majority of these studies focused on small, localised, erosion issues.

At the time of the first round of interviews there were no specific grants available for local coastal adaptation planning projects. In addition, in 2008 there was no local or state policy guidance as how to deal with climate hazard risk with the exception of the sea level rise component in the setback allowances (Western Australian Planning Commission 2003).

The first climate adaptation planning initiative in the NAR was instigated through a partnership between CGG and three neighbouring coastal councils (the BROCC group). In 2009 the BROCC received funding under the LAPP to undertake a regional climate change risk assessment and develop an adaptation action plan (AECOM Australia 2010).

5.2.3 The CVRAP Partnership

The CVRAP Partnership was a voluntary multi-agency partnership involving a local government authority, state agencies and a NRM organisation. The NRM organisation was the leading agency.

Starting conditions

The issue of long-term responsibility for coastal erosion issues along the Geraldton coast has been the subject of negotiation among the GPA, the CGG and the DoT for several years; however, without a definitive solution. A Ministerial agreement was put in place in 2004 to delineate the Port Authority and the CGG's responsibilities over coastal management following the construction of the port and the increase in beach erosion of downdrift beaches.

The main requirements of the Ministerial statement were that the GPA should monitor shoreline stability and finance ongoing sand bypassing and nourishment to the northern beaches. The CGG assumed responsibility for stabilising and developing the reclaimed beaches north of the port as part of the Foreshore Stabilisation and Enhancement Strategy. In 2008 the review of the above Ministerial conditions reopened discussions regarding coastal dynamics and long-term

responsibility for shoreline stabilization.

The CVRAP partnership started from a discussion between the Chief Executive Officer (CEO) of the CGG and me, then the NACC Coastal Program Coordinator, about the recurring erosion issues along the Geraldton coast and the Ministerial review. From that discussion, the two parties agreed that, although many studies on coastal processes existed, the coastal dynamics of the entire system were still poorly understood and that a more comprehensive (and impartial) assessment of coastal processes and vulnerability to climate hazards needed to be done. It was also agreed that this was a common issue across all the NAR local governments and that the City needed to show leadership in this field. After this discussion, representatives from the CGG, the GPA and the NACC decided to form a partnership to improve the understanding of coastal dynamics across the coastal compartment and assess coastal vulnerability to erosion and inundation. The DoP was involved through the advisory role of one of their consultants.

The DoP role was crucial at the beginning of the partnership by developing (for the group) an initial concept of a coastal adaptation planning framework (the CVRAP). DoP was hoping to test the CVRAP in Geraldton and use the outcomes and lessons learnt from the CVRAP case study for the reappraisal of the State Coastal Planning Policy SPP 2.6.

The CVRAP consisted of a number of interrelated studies for the assessment of coastal hazards and risks posed by natural processes as well as sea-level rise. The framework included a combination of regional (second pass) and local scale (third pass) studies which aimed to establish the context, assess risk, evaluate risk and develop adaptation measures. The CVRAP was expected to take four years to complete. However, the projects weren't linked together and there was no clear guidance as to how to implement the recommendations within the existing legislative framework.

The *Geraldton Sediment Budget study* was a local scale assessment of the composition, distribution (sinks, sources and transport) and mobility of marine sediment at the coastal compartment scale between the Greenough and Buller Rivers.

The third study, the *Beach Watch Program*, was again a regional study aimed at involving the coastal communities of the NAR in the assessment of coastal change through beach monitoring activities. The fourth study, the *Ecosystem-services and Socio-Economic Values Project* aimed to identify and assess, in quantitative and qualitative terms, to which degree natural and built assets are threatened by observed and projected environmental change. Substantively, this was the risk assessment phase but it was poorly defined. The fifth study, the *Strategy Development & Implementation* consisted of an assessment of risks due to projected climate change and sea-level rise in the area of interest, as a well as preparation of appropriate strategies for risk mitigation or avoidance.

Structure

The CRVAP partnership was a multi-agency arrangement led by a not-for-profit organisation (NACC) involving one local government agency (CGG) and a port authority, the GPA, (an autonomous body established under the Port Authorities Act 1999, WA). The decision for NACC to be the initiator and the coordinator of the partnership was guided by my leadership role and by availability of resources. The partnership operated at an officer level through the Technical Advisory Group (TAG) backed up by a formal MOU signed by the respective CEO's.

The primary role of the TAG was to provide technical advice on the CVRAP (for example, type of projects required, preparation of project briefs, tender documents, etc.). The TAG reported to the Joint Steering Group (JSG) which oversaw all aspects associated with the Program but in particular governance matters. Members of the JSG included CEOs, directors and senior managers. NACC was responsible for the overall coordination of the CVRAP and partnership. The CVRAP did not include elected members, or community representatives or stakeholders representative from the private sector. A Community Advisory Group (CAG) was initially established but was dismissed after the first meeting on request of the GPA and CGG CEO's.

Goals and priorities

Although the CVRAP partners had genuine concerns over the potential impacts of climate change along the coast, each stakeholder had its own priorities. For the GPA and the local government the main priority was to assess the potential implications of the port infrastructure and activities on the adjacent coastline and to

define GPA's future responsibilities over shoreline management north of the port. The overall erosion and inundation issues along the Geraldton coast and the implication for future development were also a concern but not a key priority. The CVRAP framework was provided as a 'suggested approach' by DoP to the CVRAP partners with the aim of ensuring coastal hazard considerations were better integrated into decision making at the local level.

For DoP, the CRVAP case study was an opportunity to develop and test a coastal adaptation planning framework that could be applied throughout WA and perhaps used for the upcoming review of the state planning policy. However, DoP had no resources available to support the refinement and the implementation of the framework and were conscious that policy was neither supporting nor requiring such an approach. NACC was particularly concerned about the ad hoc approaches to coastal management and planning across the NAR, especially in relation coastal hazards, and was keen to see more collaboration across jurisdictional boundaries in this respect.

Outcomes

Despite this confusion over priorities, responsibilities and roles, each stakeholder made a financial contribution towards the CVRAP. GPA and CGG helped funding the local, site-specific studies, whereas NACC and the DoP funded broader regional studies. Budget allocations were dependent on the agreed briefs for the studies meeting each partner's needs. Alternative funding venues were explored, for example, through the Mid West Development Commission, the Wheatbelt Development Commission, the Department of Environment and Regulation (DER) and the industry sectors but most of the projects were funded by the project partners.

The sediment budget project was commissioned to Curtin University and was completed in 2014. The Beach Watch project, using the purpose designed 'app' called *Photomon*, was funded by NACC and is still today a key success throughout the NAR coast. In 2010 an additional project, the *Coastal Vulnerability and Risk Assessment Program Coordination Study*, was funded by NACC with the hope of refining the framework in order to be more acceptable to the partners and potential funders and ultimately contribute towards its successful completion. There were no hazard maps developed.

In 2011 NACC engaged the BROC group in a workshop activity to explore the key technical and governance barriers for coastal adaptation planning in the NAR. The intent was to discuss the key governance challenges for coastal adaptation planning and gain support from other local governments within the NAR. Amongst the participants there were also representatives from the Shires of Gingin and Dandaragan. These two Shires would form later on a much stronger partnership for coastal adaptation planning which today has produced the first site specific adaptation plan in WA. The BROC Coastal Vulnerability Governance Workshop was conducted as part of my research and the participant observation data obtained is incorporated in the following Chapter.

Evolution

The last project, the *Coastal Vulnerability and Risk Assessment Program Coordination study* commissioned to URS was a turning point for the CVRAP partnership. With that study the NACC was seeking expert advice on how to proceed with the CVRAP. It was indeed the last attempt to solicit more commitment from the project partners.

In the mean time the CGG and the GPA decided to address the coastal erosion issues north of the Port on their own. A Coastal Erosion Ministerial Group was established behind closed doors consisting of executive directors and senior officers from CGG, GPA and DoT. The ministerial group was established specifically to review the ministerial agreement in regard to the Beresford coastal erosion issues. The group funded two detailed coastal engineering studies which investigated potential solutions for managing the eroding coastline north of the port. A sediment budget study for the whole coastal compartment was funded by DoT. These studies recommended traditional coastal defenses as the ultimate solution to long-term erosion challenges for the Beresford area. A workshop was organized by the local government to ask the community to comment on the coastal erosion issues and express preferences for a range of potential engineering solutions.

5.3 Case Study 2: The Peron Naturaliste Partnership (PNP)

5.3.1 The PNP Coast

The PNP region (Figure 4) is a geographical area formed in response to shared

priorities and concerns among a number of local authorities: it does not align with other regional areas such as the NRM, planning, regional development regions or coastal compartments. The PNP coast comprises of large and expanding local government areas such as the Cities of Rockingham, Mandurah, Bunbury and Busselton and smaller local government areas such as the Shires of Murray, Waroona, Harvey, Dardanup and Capel. Since 1986 this stretch of coast has experienced substantial urban growth particularly on low-lying coastal areas (i.e. between 1986 and 2006 Mandurah experienced more than 40 per cent increase in development on areas below 3m) (Department of Climate Change 2009).

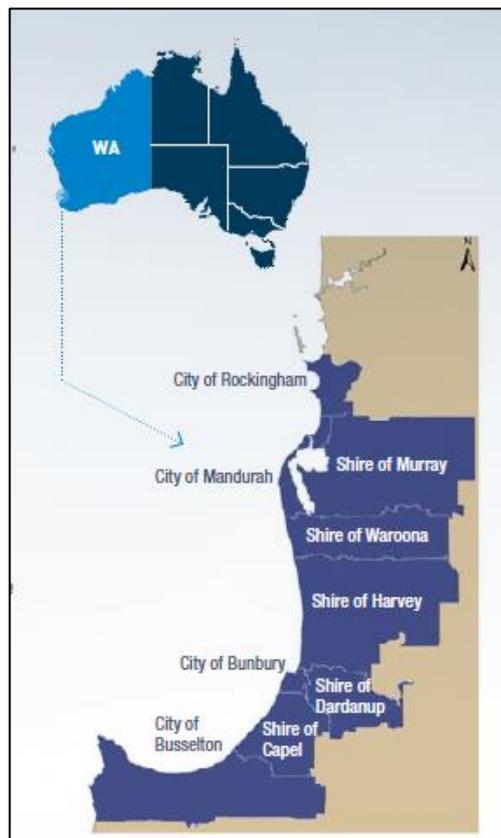


Figure 4: The PNP Region. Source: PNP website (2016).

The PNP sits across two primary coastal compartments (the Swan and the Geographe) and three secondary coastal compartments (Figure 5) (Eliot et al. 2011).

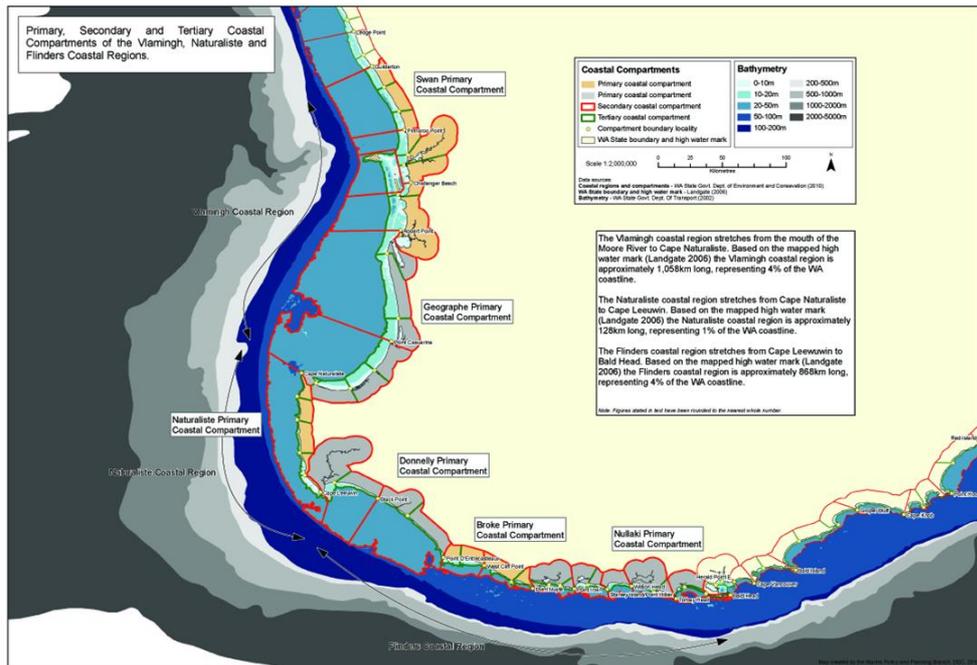


Figure 5: Coastal compartments PNP Region: Source Damara Pty Ltd (2011).

The majority of the human settlements along the PNP coast are established on low-lying land mainly young dune systems (Quindalup) backed by wetlands, lakes and swamps. More than 60% of residential buildings in WA at risk from inundation and erosion within the next century are located along this stretch of coast (Department of climate Change and Energy Efficiency 2011). According to these studies over the next century the PNP coast will be primarily impacted by coastal erosion associated with long-term sea level rise (Damara WA Pty Ltd 2012, Jones 2005).

5.3.2 Coastal Governance

The PNP region covers a broad geographical area which is defined by a variety of other governance units. The PNP covers two of the State's eight country planning and development regions: the Perth Metropolitan and Peel Region and the South-West Region.

Agencies responsible for the development of strategic directions for future land development and infrastructure in these regions are the WAPC, Regional Development Australia and the local governments through key strategic documents such as Regional Planning and Infrastructure Frameworks, Region Schemes and Regional Hotspots Reports. Key guiding documents, in addition to the town planning

schemes which are relevant to coastal adaptation planning are the Metropolitan Region Scheme (1984), the Bunbury Region Scheme (2007) and the Peel Region Scheme (2003). Most of these documents do not specifically mention adaptation to climate change but refer to specific state planning policy. The South West Development Commission and the Peel Development Commission are statutory authorities that can provide funding for regional initiatives such as climate change adaptation although the focus is often on major infrastructure, urban expansion and roads.

5.3.3 The Peron Naturaliste Partnership

The PNP is a voluntary partnership initiative between 9 local government authorities, located between Cape Peron and Cape Naturaliste, in the Southwest of WA, with one of the local government has the leading authority.

Starting conditions

The formation of the PNP followed a decade of pioneering work on coastal adaptation by the CoM.

In 2007 CoM organized a workshop called 'Climate Change and the Coast: Think Global Act Local!' which brought together scientists, researchers, practitioners and decision makers to discuss the current state of knowledge on global and local climate change, particularly extreme events and sea-level rise factors, and how these factors would impact on future coastal dynamics.

This event was an excellent opportunity for CoM to demonstrate its commitment to climate change action and engage the local community on this important issue. Shortly afterwards, a resolution on supporting leadership in climate change was unanimously endorsed by Council. This resolution became a positive platform to meet with adaptation practitioners and researchers, who encouraged Council to continue working on this issue. Importantly, it contained actions and commitments for Council senior staff to display leadership on climate change matters, and financial commitment from Council to conduct adaptation studies.

The CoM's leadership role on the issue manifested also at the national level through its involvement in the National Sea Change Taskforce, the International Council for Local Environmental Initiatives (ICLEI) and the appointment of former Mayor Paddi

Creevey on the Federal Government's Coasts and Climate Change Council showing leadership and commitment at the highest levels within the organisation has been the critical success factor in the Council's adaptive journey.

All these multiple drivers provided the impetus for the City to undergo, with financial support from the Australian Government through the LAPP funding, the *Coastal Climate Change Risk Assessment and Adaptation* study (Coastal Zone Management Pty Ltd 2008). The study was commissioned in response to the need for integration of coastal climate hazard considerations into day-to-day decision making processes and local development approvals. In particular, the City was coming under pressure from developers to release more coastal land to accommodate urban growth. Hence, the City was concerned about the inadequacy of state planning policy in dealing with coastal hazard risk and felt that better information on coastal vulnerability to climate hazards was needed to guide short and long-term land use planning and management of the coast.

The study provided council staff and decision makers with a better understanding of the susceptibility of the Mandurah's coast to climate hazards. It also (broadly) determined the risks posed on private and public assets and recommended 'strategic' measures required to mitigate such risks. During this time, the City formed a dedicated climate change team within Council. The output of the initial risk screening process was a Strategic Climate Change Risk Register that provided a list of risks per local government function for further assessment through the course of the LAPP study.

The LAPP has acted as an impetus for subsequent coastal adaptation initiatives. One of the goals was to develop through an ongoing and trustworthy dialogue with land developers, specific requirements for coastal vulnerability assessments and development setbacks. This work resulted in a local coastal policy containing sea level rise benchmarks higher than the state coastal policy. Given that this policy was created before the revision of the SPP2.6 it was seen as too forth coming, hence it lacked support from the WAPC and the policy was never finalized. Council also made a strong commitment towards continual review of scientific data and improvement in the understanding of shoreline response to changing sea levels through ongoing coastal monitoring activities which at that time was still a low priority for similar size local governments in WA.

In 2011 a Google Earth participatory mapping workshop was held as a collaborative exercise between CUSP and the City. Its purpose was to develop shared understandings about the impacts of climate change on Mandurah's coasts and waterways, to gather information on participants' key coastal values and priorities, and to develop adaptive pathways forward. It also informed community representatives and Council staff about the work undertaken so far on coastal vulnerability. Participants included the CoM elected members, the City's staff, stakeholders and self-selected members of the Mandurah community. The workshop was attended by 36 participants. It was the first workshop in WA to engage the general community in building literacy around coastal adaptation planning.

By the latter part of 2011, following the CoM's and the Town of Cottesloe's pioneering work, there was a building interest and concern in regard to coastal vulnerability and adaptation planning among local government authorities in WA. The CoM's pioneer work in the field of coastal adaptation sparked interest among neighbouring coastal local governments looking to improve the understanding of current and future vulnerability to erosion and coastal inundation. The majority of the local government authorities within the PNP region had been conducting site-specific engineering studies to understand localised erosion issues; however the understanding of coastal processes dynamics and vulnerability across the whole compartment was poor.

Structure

The PNP is a collaborative arrangement among a group of local government authorities led by the CoM. The CoM plays a coordination role managing the financial matters of the partnership, hosting the PNP coordinator positions and hosting data.

The PNP consists of four groups: the *Partners Group* comprising of Mayors, Shire Presidents and delegated Councillors from all participating local governments with the responsibility of setting the strategic directions of the partnership; the *Senior Officer Group* responsible for the management and operational matters of the partnership comprising of executive / senior management level staff or delegated officers; the *Technical Expert Group* responsible for providing technical expertise

and comprised of council staff and consultants; and the Coastal Management Working Group responsible for sharing knowledge and provide input on current coastal zone management practices across the PNP. Two part-time project officers are responsible for the coordination and implementation of the activities of the PNP as directed by the Senior Officer Group.

The partnership relies on financial and in-kind support from each partner (based on a population quota) and technical support from the DoT, DoP, Department of Water (DoW) and the DER.

Goals and Priorities

The PNP has a strong regional focus. The primary intent of the PNP is to develop an appropriated methodology for assessing regional scale coastal processes and broadly to identify the potential impacts of coastal hazards on the shared coastline. The second intent was to refine these methodologies for assessing hazard risk at the local level and once the information on coastal hazard risk becomes better understood, develop appropriate and consistent adaptation responses at the local level. Each local government participated within the limits of their own capacities both in terms of people resources as well as financial. The other ambitious goal of the partnership was to inform policy hence the close relationship with the state agencies and the WAPC.

Outcomes and Outputs

A series of studies was undertaken under the PNP umbrella to improve the understanding of the region's vulnerability to coastal hazards. The first study, funded by the Australian Government, aimed to develop models for assessing the region's coastal vulnerability under future sea levels (Cowell and Barry 2011). However, the erosion lines and estimates of coastal risk that were produced in this study differentiated substantially from those of other studies previously undertaken for the region. This methodological discrepancy was a concern for the partners who had already invested a lot in this process. To address this methodological gap, the WA state government agencies together with the Australian Government commissioned an independent review to refine the regional modelling and develop more accurate hazard line maps. The project was undertaken by a leading WA consultancy (Damara WA Pty Ltd 2012).

Subsequently, the PNP secured an additional round of funding from the Australian Government, through the CAP, for conducting a regional-based economic analysis of adaptation options. The project was undertaken by the same consultancy firm involved in the previous stages (ACIL Tasman 2013). The project aimed to identify the most cost-effective solutions for reducing risk caused by erosion and inundation impacts at the regional level. As part of the project four detailed locally-based assessment studies were undertaken in Mandurah, Siesta Park-Marybrook, Peppermint Grove Beach and Eaton-Australind.

Due to the size of the study area and data limitations the coastal hazard maps developed through the regional modeling were quite broad hence not so useful to local decision making. Key locations including Busselton, Bunbury, Mandurah and Rockingham were not well represented by the erosion model. Similarly, the PNP received critiques regarding the economic assessment, which failed to adequately integrate ecological values and community values into the economic assessment.

After 5 years from its establishment only one of the PNP councils (the Shire of Harvey) has conducted a CHRMAP and developed an adaptation plan. The other project partners have preferred to further invest in local scale coastal hazard modeling and data collection in hope to produce coastal hazard information and mapping that is useful for local planning and decision making. Table 1 summarises the key outcomes and outputs for each PNP local government member to 2016.

Table 1: Coastal Adaptation Planning in the PNP region.

Local Government Area	Planning Region	CHRMAP studies	Community Engagement	Communication	Coastal hazard risk considerations in planning Instruments	Main adaptation strategies adopted (at 2016)
City of Busselton	South West Region	<ul style="list-style-type: none"> Regional hazard mapping Detailed hazard mapping (separate process from PNP) Economic assessment of adaptation pathways (case study: Siesta Park-Marybrook) 	1 workshop	Hazard maps available on website (PDF format)	<p>Broad references to the importance of coastal adaptation planning in the:</p> <ul style="list-style-type: none"> - <i>Strategic Community Plan</i> (2013 to 2023) - <i>Local Environmental - Planning Strategy</i> (2011) - <i>Town planning scheme no. 21</i> (key instrument within the TPA is the coastal management areas). <p><i>Local Planning Policy</i> in preparation (should address coastal hazard risk)</p>	Engineering & Monitoring
Shire of Capel	South West Region	<ul style="list-style-type: none"> Regional hazard mapping PNP economic assessment case study: Peppermint Grove Beach 	No	No	<ul style="list-style-type: none"> No references to coastal hazard in TPS No coastal hazard specific local planning policy 	
City of Bunbury	South West Region	<ul style="list-style-type: none"> Regional hazard mapping Detailed hazard mapping (separate process from PNP) Storm surge inundation estimating levels of water inundation based tropical cyclone Alby (1978) and erosion modeling. Economic assessment of adaptation pathways (case study: Eaton-Australind) 	No	Link to PNP projects and webpage.	<ul style="list-style-type: none"> Bunbury Region Scheme (2007) – no specific references to coastal hazard risk Town Planning Scheme – under review No coastal hazard specific local planning policy 	Engineering & Monitoring
Shire of Harvey	Peel Region	<ul style="list-style-type: none"> Regional hazard mapping Refined hazard mapping CHRMAP adaptation plan 	1 workshop	No	<ul style="list-style-type: none"> Adaptation plan not released yet No coastal hazard specific local planning policy 	

Local Government Area	Planning Region	CHRMAP studies	Community Engagement	Communication	Coastal hazard risk considerations in planning instruments	Main adaptation strategies adopted (at 2016)
Shire of Waroona	Peel Region	Case Study PNP regional assessment		Link to PNP projects and webpage.	<ul style="list-style-type: none"> No references to coastal hazard in TPS No coastal hazard specific local planning policy 	
CoM	Peel Region	<ul style="list-style-type: none"> Coastal hazard risk assessment & Plan (CZM 2008) No CHRMAP Plan Economic assessment of adaptation pathways (case study: Mandurah) 	1 Workshop	Link to PNP projects and webpage.	<ul style="list-style-type: none"> No references to coastal hazard in TPS No coastal hazard specific local planning policy 	Engineering & Monitoring
Shire of Dardanup	Peel Region	Regional hazard mapping	No	No	<ul style="list-style-type: none"> No references to coastal hazard in TPS No coastal hazard specific local planning policy 	
City of Rockingham	Metropolitan Region	<ul style="list-style-type: none"> Cockburn Sound Coastal Alliance's CHRMAP Plan 	1 Workshop	On the PNP website and CSCA website only.	<ul style="list-style-type: none"> No references to coastal hazard in TPS No coastal hazard specific local planning policy 	As per the Cockburn Sound Coastal Alliance Adaptation Plan (not released yet)

5.4 Case Study 3: The TCAP Partnership

The focus of this study is the first round of the TCAP (2009-2011), which involved the local government areas of the CCC and Kingborough Council in the south-south east coast of Tasmania and the Break O'Day Council and Latrobe Council in the north-east. For the purpose of this study we focus on the CCC area, the biggest of the four and the pioneer in coastal adaptation planning in Tasmania.

5.4.1 The Clarence Coast

Tasmania has almost 6,400 kilometres of coastline (Sharples, Walford and Roberts 2013). Numerous coastal settlements along the Tasmania's coast are vulnerable to inundation, erosion and recession but also rising saline water tables, storm surges and tsunamis (Tasmanian Planning Commission 2009). Local government areas located on the south coast of Tasmania such as the cities of Clarence, Kingborough, Break O'Day and Latrobe are particularly exposed and vulnerable to such hazards (Lacey, Hunter and Mount 2012, SGS Economics & Planning and Water Research Laboratory 2009, Sharples, Walford and Roberts 2013). These areas are all low-lying coastal settlements with a range of built and natural assets vulnerable to projected coastal climate impacts. Most also have some significant current risks.

CCC is a local government area on the eastern shores of the city of Hobart covering approximately 200 kilometres of coastline (Figure 6). Along the 191 Km of coastline there are a number of important aquatic habitats including the Pittwater estuary, an internationally recognised Ramsar site.

The beaches identified as being most at risk from coastal erosion and inundation within 25 to 75 years are Roches Beach, Cremorne and Clifton Beach whereas the areas of Clifton Beach, Half Moon Bay, Kangaroo Bay, Bellerive Beach, Rokeby and Droughty Point Road have been identified to be at risk beyond 75 years (SGS Economics & Planning and Water Research Laboratory 2009).



Figure 6 CCC's coast. Source CCC (2015).

At these localities, development is located on low-lying sandy land, backed by relatively low and narrow dunes (Roches Beach, Cremorne and Clifton Beach). Erosion issues are common mainly due to natural processes like at Roches Beach where the beach has been subject to repeated erosion and accreting cycles. Recent studies point at a net erosion trend over a forty-year period at Roches Beach (SGS Economics & Planning and Water Research Laboratory 2009) and confirm that sea level rise from climate change will contribute to additional erosion (SGS Economics & Planning and Water Research Laboratory 2009).

5.4.2 Coastal Governance

Foreshore areas in the Clarence local government area are commonly owned and managed by Council. In Clarence 80% of Council owned or managed land are natural bushland and foreshore areas. The City's responsibilities for the management of natural assets are outlined in the Clarence Bushland and Coastal Policy (2011). In some areas parts of the foreshore to the high water mark are owned by the Crown and managed by State Government through the Crown Land Services or the Tasmanian Parks and Wildlife Service (TPWS).

The CCC was the first local government authority in Tasmania to respond to

community and Council concerns about ongoing issues with erosion and flooding events in coastal areas. Since 2005, CCC has been engaging the local community, state government agencies and other key stakeholders in a series of collaborative initiatives in an effort to better understand and manage climate hazard risk in the coastal zone and develop best practices for other coastal councils to adopt.

CCC is one of the 13 councils within the *Southern Planning Region* (Land Use Planning and Approvals Act 1993). The other council areas are: Brighton, Central Highlands, Derwent Valley, Glamorgan, Spring Bay, Glenorchy City, Hobart City, Huon Valley, Kingborough, Sorell, Southern Midlands and Tasman. Land use planning within the Southern Planning Region is guided by the Southern Tasmania Regional Land Use Strategy (2010-2035), a document prepared by the Southern Tasmanian Councils Authority. Local and/or sub-regional planning strategies prepared at the local government level, must be consistent with this strategy (and the objectives of the RMPS and relevant State Policies).

5.4.3 The TCAP Partnership

The TCAP partnership is a voluntary, multi-agency, partnership established between several local government authorities, state agencies and a government association. The TCAP partnership initiative is led by one local government authority (the CCC). Over the past decade, the CCC's approach to coastal hazard management has been a leading example to all other Tasmanian Councils and provided invaluable information to the State Government for progressing in coastal hazard risk management. In recent years, following Clarence's example, other Tasmanian Councils have been proactive in attracting federal and state government funding for coastal vulnerability and adaptation planning and in advocating the need for a review of existing policies and planning mechanisms to deal with the impacts of climate change in the coastal zone.

Starting Conditions

Since the early 1990s growing community concerns over major erosion and inundation events have sparked CCC Council's strong commitment and leadership towards further improving the understanding of coastal dynamics and vulnerability of the Clarence coast to erosion and inundation. CCC was able to attract funding and

support from both state and federal governments and involve a variety of stakeholders depending on the project scopes including universities and consultants from other states.

The first investigation undertaken by CCC consisted of a series of engineering studies to determine the underlying causes of erosion at low lying localities with a particular focus on the most vulnerable coast at Lauderdale. Among these studies, the Coastal Erosion Report 1994, the Storm Surges Causing Foredune Erosion on Roches Beach, the Roches Beach Coastal Risk Assessment Study and the Coast Protection Study for Roches Beach, Lauderdale.

In 2008 CCC received the first round of funding from the Australian Government via the Integrated Assessment of Climate Change on Urban Settlements Program with contribution from the Tasmanian State Emergency Service (TSES) to assess coastal hazard risks at 18 localities within the Clarence local government area and to investigate potential adaptation options. The *Climate Change Impacts on Clarence Coastal Areas Report* (SGS Economics & Planning and Water Research Laboratory 2009) identifies a number of recommendations and statements regarding local government responsibilities in managing coastal hazard risk.

The *Coastal Processes, Coastal Hazards, Climate Change and Adaptive Responses for Preparation of a Coastal Management Strategy Report* (Carley et al. 2008) identifies the assets at risk from current and predicted coastal hazards. The *Socioeconomic Assessment and Response for Climate Change Impacts on Clarence Foreshores Interim Report* (SGS Economics & Planning and Water Research Laboratory 2009) investigates community awareness, attitudes and values towards coastal hazard risk and potential adaptation scenarios. The risk assessment report was prepared by Water Research Laboratory (WRL) of the University of New South Wales in conjunction with Pitt & Sherry Consulting Engineers. The community and stakeholder consultation and the literature review were conducted by SGS Economics and Planning.

In 2011 the TCAP was established to secure funding via the Australian Government's CAP program. The Tasmanian CAP (TCAP) was a collaborative arrangement between several state government agencies (the TCCO and the TPC), the Local Government Association of Tasmania, and several local government authorities and non-government actors such as the ACECRC and the UTAS. The Australian Government's initial contribution of \$500,000 was supplemented by

matching contributions from the Tasmanian State Government (\$390,000), LGAT, the Antarctic Climate and Ecosystems Cooperative Research Centre, the University of Tasmania and the four councils. The TCAP program was led and coordinated by LGAT with support from the State Government through the TCCO. The TCAP sought to develop, collaboratively, future pathways for climate change adaptation in the four local government areas.

Outcomes and Outputs

In Clarence, Lauderdale beach was chosen to be one of the four case studies for the TCAP. Through the TCAP a feasibility study of hard engineering responses to coastal erosion and inundation (Pitt&Sherry 2012, WRL 2012), an asset inventory (Lacey, Hunter and Mount 2012), an analysis of feasible adaptation pathways; a community consultation process (SGS Economics & Planning 2012a) and a review of funding opportunities for implementation of adaptation pathways (SGS Economics & Planning 2012b) were conducted for Lauderdale Beach.

The TCAP project involved a range of professional expertise in advising on a range of local government activities (planning, engineering, communication, liability, etc.) through an extensive community engagement process. The consultation process consisted of workshops and seminars with expert presentations about hazard maps, assets at risk, planning amendments to respond to coastal hazards and best options to address short-term risk (SGS Economics & Planning 2012a). The consultant chosen for this work was renowned and trusted among the Clarence community.

Based on the information and recommendations from the abovementioned reports the Clarence Council included four coastal hazard overlays (inundation, erosion, storm surge and septic tank high water table hazards) and incorporated climate change considerations such as sea level rise benchmarks in the interim town planning scheme (SGS Economics & Planning and Water Research Laboratory 2009). The Clarence Interim Planning Scheme 2015 was approved by the TCP on 1 July 2015 (SGS Economics & Planning and Water Research Laboratory 2009) and was used as a pilot scheme by other Councils.

Similar projects by the other partnering local government authorities followed. The Break O'Day Council, Latrobe Council and Kingborough Council all developed their own coastal adaptation plan and interim schemes containing a Coastal Hazards Code based on Clarence Council's new Schedule.

Table 2 provides a comparison of coastal adaptation process stages and outcomes achieved through the different partnership models. Table 3 compares coastal adaptation process stages and outcomes achieved through the different partnership models.

Table 2: Comparison coastal adaptation process stages and outcomes achieved through the different partnership models.

CHRMAP	CVRAP	PNP	TCAP
Establish the context			
Second Pass (compartment level)	X	✓	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ✓
Third Pass (sediment cell level)	✓	Major LGs and case studies location	✓ (most vulnerable locations)
Values (social, economic, ecological)	x	2 out of 9 LGs	✓
Risk Assessment			
Risk Analysis	x	1 out of 9 LGs	✓
Risk Evaluation	x	1 out of 9 LGs	✓
Adaptation Planning			
Adaptation plan developed	x	1 out of 9 LGs	✓
Implementation			
Engineering	✓ (before completion of adaptation plan)	✓ (before completion of adaptation plan)	✓
Planning	x	x	✓ <input type="checkbox"/>
Funding strategies	x	1 LG established climate adaptation fund	x
Monitoring Program	✓ (only hot spots)	Regional	✓ <input type="checkbox"/>
Community Engagement			
Establish the context	x	(2 out of 9LGs)	✓
Risk Assessment	x	x	<input type="checkbox"/> ✓
Adaptation Planning	x	x	<input type="checkbox"/> ✓

Table 3: Comparison coastal adaptation process stages and outcomes achieved through the different partnership models. Elaborated from Considine and Hart (2006), Ansell and Gash (2008), and Sørensen and Torfing (2005)

(Partnerships)	CVRAP	PNP	TCAP
Structure Partnership	Voluntary – local partnership Forum is initiated by a non-government organisation (NRM) with some level of support from state agencies	Voluntary – regional partnership Forum is initiated by government organisations (local governments) with some level of support from state agencies	Voluntary – regional Forum is initiated by a forum of government and non government organisations
Scale of Collaboration (commitment level)	Collaboration as a tool, no real commitment to collaboration as a modus operandi Poor political support and involvement	Meaningful and substantive collaboration Collaboration for positive and beneficial reasons Collaboration as a means and process Development of collaborative cultures Strong political input and support.	Highest level: strong commitment to collaboration from the highest levels within an organisation Strong political input and support Overt and public forms of collaboration Awareness of collaboration is high Collaboration as a means and staged process
Mandate	Coordination: information sharing, development of common methodologies and approaches Some partners preferred to achieve goal unilaterally rather than through collaboration Partnership seen as a way to secure funding from partnering organisations Low perception that achievement of their goals is dependent on working with other stakeholders	Cooperation for service improvement: information sharing, development of common methodologies and approaches, lobbying government Despite some improvement partners still have low perception that achievement of their goals is dependent on working from other stakeholders	Consensus building, seeking interest group consensus to improve policy and decision making: Information sharing, development of common methodologies and approaches, address a policy issue, improve decision making tools and outcomes
Starting conditions	Problems of distrust, disrespect, and outright antagonism which persisted throughout life of partnership Low incentives to participate for some partners – low expectation that collaborative processes will yield meaningful results	Trust and respect among partners. History of distrust towards state actors Strong incentive to participate to share resources and help less resourced partners but some degree of hesitation that collaborative processes will yield meaningful results	History of distrust towards state actors but willingness to work together Strong incentive to participate to share resources and help less resourced partners
Power Dimension	Collaboration for individual strategies / agendas Power imbalances among partners Confusion over roles and responsibilities	Some level of power imbalances particularly between partners and state actors	Some level of power imbalances particularly between partners and state actors
Understanding of the problem	Focus on one 'side' of the problem Confusion over methodologies, data applicability and accuracy	Overall poor but some level of problem applicability, focus on one side of the problem (technical) Confusion over methodologies, data applicability and accuracy	Good problem applicability, problem addressed from different perspectives
Capacity building/social learning	Poor learning and limited capacity building	Shared learning among partners. Poor capacity building among interested communities	Collaborative learning Strong capacity building among interested communities

(Partnerships)	CVRAP	PNP	TCAP
Goals and priorities	Competing objectives; different reasons for participating in collaboration	Some objectives are shared and there are some mutual intentions. Poor consensual strategies and outcomes	Shared objectives; mutual intentions, consensual strategies and outcomes
Legitimacy of process/collaboration	Poor	Strong	Strong
Roles and Responsibilities	Confusing, fear of liability Poor understand of feasibility of implementation mechanisms	Clear roles and responsibilities within partnership but fear of liability for work generated Poor understand of feasibility of implementation mechanisms	Clear roles and responsibilities within partnership Clear understand of feasibility of implementation mechanisms
Participation stakeholders and community	Lack of meaningful stakeholders and community engagement Distrust in community	Stakeholders and community poorly engaged	Stakeholders and community are engaged in the coastal adaptation planning process but not directly in the decision making process (influence only)

6 COMPARATIVE ANALYSIS

6.1 Introduction

This chapter presents a comparative analysis of the case studies, drawing on interviews conducted for each case study. Interviews were conducted twice, at the beginning of the research project and after two years. Each governance principle described in Section 2.3 and tested through the in-depth interviews is compared across the three case studies. The analytical narrative, containing verbatim quotations from research participants, exposes the key challenges faced by the three partnerships and reveals participants' key concerns and attitudes regarding adaptation governance issues. Opportunities for change are also explored. A revised set of principles for good governance for coastal adaptation is presented and discussed in the following chapter based on the following analysis.

6.1.1 Principle 1: Shared understanding, goals and priorities

The interviews reveal that in the current context of scientific uncertainty, funding shortage, political volatility and inadequacy of climate adaptation policy, it is multi-agency collaboration that has enabled some progress in coastal adaptation planning at the local level. Uncertainty and governance deficits have caused greater interdependence among local governments, which in turn has translated into stronger commitment to sharing information and resources for the achievement of joint outcomes. The most successful attempts to coastal adaptation planning, out of the three case studies, occurred where key actors, including community, have committed to working together for the development of common methodologies and strategies for assessing and dealing with climate hazard risk particularly where policy is inadequate.

Interviews with the PNP and the TCAP members reveal that each partner agreed that coastal adaptation planning is a complex process that requires a multi-disciplinary approach and substantial resources, and that working together would have been more beneficial and effective than working in isolation. According to a City of Busselton (CoB) senior manager the PNP played a crucial role in improving collaboration across the region and in building capacity among smaller, less resourced councils on this complex issue:

I guess one of the real values of the PNP has been that it's stepped in and I think Busselton and, from what I understand, Mandurah and Rockingham,

have really sort of been the main drivers, but the other councils in between probably would not have had the motivation to be involved without that [partnership] structure. (Town Planner, CoB. Interview May 2015)

The CVRAP, by contrast, failed to generate mutual commitment to working together and because of this the partnership achieved just a few project outcomes. This was a very frustrating situation for the CVRAP partners. There was a majority of partners agreeing that collaboration would have been beneficial to all parties involved, opposed by a powerful minority who did not see the direct benefit to themselves and whose primary concern was lack of funding and potential liability.

The interviews revealed although that within that minority and within the same organisation views contrasted. At the officer level respondents were more in the view that coastal adaptation planning required strong collaboration between all relevant actors. Collaboration was seen as necessary for developing common methodologies, for sharing and securing funding and for developing and implementing consistent policy. A manager at the CGG points out that although collaboration is necessary the local governments are not quite doing it yet:

So for me the cross-agency collaboration is more about addressing the same problems but maybe trying different approaches or enhancing whatever approach one has used so the next time it is better and keeps getting better that to me is how. But.. I think we are not together as yet. (Director Sustainability, CGG. Interview March 2012)

At the executive level the CEO did not seem to think that the CGG needed to collaborate on this issue:

You need to do it where you need to collaborate but if you have one entity, you do not need to collaborate, you can do everything on your own. (CEO, CGG. Interview September 2011)

Another key issue experienced by all partnerships was the lack of familiarity with coastal adaptation planning frameworks and processes. This seemed to be an issue for the CVRAP partners. When asked to clarify what that meant, a senior state government officer blamed the lack of expertise within the partnership and in particular the leading organisation NACC, to implement it:

The CVRAP framework is a great start for progressing coastal adaptation planning but it requires additional work and not many know how to refine and most importantly implement it. I do not think that NACC has the expertise to do so and the local government simply doesn't want to do it. (Senior Officer, WA DoT. Interview May 2011)

A follow-up interview with a local government representative on the TAG provides interesting reflections on the challenges faced by the partnership which included lack of shared understanding and different goals and priorities:

Well, I do not think there was a shared understanding of who we were and what we were doing. I do not think a lot of people are particularly comfortable with what the framework actually means and entails. (Director of Planning, CGG. Interview April 2012)

According to NACC too much was expected from a non-government organisation to understand, refine, coordinate and help implement the CVRAP without a much clearer commitment and support from the other partners. From my point of view as the coordinator of the CVRAP I felt that the framework would have been a great opportunity to enhance each other's capacity for mutual benefit, to develop solutions for a common purpose and to show leadership for coastal adaptation in the region but also in the state. However, in every meeting the focus would shift back to localised and politically urgent issues and I was reminded of the risks that the local government and the port authority would be exposed to if they were to pursue the CVRAP in the current governance context.

My involvement in the partnership made me reflect on the mutual relationship between shared goals and collaboration for coastal adaptation planning: on one hand meaningful collaborative approaches can help achieve shared understanding and consequently develop shared goals and long-term commitment; on the other hand effective collaboration can help goal convergence. I could also see a strong distrust between local and state government agencies and that such distrust and frustration were somehow transferred onto NACC. This highlights the huge challenges that boundary organisations face in dealing with complex decision making issues.

The issue of inadequate governance for adaptation was raised by the CEO of CGG who commented that local government initiatives on such complex issues are pointless if there is no formal support from state government both in terms of funding and policy. He also expressed concerns over investing too many resources on something that wasn't completely understood and endorsed by policy.

The CVRAP case study provides a clear example of how uncertainties with regard to the problem, the process and the policy context can translate into poor commitment. The CVRAP partners got together to solve a common problem but

different priorities and agendas, lack of clear policy guidance and leadership for adaptation meant that the partnership lost track of its vision.

The framework proposed was too complex and the partners tried to make sense out of it but they could not see a way forward. In addition GPA and CGG, despite an initial interest in sharing resources, did not want other stakeholders to be involved in coastal decision making processes. The role of the NACC was therefore confined to coordinating, but primarily providing, resources for projects that were either of regional scale (hence not a priority for the local public agencies) or projects that were going to address localised erosion issues (e.g. the contentious Beresford project).

The issue of lack of familiarity with coastal adaptation planning was not unique to the CVRAP. The PNP also experienced throughout the years several issues with methodological approaches, interpretation and applicability of scientific findings. However, the group demonstrated a stronger commitment to working together in the long-term to unravel such difficulties as described by the PNP coordinator:

All partners are now committed to the common purposes and goals of partnership activities. Such high level of commitment is demonstrated decision of making the PNP into an incorporated body. (PNP Coordinator, CoM. Interview September 2011)

The key to the TCAP success despite the common difficulties described above hand, according to a senior officer at CCC lied in the ability of the project partners to develop shared understanding, goals and priorities; however, goals and priorities do not have to be rigid:

Coastal adaptation planning is an evolving process. We still do not know much about this process and where it's going to take us. We are committed however to calibrate our views and goals as we learn more about it and we are aware that collaboration requires us to compromise. (Senior NRM Officer, CCC. Interview June 2012)

Overall the majority of the respondents thought that collaboration is an evolving process which might be different for each stage of a coastal adaptation planning process. There was also an acknowledgment that collaboration at the policy development and implementation phases is definitely more difficult. A senior local government officer on the PNP commented that interdependence and shared commitment are typically higher at the beginning of a coastal adaptation planning process but more difficult to achieve as the process shifts towards the development of adaptation strategies and even more so during the implementation process:

You can have a loose association, you can have agreement to shared funding, you can have a consultant or a group of consultants experts in their field working on delivering a document or documents but it's going to be a little disparate in being able to cater for each individual entities requirements. (Director Planning, City of Bunbury. Interview May 2015)

However, for some this didn't necessarily mean that collaboration has failed. According to a senior officer on the PNP collaboration can still help assisting decision makers:

That's where you should have appropriate bureaucrats in place that have an ear to what the partnership is saying, particularly to put forward the key messages. (Director Planning, City of Bunbury. Interview May 2015)

The interviewees were also asked if the partnership's goals aligned with those of the community. The PNP and the CVRAP appeared to be quite disengaged with their coastal communities on this issue. For example, the PNP coordinator commented that the community did not seem particularly engaged in the climate change debate especially at the beginning; rather \ the initial stimulus for a climate change impact assessment came from the elected members:

I do not think Council gets a strong push from the community to deal with climate change. Yeah, like 'fix this, we're getting erosion issues here', yeah so localised events really, but nothing to do with climate change. (PNP Coordinator, CoM. Interview September 2011)

A senior officer at the CoB confirmed this and added that community is more likely to react when Council decides what strategies to adopt in certain areas:

I guess, also, there has not really been anything to really galvanise the community onto a position. That will come when areas are actually nominated in terms of protection and retreat and that's when you're likely to go the people who are directly affected, you can see that they're affected adversely by the policy, that will then start coming out. (Town Planner, CoB. Interview May 2015)

By contrast, the initial adaptation work undertaken by CCC was strongly driven by community concerns about the current and future impacts of coastal erosion and inundation and community priorities.

The interviews also revealed that shared, and most importantly long-term, commitment from an organisation is a capacity issue:

And also...even if they are interested in it as individuals, as the CEO or staff, they're limited in how much they can engage with it due to the priorities of their organisation. (Sustainability officer, CGG. Interview April 2012)

However, a state government officer commented that collaboration can help addressing capacity issues particularly in smaller organisations:

PNP has really benefited smaller local councils because it's given a whole coastline approach to it and actually developed a lot of methodologies that normally they would not have the resources for. Bigger councils are better off in the sense that, again they have more capability, more resources. (Senior Manager, WA DoP. TAG meeting May 2011)

6.1.2 Principle 2: Policy integration and coordination

The concepts of policy integration and coordination are closely linked. With policy integration scholars refer to policy objectives being consistent, comprehensive, aggregate across policy levels and sectors. Coordination refers to the need to ensure that there is no redundancy or gaps in policy and services.

The majority of the respondents felt that effective integration of adaptation objectives in government policies and decision making and effective policy coordination for coastal adaptation across the different government tiers was not occurring. A common view among the respondents was that adaptation considerations should be addressed coherently and consistently in all relevant policies at the national, state and local level and gaps minimised. For a senior manager at DoP the current coastal adaptation governance framework is a state of complete disorder and confusion to be able to deliver a coordinated approach:

Policies are in a state of confusion and there are huge gaps. As a result we are at the mercy of tribunals. (Senior Manager, WA DoP. TAG meeting May 2011)

From a local government's point of view, given the lack of support from the federal government, it is the state government that has to step in and provide a state-wide policy framework that can enable the integration of climate objectives into sub-policy instruments and also provide a policy coordination role. During the *first round of interviews* respondents felt that coastal planning policies both in Tasmania and WA failed to provide adequate guidance for coastal adaptation planning.

A former Tasmanian state government policy advisor and now active member on numerous coastal adaptation committees commented that vertical policy integration in Tasmania has been held back by an old and inadequate state coastal policy:

Everyone agrees that the old Coastal Policy has run its course, and needs replacing (Research Fellow, University of Tasmania. Interview May 2013)

This sentiment was unanimously shared by respondents from Tasmanian local government, LGAT, consultancies and universities. However, from a TPC's point of

view coastal governance does not need to be further complicated and state policies should be high-level statements which should only provide general guidance:

There is a strong view in the Commission, and particularly in the planners attached to Commission, that the less regulation the better, and the last thing that we want is another new statutory body maybe, or coordinating body, or a new piece of legislation. (Policy Advisor, Tasmanian Planning Commission. Interview May 2013)

This was a sentiment shared by another WA senior state government officer at the DoP who argued that adaptation objectives should be integrated into every day decision making mechanisms rather than adding a new policy layer:

I think that we have, rather than just saying we need a new layer, we have to integrate it into the existing systems and approaches... I think it would be better. (Acting Director, Policy Coordination and Development, WA DoP. Interview May 2011)

Many respondents particularly within local government, there was a disconnection between state policy goals and local level needs and that this was attributed to the state government top-down approach to policy formulation which occurred with minimal consultation with local government. Local government respondents felt that this was a way for state government to prioritise economic growth over environmental care and social justice and to decrease state government involvement in local adaptation issues.

In WA, prior to the revision of *SPP 2.6* in 2013, similar comments were made in regard to the inadequacy of the state coastal planning policy in dealing with coastal hazard risk. This was described as a major issue for local governments who felt that policy integration and coordination is key to achieving adaptation outcomes at the local level. Without it local government respondents commented that local government would be too exposed to liability risk exposure as explained by the Mayor of the CoM:

I mean the reason these studies are 'ad hoc' is because there has not been the ability of the state government agencies to set up a framework to coordinate all these things so there just has not been enough effort going into it.. (Mayor, CoM. Interview November 2012)

In Tasmania, despite the inadequacy of the state coastal policy, at the local level local governments were successful at achieving the integration of adaptation objectives into local policy mechanisms through the coastal overlays and planning provisions which were developed through collaborative means. This approach was

regarded as highly successful by the respondents including state government as well as university and private consultants:

The State Coastal Policy provides some loose guidance, but councils like CCC and now Kingborough have been doing some really interesting and innovative work. (Research Fellow, University of Tasmania. Interview May 2013)

This shows that policy integration in local government policy and decision making can still occur in the absence of a strong overarching policy; however the Tasmanian case study seems like a unique and isolated case. Further, a WA state government officer argued that whilst a state-wide policy can provide better policy coordination, a state-wide policy does not always guarantee effective adaptation responses at the local level:

So it's coordination in a sense of having the Commission (WAPC) setting state policies and things that influences the decisions at the local level. So state-wide policy provides a coordination function. (Manager Planning Team, WA Department of Planning. Interview April 2011)

Follow-up interviews with local government officers in WA revealed that the revised SPP 2.6, its more detailed guidelines, the sea level change statement and the CHRMAP process have provided better guidance in regard to planning for future development on vulnerable areas. However some key challenges for integration across policy levels remain such as the interpretation of policy objectives and the applicability of such objectives at the local level:

At the end of the day us at the local level need to understand policy and ensure that we adequately take such objectives into account when developing our own policies. (Senior Engineer, CoB. Interview May 2015)

From a local government perspective SPP2.6 is still too vague in regard to methodologies for integrating social, economic and environmental values through spatial planning instruments:

SPP 2.6 recommends methodologies for undertaking risk management following the Australian standard approach but how you actually deal with risk management really didn't come through the stuff that is supplementary to 2.6. (Town Planner, CoB. Interview May 2015)

For a senior officer at the City of Bunbury SPP 2.6 is too closely associated and influenced by sectoral interests and priorities:

I do not think it [SPP2.6] goes far enough. This is why we need a very clear, pragmatic and honest approach to coastal adaptation planning which is not so influenced by political and economic interests. (Director Planning, City of Bunbury. Interview May 2015)

For the Director of Planning at the City of Rockingham SPP 2.6 fails to provide clear and practical recommendations:

So we're still coming to terms with how that might affect our next generation of planning schemes and it may be that the local planning policy has a lot more weight in it than what we actually choose to put in the scheme, because we can dynamically manage the local planning policy. (Director Planning, City of Rockingham. Interview May 2015)

From a local government point of view achieving the integration of social, cultural, economic and ecological values into the adaptation planning process and into everyday management and decision making in the organisation is still a major challenge in WA. At the time of the interviews local government felt that this wasn't in place however the follow up interviews revealed that progress was made on this front:

We are trying to balance economic, social and environmental considerations in our decisions and in principle we accept that this is our role however SPP2.6 is not clear as to how this should be done and I do not think we are quote there yet. (Director Sustainability, CGG. Interview March 2012)

Several respondents both in Tasmania and in WA felt that a piece of legislation (such as a Coastal Protection Act) would provide a more coordinated and coherent set of policy directives (than just a policy) by bringing together all management and planning under the one framework. A member of the Tasmania Coastal Alliance felt that Tasmania needs an overarching coastal legislation similar to the one adopted in Queensland, New South Wales and Victoria:

I believe that Tasmania needs a Coastal Management Act that establishes the framework that would require the statutory policies to integrate climate objectives.. like the Queensland model. I think that the Coastal Management Act would set up institutional arrangements, we would need high-level coordination to achieve this though. (Member of the Tasmanian Coastal Alliance. Hobart Workshop June 2013)

Others commented that a coastal coordination council should play that coordination role. Many local government representatives were concerned about the WA Government choice to reduce the number of committee members on the WA Coastal Coordination Council and to not call any more meetings.

The issue of poor cross-scale policy coordination was discussed during the BROCC workshop. According to a state government officer from DoP coastal adaptation should not be dealt with through the planning system only and that better coordination is needed across state agencies responsible for the management of the coast such as the DER and the EPA:

I actually feel like our department and the DER and EPA are not working together on this issue. (Senior Planner, WA DoP. Interview June 2012)

A policy maker at the WA DoP commented that improving policy coordination requires additional resources and stronger political commitment:

DoP provide advices on how they fit with SPP2.6, we send them down to DoT for input from their side of things but they do not have the resources. Really that team needs to be doubled. I do not think their Director General has any commitment to it (Acting Director, Policy Coordination and Development, WA DoP. Interview May 2011)

A senior officer from the WA DoT commented that the problem is the lack of political support towards climate adaptation at high levels of government. The same person praised local governments for trying to find ways to undertake adaptation planning in this political and economical context by collaborating with one another and sharing resources and knowledge:

I think information sharing is quite important... and the same at the Federal level... I think their role is much as anything else is to facilitate the sharing between the States... (Senior Coastal Engineer, WA DoT. Interview May 2011)

During the BROCC workshop participants explored the role that adaptation planning partnerships can play in achieving policy integration for coastal adaptation. Respondents from various sectors and levels of government concurred that adaptation planning partnerships have been instrumental in increasing the political demand for better integration and coordination of coastal adaptation policy. Below is a comment from a senior officer at the WA DER in relation to the role of collaboration for policy integration and coordination:

Partnerships for coastal adaptation planning can be very effective at sharing knowledge, advance best practices, identify required operational and governance capacities for implementation as well as provide ongoing feedback to policy as necessary based on policy learning. (Principal Policy Officer, WA Climate Change Adaptation Unit, Department of Environment and Regulation. Interview June 2014)

The same sentiment was shared by the TCAP and the PNP partners who felt that adaptation partnerships played an important role. However, a local government officer felt that to be successful adaptation planning partnerships (particularly the local government driven ones) may not have the capacity and ability to coordinate adaptation policy across the state and that state government needs to provide that level of support through the partnerships:

Yes we [PNP] have been doing a lot of work to try to ensure coordination of policy across the region but ultimately it is not our role, it is state government's. (Town Planner, CoB. Interview May 2015)

The majority of respondents agreed that despite recent improvement in the way that policies take into account coastal hazards, practical evidence of integrated coastal adaptation policy is still limited. Key challenges include the ambiguity of policy goals and objectives; the imprecision of methodologies and inapplicability of policy instruments; poor policy dialogue and lack of governance mechanisms that can help achieve policy integration and coordination. Hence, for many respondents collaborative approaches are crucial for the successful integration of coastal adaptation objectives into policy and into every day decision making processes, and for effective coordination across multiple levels of government especially where adequate governance mechanisms are missing.

6.1.3 Principle 3: Long-term political commitment and leadership for adaptation

The PNP and TCAP partnerships show that high-level political support for adaptation is a necessary prerequisite for enacting adaptation planning processes. Respondents felt that coastal adaptation is a mainstream political issue and that long-term commitment is crucial to support ongoing cycles of adaptation planning.

The issue of competitive political priorities was described as a key barrier to political commitment for coastal adaptation both at the state and local level. An officer from the CGG commented that adaptation was not high on the City's political agenda due to other pressures being perceived as more urgent and due to a lack of awareness about adaptation and its implications among staff, councillors and community. Most importantly he argued that as a result of poor engagement with the community on this issue and public expectations and values often being ignored political support for coastal adaptation in the City was minimal. This has resulted in insufficient attention to the coastal problems, short-term fixes or insufficient allocation of resources for adaptation research.

(..) when you talk about climate change its about values, its about how we're going to live, its about what's right and just and important, and grappling with those sorts of issues is a political thing. So it's not an organisational/institutional thing it's a political thing. (Sustainability officer, CGG. Interview April 2012)

There were mixed perceptions regarding coastal adaptation among the CGG councillors. At the time of the interviews some councillors were still very sceptical

about climate change impacts. Others indicated that they were very concerned about the potential impacts of climate change on the coast and keen to support adaptation research and policy although felt that Council was not united on this.

The issue of climate change competes with many other priorities. Anyway, no I have not seen the report and I was not involved in the CVRAP process. I am not sure that the community has been either...(Councillor, CGG BROC Workshop August 2012)

A CGG councillor commented that just political leadership is not enough. Leadership has to come from all levels of governments, industry and community. Community has in fact a key role to play in preparing for future climate:

And I guess it's a two-way thing though. To be a responsible citizen you've got to have some knowledge, you know, and you've got to accept your role. So it's probably a little bit unfair just blaming the state or local government because it needs to come from both sides (Councillor, CGG BROC Workshop August 2012)

While working at NACC and during the various CRVAP meetings I observed a negative attitude among the local government staff and elected members towards the Geraldton community probably due to the many instances in which community members expressed their discontent with Council about coastal management and development decisions. Many of the comments made during the interviews were merely based on assumptions. Some councillors thought that the Geraldton community was not particularly concerned about the potential impacts of climate change. This was very surprising to me especially given that the City had never commissioned a coastal values study and the only one that was undertaken by NACC was never endorsed:

We (NACC) have done a comprehensive study on community perception around sea level rise and erosion issues and other coastal management issues in 2010. Council never used it and never endorsed it. I do not think there was much push from the senior staff either. (CEO, NACC. TAG meeting May 2011)

The interviewees conducted with the PNP partners and the TCAP partners reveal a stronger role of elected members in the coastal adaptation planning process. According to the former Mayor, the political will of the elected members was a critical condition to enacting adaptation action at the CoM:

Council was very keen to support adaptation research. Without that political will on behalf of the elected members, it would not have happened. (Mayor, CoM. Interview November 2012)

An officer from the WA DER, Climate Change Unit commented in regard to the CoM Council's leadership:

I think the leadership of Mayor Paddi Creevey and before when she was a Councillor was key to the CoM's proactive involvement in coastal adaptation planning. (Principal Policy Officer, WA Climate Change Adaptation Unit, Department of Environment and Regulation. Interview June 2014)

Another point raised by the former Mayor at CoM is that in order to be properly addresses, climate adaptation issues need to be elevated to CEO status because it is:

(...) about the risks to the entire Council.. (Mayor, CoM. Interview November 2012)

The CCC in particular has benefited from strong local and consistent political support. A CCC officer and a LGAT officer commented that the involvement of mayor and councillors throughout the process has been key to securing ongoing Council's support:

Council has provided political back-up for improving preparedness to climate change adaptation in the coastal zone and has provided support to administration for implementation of related tasks and activities. (Senior NRM Officer, CCC. Interview June 2012)

A senior consultant from SGS commented that CCC Councillors played a key role in championing adaptation at the local level by listening to community views and requesting technical studies to support decision making.

Coastal adaptation starts with the aldermen. (Director, SGS Planning and Economics. Interview May 2013)

A CGG councillor mentioned that, often, misinformation and private interests have a strong influence on decision making especially in coastal development:

The CEO is very supportive of councillors putting motions in and on climate change and on environment issues, it's up to councillors. I think that some councillors do not include that in their role. They'll react but they're not proactive, I think. (Councillor, CGG BROC Workshop August 2012)

For a councillor leadership for adaptation means a stronger focus on community involvement:

Leadership for me means that we are prepared to ask the community what their priorities are and how they perceive risk and most importantly that we are going to make use of this information. (Councillor, Shire of Dandaragan. BROC Workshop 2012)

According to a Research Fellow at the Institute for Marine and Antarctic Studies at UTAS political leadership means also giving skilled staff the necessary resources to explore and invest in new projects and embark in long-term initiatives:

And I think that the other thing with the lesson from Clarence is that a very good and astute council staff senior officers who were able to do significant things within sort of their work plans and things and be supported by their elected members of council, in a sense. (Research Fellow, University of Tasmania. Interview May 2013)

The issue of local level political support sparked some interesting discussions around the need for stronger leadership roles in support of adaptation from state and federal government. This was an issue raised by the majority of the respondents across the three case studies.

The need for a stronger leadership role from the Australian Government was recognised as crucial particularly by state government officers for coordination of national and state funding for adaptation studies and technical assessments:

In respect to leadership, I think the federal government has got to take the leadership role. So invariably the parties have to come into line with their angle on things so they can tap into some of that funding opportunity but also they've got the resources to do the larger vulnerability like the Smartline and other sorts of assessments that are done. (CSCA Coordinator, City of Cockburn. Interview June 2013)

A stronger leadership role from the Australian Government was recognised as important also in terms of providing clarity on roles and responsibilities for adaptation planning across all levels of government.

The issue of poor leadership for adaptation which in turn causes overlapping and uncoordinated action between states and the Australian government was raised by a senior officer at WA DoP:

The Feds want to tell the states what to do, they want to force them to do things but they do not want to fund it and they do not want to take any responsibility. (Senior Manager, WA DoP. TAG meeting May 2011)

In the initial round of interviews both the WA and the Tasmanian Governments were criticized for not taking a strong political stand on climate change issues. From a local government point of view, adaptation planning requires a state-wide approach and political support:

There may be things that the council can do itself – but what we really need is a state-wide consistent approach and strong political support from the Cabinet. (CEO, CGG. Interview September 2011)

According to a state government officer, champions are needed to drive leadership at the state level but this can be risky for those individuals.

We need a person in state government agencies who is prepared to stand up and say things that are not necessarily palatable. Where we need a state champion. It's tricky, you know because they're all appointed by government... (Senior Manager, WA DoP. TAG meeting May 2011)

Lack of leadership, commitment and support from state government was an issue for the three partnerships during the early days of coastal adaptation planning. This was true in particular for the CGG who instead of taking advantage of the partnership arrangement kept blaming the state government for not providing clear directions or the CVRAP framework itself:

The Department dumped this framework on us saying, now explore it but did not commit any resources for its implementation. (Sustainability officer, CGG. Interview April 2012)

Instead, the PNP and CCC demonstrated that in the situations where there are no top-down recommendations or legal requirements from the national level or the state level, local government can still enact change by taking advantage of other triggers such as bottom-up pressure from constituency, urgency associated with extreme events or through the lobbying power of collaborations among local authorities. State government's leadership was felt as particularly important to advance adaptation in some Councils where climate change is not a priority especially where state policy is inadequate:

So that that level of awareness among Councillors, I think, is there to a small degree.... And again, that's where I think you need some sort of proactive state policy, because not all councils are going to be proactive. But there's long-term thinking that's gone into it. It's not just responding to day-to-day stuff and I think without long-term planning. (Sustainability officer, CGG. Interview April 2012)

A professor at UTAS explained that the lack of political commitment for climate change in Tasmania goes back to 1996 when the State Coastal Policy was approved in 1996 by Parliament. The State Coastal Policy was the first of the three new policies to be approved and it was approved when climate change wasn't a priority on the political agenda. According to a senior officer at the CCC, State Government risk aversion is the reason behind the lack of political support:

I think that it's the legacy issues around the coast that the state government has to address – it's about crown land activities. Also State Government is very risk adverse, and very concerned about liability. At this point in time they are not prepared to act beyond that. (Senior NRM Officer, CCC. Interview June 2012)

From a state government point of view it is the local government that needs to step it up and provide stronger political support because for many areas and decisions it is not responsibility of the state to intervene. A senior officer at the WA DoT commented that if state leadership for coastal adaptation is weak local government needs to strengthen local level political leadership through education and community involvement:

Well like I told you it's not a secret that the state government has not committed a huge amount of energy and resources into the environment or the climate change sector. Local governments are better positioned to engage with community, make this issue a community priority and gain momentum. (Senior Officer, WA DoT. TAG meeting May 2011)

A recurrent comment also among local government officers who felt that local government cannot sit and wait for state government to take responsibility:

Local governments in vulnerable areas such as Cockburn, Bunbury, Busselton and Mandurah are beginning to make significant leads in climate change driven by proactive Councils and new leaders across the organisation. (PNP Coordinator. Interview January 2014)

From a state government point of view leadership must also come from local government because on some issues such as development and local planning decisions the state has no control:

From the coastal planning perspective I think the policy direction is pretty good. I guess leadership could always be improved. However, local government controls development in their municipal areas. State government, outside of that and outside of subdivision, has no control so why would the state government start meddling in and telling them what they can and cannot do in development outcomes when they do not have the power to? (Manager Planning Team, WA Department of Planning. Interview April 2011)

The PNP and the TCAP case studies show that leadership from local government and state government staff (administrative leadership) was also crucial.

A CGG Councillor expressed concerned about the role played by the CEO in the CVRAP. The CEO was considered by most councillors as a charismatic and a visionary and therefore very influential in the decision making process; however he didn't seem to wanting to bring adaptation and in particular collaborative planning on the agenda:

It would not be very expensive. The CEO is great, he's doing a lot of good things, but sometimes I think we are not doing the right studies because he's just worried about developing the foreshore.. (Councillor, CGG. Interview April 2012)

Another aspect of leadership that came out of the interviews was that leadership is not linked exclusively to positional power and can also come from scientists, individuals, community groups and NGOs. Consultants for example have been working closely with local and state government to develop methodological approaches for hazard mapping but also to educate government officers and elected members on adaptation issues, which in turn enriched awareness and leadership. A CCC officer commented on the role that a consultant from SGS played throughout their adaptation planning process and in particular on his influence on local and state political support for adaptation:

Clive was involved with our initial impacts report fairly deeply and has been closely involved with us for the last two years on all aspects including talking to politicians and gain support for the Program. (Senior NRM Officer, City of Clarence. Interview May 2013)

When asked if non-government organisations such as NRM groups could also play a role in leading coastal adaptation planning some respondents from state and local government agencies commented that they can definitely play a role. However given that they are not a decision making body they must have full support from the other relevant parties:

Not-for-profit organisations are probably more effective at facilitating linkages between knowledge and action for sustainable development as long as they have the support of the decision making agencies. (CEO, NACC. BROCC Workshop 2012)

For this reason, some respondents felt that coastal adaptation planning is best if led by a government authority:

I think that the way you make the project a success is that the person who benefits the most from it owns the project and runs the project and then it actually happens so I think probably that's the lesson learnt on that project is that it's difficult for a group to continue to put in resources and funding such as NACC when they're not getting any direct benefits themselves (...) whereas if things have been coordinated by local government ... they can see the instant benefits comes back and informs them how to do better planning, you know. (Senior Coastal Engineer, WA DoT. Interview May 2011)

The same sentiment was shared with regard to other organisations like local government associations:

Local governments expect more of WALGA, but because they're at risk of not having state government support, they're actually peeing in the pocket of state government to survive. So they're not truly representing local government, and that's another problem (Participant, BROCC workshop 2012).

In Tasmania the local government association played a stronger coordinating role but ultimately it was the state government that supported the TCAP process:

The local government association was the leader of the TCAP initiative however it is fair to say that it was the state government that provided support and leadership for the TCAP. (Climate Change Officer, LGAT. Interview December 2011)

The other inhibiting factor for the CVRAP was the weak administrative leadership provided by local government. This was proven by the continual change in representation on the TAG and the JSC. This caused confusion over roles and responsibilities over this project, lack of clarity over the objectives and communication issues between different officer levels. The CEO in particular was not providing strategic thinking and operational directions to the officers which lack then translated into insufficient allocation of the necessary resources for the CVRAP. By contrast, the PNP governance was described as being very efficient and representative.

The other important role that was discussed by the respondents is implementation leadership. Implementation leadership is the driving force needed to implement change, to take the outcomes of a project and transform them into tangible outcomes for the community. It also requires decisions on communication of risk to the broader community, a very challenging task for local government authorities. This function is usually performed by Councils and requires strong knowledge on the issue and willingness to challenge existing practices and believes. Implementation leadership was seen as crucial for adaptation and generally something that resides with Councils and Planning Commissions:

So the way that you can incorporate it is through the Council ... Council makes decisions on behalf of the ratepayers... I think you want to set it up such that the state can support the decisions of the council. (Senior Coastal Engineer, WA DoT. Interview May 2011)

After the revision of the SPP 2.6 in WA, respondents felt that state leadership weakened during the implementation phase and that this caused confusion among local authorities:

State government reviewed the policy so that now it provides guidance in relation to coastal hazard management; however they haven't followed it through. Funding hasn't increased. Guidelines are still too vague and basically we [local governments] need to do all the work to see if the policy can actually be implemented. Well, that's not leadership in my opinion. (Senior Coastal Engineer, WA DoT. Interview May 2011)

An important aspect raised throughout the interviews is the mutual relation between collaboration and leadership. The PNP, the CVRAP and the TCAP coordinators shared the same view that collaboration is necessary to strengthen adaptation leadership at the local and state level:

Well I think that Councils working together on this issue has been a powerful and effective way to increase political buy-in at the state level and to make local councillors and staff feel less isolated. (Senior NRM Officer, City of Clarence. Interview May 2013)

The same people commented that a complex process such as coastal adaptation planning requires strong leadership at all levels of government to ensure that each step is well supported, including implementation:

We cannot just have strong leadership for studies and not for development and implementation of policy. To be effective leadership must support all stages and adequately too. (Senior NRM Officer, City of Clarence. Interview May 2013)

In summary, respondents felt that political leadership and long-term commitment are necessary for supporting collaborative coastal adaptation planning; however there are still many challenges to be overcome for achieving effective leadership for coastal adaptation. With a majority of respondents pointing the finger at other institutions as the responsible ones for providing a leadership role, a minority looked introspectively and understood that leadership is something that develops through education, involvement and collaboration. Adaptation planning partnerships were seen as a key vehicle to develop stronger leadership roles across government levels and outside the government realm.

6.1.4 Principle 4: Clear, coherent and flexible policy directions

A lack of clear direction and policy guidance for coastal adaptation planning on part of state government was a key concern for local government across the three case studies. Lack of policy direction can be attributed in part to the lack of political will and leadership discussed above.

The three partnerships, the CVRAP the PNP and the TCAP, formed in response to policy inadequacy, insufficient resources and confusion over government roles and responsibilities in addressing coastal hazard risk. The main difference between the CVRAP partnership and the other two is the willingness of local government to overcome the barriers and challenges to policy development by working collaboratively with other agencies. The CGG was aware that state policy needed

improving but didn't want to play a key role in the shaping of new methodologies and policy and establish better state/local government collaboration.

The initial interviews, before the revision of SPP2.6, local government respondents made it very clear that a lack of clear policy from state government inhibits effective adaptation at the local level, increases local government exposure to liability and is more likely to create additional costs for the community. From a CGG Councillor's point of view it shouldn't be up to local government to take on the responsibility of leading policymaking for adaptation planning especially if state government is not willing to come to the table:

I do not think from a state level that there's good policy being developed to assist local government. (Councillor, CGG BROC Workshop August 2012)

From a local government's point of view the state government should be responsible for the development of methodologies, guidelines and tools for coastal adaptation planning to avoid *ad hoc* approaches and implementation issues down the line:

State government should take leadership and provide us guidance, which is lacking in a lot of areas of government, but yet we do need that. It's not our core service.. (Director of Planning, CGG Interview June 2012)

The former Mayor of Mandurah commented that local governments owe the duty of care to their constituency in regard to coastal hazard management. This means that local government even without clear directions from state government must develop hazard information and local regulatory responses. These could however be inconsistent with higher-level policies and legislative frameworks ultimately causing poor decision making outcomes, legal exposure or decision making stagnation:

Look, it's true that there's been a terrible slowness in policymaking for coastal adaptation on the part of state government. So that's left local governments in a very difficult situation. (Mayor, CoM. Interview November 2012)

The PNP coordinator commented that the state policy vacuum created problems for local government policy development.

State Government is saying, well through policy, that you're damned if you do and you're damned if you do not (PNP Coordinator, CoM. Interview January 2012)

The follow up interviews reveal that most of the WA respondents believed that the revised SPP 2.6 policy has brought some improvement, but more work is needed to ensure that the policy is applicable:

Key strengths of the new SPP2.6 include the use of the precautionary principle, the significance given to community engagement and the need to incorporate social and environmental values in the assessment of potential benefits and costs of a range of feasible adaptation options. The problem is that we do not really know how to do it and there is no funding for it. (Director Planning, City of Bunbury. Interview May 2015)

According to a state government senior officer the strength of the revised SPP2.6 is its flexibility and risk management approach:

The Policy Guidelines and the CHMRAP Guidelines are documents that can be reviewed as better information becomes available and we do not have to wait 5 years to do so. (Manager Planning Team, WA Department of Planning. Interview May 2014)

A senior officer at the CoB commented that PNP has invested a lot of resources and time in developing methodologies for coastal hazard risk assessments in collaboration with state government. Despite all this after 5 years of collaboration, only one out of nine local government has actually completed a CHRMAP and none have yet developed a local policy:

SPP 2.6 recommends an adaptation decision making hierarchy in order to identify and compare appropriate adaptation solutions; however it does not provide guidance on how to actually implement it. On paper it sounds all good but.... (Town Planning, CoB. Interview May 2015)

A senior officer at the City of Bunbury argued that the SPP2.6 is not specific enough and it's causing confusion among local government and landowners:

There's no reason why you cannot provide better guidelines. (Director Planning, City of Bunbury. Interview May 2015)

Responses from senior staff and elected members from the PNP local governments but also from workshop participants reveal key flaws with regard to the applicability and implementability of the CHRMAP framework, in particular: the lack of clarity in regard to standards and methodologies required for the assessment of coastal hazard risk at the scale that is useful to local decision making processes; and the legal feasibility of applying planning instruments for coastal adaptation planning within the existing regulatory framework.

The issue with implementability of policy was raised by many local government respondents including and foremost by the members of the PNP adaptation partnership: according to the PNP Coordinator the WA State Coastal Policy wants to be innovative but there has not been enough research and work done to test the proposed measures and State Government is relying on local government to do that:

SPP 2.6 still needs a lot of work. Local government cannot afford to trial the policy of behalf of the state government without adequate financial support. (PNP Coordinator, CoM. Interview January 2014)

He also commented that there are no formal mechanisms in place for providing feedback to state government in regard to the SPP2.6 and CHRMAP.

There were also some conflicting views in regard to the effectiveness of a coastal policy as opposed to coastal protection legislation.

When it comes to coastal planning there is a fundamental problem that you'd be aware of I am sure that the coastal planning policy does not have to be obeyed. (Senior Manager, WA DoP. TAG meeting May 2011)

In Tasmania there has been several unsuccessful attempts by the Government to review the State Coastal Policy and develop a statewide coastal protection and planning framework. A general consensus amongst the attendees of the Hobart coastal adaptation workshop was that Tasmania is lacking consistency in climate change adaptation policy and the State Government is not taking climate change adaptation seriously:

The truth is that Government does not know how to deal with coastal adaptation in a policy context, or a legislative context. It still needs some serious work. (Research Fellow, University of Tasmania. Interview May 2013)

A former member of the Tasmanian Coastal Marine Branch commented that the policy review process was poorly managed and failed to meaningfully engage relevant stakeholders:

The role of the Coastal Marine Branch was to do our best to implement, and provide advice, and information to implement the policy. But... it wasn't a role that was encouraged, shall we say. (Manager and Steering Committee Chair, Coastal Marine Branch. Interview May 2013).

Workshop participants commented that over the last decade the State Government has invested more resources in data collection and tools (i.e. sea level rise planning allowances and coastal hazard maps) than in policy development.

The information that we have about present day hazards is not as good as we would like, but we're making decisions in the policy situation which is probably even worse than the hazard information. What we need is to understand how to use the information we have to make better decisions, we need to improve policy design. (Director, SGS Planning and Economics. Interview May 2013)

Multi-agency collaboration was seen by the majority of respondents as key to improved policy dialogue although many recognised that even through collaborative

means achieving full policy clarity and coherency might not be possible. According to a Tasmanian senior government officer local policies should be flexible to allow for ongoing review and adjustments as new and relevant information becomes available, whilst state policy and that local planning mechanisms are more effective at responding to new approaches and scientific information:

Policy instruments that are flexible, clear and practical would provide better guidance for developers, local governments and the Tasmanian community. However state policies are not supposed to be flexible documents. (Policy Advisor, Tasmanian Planning Commission. Interview May 2013)

When asked if such dialogue was in place, the majority of respondents (from Tasmania and WA) commented that although there has been some improvement over the recent years, local and state governments needed to establish a clearer and more honest dialogue. Some commented that perhaps organisations such as universities or WALGA should take on a mediation role. In

In summary, the revised SPP2.6 in WA provides a much sounder basis for coastal adaptation than the previous version. It confirms the centrality of sustainability, community engagement and the precautionary principle. In particular the existence of guidelines provides the flexibility needed, for example, for updating as new evidence comes to hand, without having to go through the more arduous process of changing the policy itself. However, local governments still find that there is not enough detailed guidance on how to implement the policy. Collaboration was considered useful but the overall response was that there is a need for formal mechanisms in place at the state level to improve policy dialogue capacity for coastal adaptation.

6.1.5 Principle 5: Embracing complexity and uncertainty through innovation, experimentation and reflexivity

The majority of the respondents were familiar with the broad concept of adaptive management but found that in a coastal hazard management context adaptive management practices were either: poorly understood, poorly supported or poorly implemented. Respondents commented that decision making for the coastal zone today requires good and trustworthy information, ongoing learning opportunities for all parties involved and better organisational skills to deal with uncertainty and complexity. Only a minority referred to improved monitoring activities and occasionally changes of practices as doing adaptive management.

The first barrier to adaptive management identified by the respondents was how to deal with uncertainty of science, of the quality of the information produced and of decision making in highly conflictual and complex contexts. The issue of complexity and uncertainty in the scientific knowledge and more specifically in the coastal hazard estimation (hazard mapping) came up repetitively in the initial interviews as well as in the follow-up interviews. In WA local government respondents felt that uncertainty in coastal risk information and confusion over legal and policy frameworks have been key barriers to changing traditional thinking and business as usual practices and to embracing reflexive management and policy approaches. Interviews with the PNP partners showed that coastal adaptation planning in WA has primarily focused on scientific endeavours (modeling and data collection) over experimentation to reduce uncertainties and explore new options:

We need a robust and defensible methodology for assessing coastal hazards, we still have too many uncertainties in the predictions. Planners need “lines on a map” that are credible and information detailed and accurate enough and we do not have that yet. (PNP Coordinator. Interview January 2014)

Another member from the one of the biggest PNP councils commented that they were not going to develop an adaptation plan until “enough was known” about coastal systems down at the sediment cell scale:

We do not have an adaptation plan no. Until we have a better understanding we cannot talk about solutions. (Town Planner, CoB. Interview May 2015)

For example, the majority of the PNP respondents seemed to be of the opinion that until there is less uncertainty about hazard risk and policy guidance local governments will continue to operate under business as usual:

There are a few feasible options through planning instruments over the long-term but while we wait for better modeling and community support we will continue to rely on coastal engineering measures. (Senior Engineer, CoB. Interview May 2015)

In the follow-up interviews local government respondents commented that the complexity of coastal adaptation decision making and the lack of preparedness within government to deal with the new paradigms and approaches brought by climate change science has hindered adaptation action.

When asked about the role that collaboration played in dealing with a complex system wrought with multiple uncertainties responses varied. For some, the PNP had been instrumental in improving knowledge and information sharing and for increasing capacity within the partner organisations. For others, (even within the

PNP), collaboration has not produced the desired effects. The partnership was not able to successfully deal with data uncertainty, to foster innovation in decision making and to catalyse social learning.

In Tasmania, one of the key people behind the CCC initial work and the TCAP partnership, had a strong view that uncertainty will always be part of coastal adaptation planning. Hence, adaptation planning requires a structured process of investigation that leads to a series of management actions (or adaptation pathways) which are constantly refined as new information becomes available and enacted through trials (where possible) and that incorporates an evaluation process which in turn fosters further rounds of uncertainties, and iterative solutions.

The reality is we have to deal with a lot of uncertainty, and it ain't going away, and even if we spend a lot of resources to try and reduce it, it still is not going to go away, it's just going to be a little less, and it may not effect your decision. So let's get enough of a feeling for the context in this situation, a good overall sense of context but not worry about the detail, because the detail will always be wrong, and that will not change, we cannot fix that, or at least the cost of fixing it... (Director, SGS Planning and Economics. Interview May 2013)

A state government officer commented that the CCC Council's wasn't too worried about the uncertainty of hazard information as demonstrated by the decision to made the hazard overlays information accessible via the local government website.

Liability specifically itself is not going to be addressed as such by the TCAP project. The idea is that the whole liability will benefit from this type of project because it is going to be looking at the values that communities place on living in coastal areas. (Coastal Manager, DPIPW. Interview December 2011)

Uncertainty of hazard information and policy was also a key concern for the CVRAP group however primarily for the CGG. Respondents from the City commented that the uncertainty associated with the potential effects that can result from coastal hazards could give rise to liability issues and lead to poor implementation of management recommendations. Respondents also felt that uncertainty could lead to divergences among different interest groups, resulting in more pressure on local government to reach an agreement or a decision. Others feared that utilizing ambiguous information could have an impact on insurance costs, property values and ultimately negative economic impacts from loss of development opportunities.

The second issue identified by the respondents concerned the ability of their organisations to foster a culture of innovation, experimentation and reflexivity in the management of the coastal hazard risk in the current governance context.

Respondents did not give the same interpretation of and importance to the concept of 'experimentation' in coastal adaptation decision making. In WA the majority of respondents claimed to be practicing 'experiments' and 'trials' but when asked to provide some practical examples it seems that most of these practices were just some variant of trial and error management.

On the contrary in Tasmania, respondents felt that innovation and experimentation was achieved through the introduction of the new planning scheme provisions (the hazard overlays and the hazard code) and through the development of risk management matrices, triggers, adaptation pathways and feedback loops, which according to a SGS consultant are very successful tools for building flexibility into adaptation planning mechanisms:

So the idea is whatever modifications you make, you make them in a way which have the potential to be reversible in the short-term. (Director, SGS Planning and Economics. Interview May 2013)

An elected member on the CCC Council CCC commented that CCC committed to trailing various adaptation options or techniques demonstrates council's willingness to find flexible, low impact and most cost-effective solutions:

With Clarence, the view was taken – and I think appropriately – that if we do consider groins, the first groin will be a trial groin made out of geotextile bags, and it would be in the form of attempt to achieve what a permanent groin might achieve, but we will put that in and we will monitor it for a period of time, subject to its behaviour.. (Senior NRM Officer, CCC. Interview June 2012)

Whilst in WA the majority of local government respondents were of the view that experimentation in coastal adaptation planning is too risky as demonstrated by the limited number of adaptation plans developed and adaptation strategies implemented. From a local government point of view experimenting with planning and engineering is too costly and too risky. In the follow-up interviews, respondents commented that local governments are still cautious about 'experimenting' with policies given that the state policy is still very unclear about the degree of flexibility and consequently (legal) responsibility that local governments have in coastal hazard risk management:

We have tried to be more innovative in our approaches but ultimately we need to ensure that our approach sits with the state policy and WAPC recommendations. I do not know how much freedom to experiment we really have. (Director Planning, City of Bunbury. Interview May 2015)

A similar view was shared by other respondents who felt that innovation, experimentation and implementability are closely linked and achieved through learning. The following interview with a senior planner at the City of Bunbury summarises very well the relationship between these three factors:

Well, in my opinion innovation in management practices is only useful if it can be implemented within the existing legislative framework. Experimentation is key to ensure that innovative approaches can be implemented. (Director Planning, City of Bunbury. Interview May 2015)

In regard to learning opportunities, those respondents who have been actively engaged in an adaptation planning process commented that learning has occurred but that adaptation planning is a long journey...:

Yes, it's important, but it always comes down to how well expressed is that best available information, and what level of certainty there is over it. So it is important to adapt to changing scientific information, and bring it on board and incorporate it. But also it's got to be done; you've got to acknowledge that it takes time to do that. (Senior Planner, WA DoP. Interview June 2012)

Overall adaptation planning partnerships were seen as crucial in providing a learning platform, both internally within an organisation and externally among key stakeholders. The majority of the respondents felt that working together on this complex issues had taught them a great deal, especially with regard to the science behind coastal processes and climate hazards and the key barriers and opportunities for adaptation planning at the local level. The PNP coordinator commented that the partnership had provided an opportunity to all involved to *learn through reflection on doing*:

When you start looking at what we've done, what we originally proposed our methodology is very different to what we end up doing. We have learnt a lot. To be able to actually get your head around the physical vulnerability stuff, the science engineering, the economics, the modelling is impossible for one person to understand all of that stuff. (PNP Coordinator. Interview January 2014)

However, for other respondents, opportunities for reflexivity within the PNP could have been more effective with stronger reflections on the issues of governance and on the lessons learnt as opposed to the issue of data accuracy. Throughout my involvement with the PNP and the CVRAP I felt that the coordinators did not have the knowledge and the capacity to initiate these types of discussions. In one of my notes I note that other arenas or players might be better placed to facilitate reflexive practices for certain stages of coastal adaptation planning:

In my opinion, we need someone with the expertise in planning and governance such as Universities or local government associations who can

come and help these local governments identifying the key issues and moving forward. Especially where the internal capacity is still limited.

Other respondents felt that although many actors were willing to learn and change to more adaptive approaches not many knew how or weren't supported at senior levels by individuals with the ability to view the situation more holistically, reflect on patterns of actions and review decisions in light of this. Hence, the involvement of executive officers and elected members into the process was considered crucial by several respondents. From a consultant point of view the key to success of the TCAP project was the opportunities for learning provided to Councillors:

Councillors are important because they need to know what's being discussed, they need to have thought through the options themselves, not necessarily to make a decision but from the point of view that if someone asks them a question they do not look like idiots..(Director, SGS Planning and Economics. Interview May 2013)

The CGG seemed to have learnt the least given that for the following decade they maintained the same maladaptive approach in regard to coastal hazard management. Nevertheless, the coastal governance workshop organized by the BROCC was considered a great initiative for exploring governance barriers and opportunities for coastal adaptation planning with the other NAR local governments and key stakeholders. A high number of participants mentioned that the knowledge gathered through discussions would have helped them informing work colleagues on the importance of assessing and reducing vulnerability to climate change. The NACC Coastal Conversation Series and the Community Beach Monitoring Program were also mentioned by the respondents as key initiatives for promoting community learning and involvement.

In regard to stakeholder participation and mechanisms for learning the CVRAP and the PNP had delivered quite poorly. Respondents from the PNP felt that the workshops organized by Curtin were useful because they enabled discussions around values and sustainability principles; however, workshop participants felt that this was a one off event and that the community should have been involved from the beginning of the process:

I think... regardless of who does the studies it's essential that the stakeholders are not just ... I think not consulted and told at the end so they're actually somehow drawn in ... sucked in to the process so that they're not just ... they sort of get educated along the way...that's really important and that gets missed quite a lot in studies... (Councillor, CGG BROCC Workshop August 2012)

From a PNP local government officer point of view, it is less risky to bring the community into the discussion about risk mitigation once detailed mapping is completed and adaptation strategies have been developed:

I think most of the weight will actually be on information sheets that we make available to the community where, through that information sheet, we actually provide the one stop shop where we're pulling all the relevant considerations together. At some point in time, and in the probably not too distant future, the city will identify the various areas of protection and retreat.. (Town Planner, CoB. Interview May 2015)

On the contrary, the majority of the respondents praised Clarence's effort in acknowledging the uncertainties and accounting for such uncertainties through dialogues with community about risk and risk tolerance and through appropriate decision making instruments. According to the consultant who ran the community engagement process the focus of the information sessions was not on the level of detail of the maps but on the overall issue and the opportunities for change. Respondents felt that through the TCAP the CCC was successful at sharing information on risk with community and at identifying again with community a range of decision alternatives from which actions are to be selected.

Potential short-term and long-term consequences of decisions were also discussed with community and key stakeholders. This was achieved through a sense of shared ownership, in which the stakeholders genuinely felt that they played a role, and alternative actions were discussed and contrasted without a hidden agenda. A state government officer commented that the TCAP approach and the learning process will provide useful guidance to other local governments:

Our unit after is looking at how we could extend the Clarence project around the state, and how we could take those lessons from that project into the rest of, there's 24 coastal councils in Tasmania. (Policy Advisor, Tasmanian Planning Commission. Interview May 2013)

Another aspect discussed by the respondents (also incorporated in some of the comments above) was that the organisations with key responsibility for enabling coastal adaptation lacked of a specific set of social, economic and governance factors crucial for the implementation of adaptive management approaches. Respondents reasoned that the problem wasn't just about the uncertainty of hazard information but also how to use this information within the current legislative framework. According to a senior planner at the CoB local government does not want to take the lead on this complex matter for fear of legal liability and of adverse community reactions:

Local government faces many challenges surrounding policy interpretation and application. (Town Planner, CoB. Interview May 2015)

It is obvious from the interviews that the coastal governance system in WA is still struggling with dealing with the complex social, political and economic interactions that are obstacles to the implementation of adaptive management. This was mentioned as a key challenge for the WA adaptation planning partnerships; however, their work was praised for trying to improve policy dialogue and policy outcomes; for providing a form of coordination role and links among individuals, organisations, agencies, and institutions at multiple organisational level; and for trying to challenge the status quo of coastal decision making particularly at the local level.

A state government officer from the DER commented the fundamental issue is that the whole governance system requires a paradigm shift:

The key is to challenge the status quo. We will see things change when our governance system effectively starts supporting long-term thinking, sustainability goals and fostering innovation and collaboration. (Principal Policy Officer, WA Climate Change Adaptation Unit, DER. Interview June 2014)

A state government officer representative commented that local governments should spend more energy focusing on long-term issues rather than try to address just urgent and short-term issues.

From a senior officer at the WA DoP the state coastal policy needs to be a more flexible and adaptive document which is better suited to deal with uncertainty of scientific information:

What we want is a policy that can be reviewed as the science informs the situation. (Senior Planner, WA DoP. Interview June 2012)

From a state government perspective the number of studies undertaken at the local level are an example of adaptive management. He also confirmed that although there are no guidelines available to local government for conducting coastal risk assessments, the local government case studies are helping state government developing a common methodology:

It's a very difficult thing to write actually on how to do these types of assessments. We need to do more studies first to understand how we should be doing the studies... you know.. (Senior Officer, WA DoT. Interview May 2011)

About mechanisms for evaluating and incorporating learning into future decisions, the majority of respondents from the three case studies admitted that there has been no evaluation framework to compare outcomes of management decisions. Some planners at the local government level commented that evaluation mechanisms are very important for monitoring and evaluating outcomes but often forgotten about. A few respondents from the PNP felt that WA local governments were catching up with monitoring activities which until now had been inconsistently undertaken throughout the state but that these monitoring activities consisted primarily in monitoring of ecological processes rather than management and governance.

Overall, the common view among respondents across the three case studies was that adaptation planning is undergoing a transition phase during which decision makers are learning to deal the complexity and uncertainty of scientific information, with the new multi level focus and timeframes of decision making. Hence adaptive management practices are something that organisations are increasingly more familiar with, yet are poorly implemented and evaluated.

Collaboration in the form of local or multi-agency partnerships is key to support innovative thinking and experimentation in coastal adaptation planning. However, collaboration can be less effective if the governance system is not supportive of adaptive approaches and more in general does not favour adaptation goals. Learning, capacity building and reflexivity for adaptation are also enhanced through collaborative means but must be fostered at all stages of an adaptation planning and supported/undertaken at all levels of government including state government.

6.1.6 Principle 6: Uptake and use of evidence and value-based knowledge in adaptation decision making

Despite the growing recognition that a broader set of values in relation to climate adaptation needs to be taken into consideration, views and approaches concerning the uptake and incorporation of societal values into the adaptation planning process differed considerably across the three case studies. The need for quality evidence was more widely accepted, by contrast.

In WA, at the time of the first round of interviews, respondents seem mostly concerned about the lack of, if inaccuracy of, data (especially in regional areas) for

undertaking coastal vulnerability studies. Later on despite the progress made in coastal adaptation planning respondents seem still particularly concerned about the level of accuracy that *hazard maps* and their usefulness for local planning decision making as opposed to the importance of incorporating ecological and societal values regarding the coastal zone and perception of risk from coastal hazards. Although a few respondents, particularly within state government, highlighted the importance of considering other values than just economic ones in coastal adaptation decision making.

The following interviews show that WA respondents placed strong focus on the challenges of evidence-based policymaking. The CVRAP framework was designed to incorporate social, cultural and economic values into the adaptation planning process; however the CGG and the Port Authority didn't seem particularly keen to support these types of projects. For example, the NACC *CGG-Greenough Coastal Communities Study* (Beckwith Environmental Planning 2010) was never endorsed by the City and never utilised by the partnership.

A senior officer at the CoB comments on the need for more detailed studies before any adaptation planning can be undertaken confirm the high reliance of decision makers on probabilistic hazard mapping tools.

According to a respondent from one of the PNP partners, local government primary concern is to produce information on risk that is 'robust enough' and 'defendable'. This was dictated by three main reasons, the first one being fear of exposure to legal risk:

Firstly, local government cannot do nothing, we know that. But what happens if the information we produce does not stand up? (Town Planner, CoB. Interview May 2015)

The second reason is the uncertainty and the complexity surrounding climate related information and its role in management and policy:

Secondly, we simply do not know how to interpret the information that consultants and scientists give us. Is it good? Is it robust (Town Planner, CoB. Interview May 2015)

The third reason concerns the difficulties associated with communicating hazards and risks to community and stakeholders:

And thirdly, to be able to respond to the community, because the community will be invariably less informed than what we are and things like the federal

governments' visualisation tool and mapping that they've already got out there could be alarmist. So the community could ask us what do you know and what are you doing about it? (Town Planner, CoB. Interview May 2015)

The PNP coordinator added that from an adaptation partnership's point of view gathering evidence-based knowledge on climate hazards has been really challenging for several reasons. First, local governments, especially the less resourced ones, do not have the expertise to know what needs to be done, at what scale and how:

Well we probably could have done a more detailed study in a specific area where we knew there's a current risk, rather than going through a regional study and getting something which just reiterates what we kind of already knew. But we didn't know. (PNP Coordinator, CoM. Interview January 2014)

Second, there are not sufficient resources so local government either request too much of consultants for the money offered or undertake parts of a coastal adaptation planning process with community engagement as the sacrificial element.

Third, different consultants provide different methodological approaches and this can generate confusion among the end users or contrasting results:

I think ...[consultant's] and PNP stuff ... are not apples with apples ... putting another layer of error on another layer of error is going to alter a study that's had some major compromises, because time frames and costs and knowledge and things. (Town Planner, CoB. Interview May 2015)

Only a few respondents argued that the uncertainty or incompleteness of technical information should not be used as an excuse for holding back decisions regarding the coast:

We do not need any more high level data, we've got enough knowledge now to take action – but we're not taking action, and I do not think that not having the level of detail should be a hold up, because there's always going to be better and more accurate data come out. (Director of Planning, Shire of Dandaragan. Interview March 2014)

During the follow up interview some respondents made specific references to the importance of collecting and effectively integrating information on services that ecosystems provide and information on community values, tolerance and responsibility towards risk and people's attitudes towards possible adaptation measures. A senior state government officer commented that decision making processes must integrate also value-based information:

The decision making perspective needs to be connected with a broader 'decision-context perspective' that focuses on how the societal system of decision processes affects the manner in which a particular problem is

addressed. (Principal Policy Officer, WA Climate Change Adaptation Unit, DER. Interview June 2014)

A senior officer at the City of Bunbury argued that risk assessments alone cannot achieve much in term of adaptation planning and that local governments need to take community values into consideration in the development of feasible strategies. He talked about the importance of empowering community to build resilience to climate change and the importance of using a variety of participatory tools to achieve that:

That just doing risk assessments alone will not achieve that and one of the things that has had you overcome the barriers that I mentioned about lack of confidence in the science, lack of awareness about the implications of climate change and therefore a commitment to actually really look at it seriously. (Director Planning, City of Bunbury. Interview May 2015)

In my role as the Cockburn Sound Coastal Alliance (CSCA) Coordinator I observed that although the partnership was committed to better integrate ecological and social values into the risk assessment process and into the adaptation planning process it remained a very complicated task which is potentially very resource intensive.

In relation to the acquisition of information about social values and perception about coastal risk the initial interviews show that in WA community engagement for coastal adaptation has been a low priority, or poorly managed or information acquired poorly integrated into the decision making process. However, the majority of respondents in local government felt that coastal adaptation is a complex matter and that there was potential for improvement within their organisation.

During the initial round of interviews local government respondents expressed concern over the involvement of community in coastal adaptation decision making. Responses indicated that this reticence arose from the uncertainty about the extent of liability and responsibility of local government to address climate change, from unclear policy directions both at the local and state level, from the uncertainty associated with climate hazard models but also from fear of losing control of the decision making process and of political backlash. Two years later the follow-up interviews reveal that although technical reports and maps had been made available to the community in WA the majority of the local government failed to adequately engage with their communities on this issue.

The interviews with the CGG councillors, community members and local decision makers disclosed a series of key barriers to effective community engagement that

are common in coastal adaptation planning. The first key barrier concerned issues with institutional trust and communication between the local government and its community. Community members mentioned the long history of poor community engagement and a legacy of questionable decision outcomes has caused increased distrust and lack of confidence in local government with regard to coastal decision making.

A resident pointed out that the Geraldton community has always eager for a more active role in the coastal management decision making but that both staff and elected members have been reluctant to engage community in a deeper level or to take community's views into account. This has often escalated at the council level generating tensions between elected members (who felt that they were truly representatives of the local community) and members of the local community (who felt either poorly represented or felt that Council's decision were too influenced by a 'vocal' minority of influential people):

Community engagement requires a relationship built on trust and integrity. The problem is that we do not trust the City and they do not value our opinion because... it would cost them more time and money. (CGG resident, Interview April 2012)

The councillors interviewed had opposite views on this. A councillor argued that community's reaction is usually driven by a few dominant personalities and that overall people are not particularly interested in being involved in discussions about coastal hazard issues unless they are directly affected:

But really the only source of conflict between the strident environmentalists and the city is where the conflict lies. I think you'll find everyone else is I've got my footpath I do not really care, if my house does not get washed away I do not really care. (Councillor, CGG BROCC Workshop August 2012)

A local government officer (and also a TAG member) argued that when a local government prefers a reactive or deferred approach to community engagement it means that it sees climate change as a too complex issue that is addressed from the moment that becomes a 'political risk', or a 'risk to the organisation', in other words when the risk of not responding to community concerns and values becomes too high for the organisation not to act:

So it's not an organisational/institutional thing it's a political thing. But until it becomes a political risk for them to not deal with it, it's not going to become an issue of moral significance for decision making. (Sustainability officer, CGG. Interview April 2012)

From my direct experience, the Geraldton community has always been extremely interested in learning about coastal issues as demonstrated by the success of the Coastal Conversation Series Program which I designed and coordinated while working as coastal coordinator at NACC. However, the community was always extremely unsatisfied and disillusioned about the information provided and the lack of transparency of the City's decision making processes. Residents commented that the City has never shown interest in creating opportunities for community members to share experiences and develop new ideas (this was seen to be predominantly a NRM role) or gathering information on community's perspectives and priorities on coastal hazard issues. A Councillor confirmed it too:

No we have not done any studies to look into what community's priorities may be. I guess for now it is all anecdotal and comes through the democratic process. (Councillor, CGG. Interview April 2012)

During the BROC Coastal Governance Workshop, state government officers shared similar views:

The role of community engagement in the coastal governance structure as in the role that the community is allowed to or does play in the policymaking, is really, I think they are really under-utilised as a resource in WA. (Principal Policy Officer, WA Climate Change Adaptation Unit, DER. BROC workshop August 2011)

The CoM and the PNP also share a poor history of community engagement in coastal adaptation planning despite being considered important:

What we do not really have, yet, is information about what the community think and want, apart from the few bits in the paper about. (Mayor, CoM. Interview November 2012)

Other PNP local government respondents commented that community had not been sufficiently engaged:

I do not believe the community has sufficiently been engaged on what this PMP means. (Town Planner, CoB. Interview May 2015)

Other commented that conducting studies on community's attitudes and values wasn't a key priority especially given the lack of funding from state government for undertaking these baseline projects. Respondents from the CoB explained that two forums were held in Mandurah and Busselton as part of a participatory mapping process run by Curtin University for exploring people's perceptions, expectations and attitudes in relation to sea level rise and coastal hazard issues.

During a follow-up interview a CoB officer commented that these workshops and associated reports were pursued by the City simply because of the substantial financial support from Curtin University. When asked about the usefulness of the community engagement process the director of planning at the CoB commented that the mapping workshop in his report and recommendations to the Council, while the mayor of the CoM said the that workshop conditioned the decision making environment, and the city planner said prior to the workshop he did not accept climate change and after the workshop he did.

In Tasmania the approach to community engagement was very different. The CCC was highly praised by residents, stakeholders and government for their effort in leading an open and transparent process and for investing additional time and resources in capacity building initiatives. Respondents commented that CCC residents were given the opportunity to be engaged right from the beginning of the adaptation planning process through in meaningful discussions regarding coastal hazard risk and potential adaptation options. This gave a greater sense of being in touch with decision makers and decision making processes during the entire adaptation planning process compared with Mandurah and Geraldton where engagement was one-off or ad hoc.

A different approach all together compared to the CVRAP and PNP approaches. The CEO of the CGG explained that engaging the community too early in the process would have raised community expectations, increase tensions and political pressure and ultimately potentially increase local government's legal exposure. This response from the coastal project officer at the CGG (also member of the TAG) commented that community shouldn't be involved in the technical aspect of a coastal adaptation planning process:

I think it's not a good idea to get the public involved in technical projects which should be only discussed between professionals. (Coastal Project Officer, CGG TAG meeting June 2012)

On the importance of involving community throughout the process, PNP respondents were in the opinion that community concerns *typically* come into play when people are directly affected by a management measure so it's important that community is engaged at that stage (rather than throughout the process):

I guess, also, there has not really been anything to really galvanise the community onto a position (Town Planner, CoB. Interview May 2015)

The consultant who was engaged by CCC to facilitate the community engagement process commented that the investigation of community baseline attitudes towards coastal hazard risk was commissioned right at the beginning of the process, at the same time as the vulnerability assessment, showing great commitment from Council to understand community's concerns and values. The CCC approach has provided a great example to other coastal local governments. A former state government policy maker commented that in Kingborough, despite having fewer high magnitude events, Council has committed to undertake a through community engagement process:

In Clarence it was the ideal situation, whereas in Kingborough there has not been that sort of event that focussed people's minds. Anyway Council has committed to doing further work and more detailed analysis and in particular they are about to launch a community, a more intensive community, consultation process there to get the community on board (Research Fellow, University of Tasmania. Interview May 2013)

At the time of the initial interviews in WA the issue of accessibility of information about coastal hazard risk to community was repeatedly brought up by local government respondents. Coastal hazard information was either not available to community or not provided in a format that was practical and accessible. This attitude persisted throughout the interview period despite examples from the eastern states and from the Town of Cottesloe's attempt to inform community on coastal risk.

Lack of accessibility to information was a key issue for the CVRAP partners in many aspects. First of all the CGG didn't want community involved in the CVRAP process and the Community Advisory Group was dismissed after the first meeting. Secondly councillors were also excluded from any of the CVRAP committees. These two decisions by the CGG and Port's CEOS concerned greatly the other members of the CVRAP such as NACC and DoP that in many instances during the meetings expressed concern about the lack of transparency, representativeness and openness in the process:

The decision by CGG to exclude councillors and community from this process does not surprise me. It is the typical 'top down' information and consultation process which happens at the end of a project, quite backward thinking I'd say. (Senior Manager, WA DoP. TAG meeting May 2011)

Residents also discussed the role of non-government organisations like NACC for facilitating community involvement. These organisations were seen as 'unbiased' and open to share information. From my experience to be effective non-decision

making organisations need the cooperation from ‘champions’ within local and state government agencies who can help progressing the project within their organisation, help advocating for better community involvement and for the improvement and adoption of adaptation policy. The CVRAP case study shows that without leadership and support from ‘coastal champions’ external organisations and even partnership arrangements are more likely to fail.

In Tasmania respondents commented that the CCC was not concerned about releasing the maps. In fact the CGG coastal hazard maps were the first hazard maps published online in Australia. The SGS consultant involved in the TCAP initiative explains that the decision as to publish the hazard maps or not was a no brainer:

And I am saying “look guys, this whole process is a waste of time if you assess hazards and nobody knows what they are, and therefore cannot take that into account when they make decisions about where to buy or build houses, or any other investment for that matter – you’ve got to publish the maps”. It’s not maybe or should we, it’s just that’s the point. So they published the maps. (Director, SGS Planning and Economics. Interview May 2013)

Another issue raised by community members concerned the quality of the information provided during a consultation process and the role that consultants play in providing and translating technical and strategic information on coastal hazard risk. A Geraldton resident commented the typical consultation process undertaken by the CGG involves a small and unrepresentative sample of citizens. The information presented by the appointed consultant is either too technical or insufficient or unclear with regard to the potential consequences of each alternative management strategy. The consultation also ‘feels’ like the organisations has already decided on the preferred management alternative, and that is engaging the community to gain support for that alternative. This resident was very concerns about the contents of the report presented during the consultation period:

It is absolutely imperative that the consultant's report is released as a draft for public comment and scientific peer review and that the consultant's should have the option of accepting review comments or explaining why review comments are not justified. (CGG resident. Interview April 2012)

This was an issue raised by the PNP members as well when a few respondents commented that the consultants have provided information which they didn’t understand hence they were worried about providing the information (as it was) to the community. A respondent from a PNP local government argued that meaningful

community engagement requires a shift in the nature of the relationship among professionals, local government and communities. The PNP coordinator commented that to be successful community engagement needs to have a strong local government ownership and more resources are required to support local governments acquiring information on community values:

Community engagement is primarily a relational process that operates at a local level but smaller local governments do not have the necessary resources and skills to coordinate an engagement process. We were disappointed with the consultants who promised to do a good job but they didn't even complete the task. (PNP Coordination. Interview January 2014)

He proceeded with saying that consultants become an important figure in coastal adaptation planning. Hence, highly trusted, well spoken and knowledgeable across the different aspects of climate adaptation planning can be much more effective at positively engaging community.

The TCAP project coordinator commented that CCC Council's decision to appoint the same consultant with an economic and planning background throughout the entire project was key to the project success and positive community consultation outcomes:

Clive was involved with our initial impacts report fairly deeply and has been closely involved with us for the last two years on all our aspects research and assessment and communication with the community so he's very much an integral part of our progress. (Senior NRM Officer, City of Clarence. Interview May 2013)

For community the TCAP partnership has meant a more active and meaningful engagement in coastal decision making. The SGS consultant describes the various techniques used during one of the workshop to engage community into discussion about risk:

And then we ask them to talk about a whole bunch of things. So we paint the scenario first, allow it to be teased and challenged a little, because people are kind of "oh hang on, how would that work" sort of thing, and it might get slightly modified. (Director, SGS Planning and Economics. Interview May 2013)

In summary, the interviews show that although the WA partnerships were not particularly successful in gathering value-based knowledge local governments are more aware of the importance to incorporate information about non-economic values into the adaptation planning process. The majority of respondents felt that whilst community engagement is ultimately a relational process that operates at a local level (hence a local government core responsibility), partnership approaches

between local governments can still be beneficial to ensure consistency of approach and messages to the community.

6.1.7 Principle 7: Scale matching

The majority of the respondents agreed that the problem of scale mismatches between ecological processes and governance is a key issue in coastal adaptation decision making. Concerns were raised in regard to spatial and temporal scale mismatches but also between scales of knowledge. The problem of spatial scale mismatches was felt more strongly by the WA respondents where along the coast multiple jurisdictions share similar geological features and are affected by the same coastal processes thus hazard assessment and decision making should take cross-boundaries dynamics into consideration. In Tasmania this wasn't as important given that the natural fragmentation of the coast leads to a better alignment between the scales of ecological processes and scales of governance.

As a result, a recurrent issue among the WA respondents, and in particular local government, was the lack of clarity regarding the scale at which coastal risks should be assessed, by whom and for what level of application. From a local government point of view the coastal compartment classification introduced by the WA State Government was important and well received but people seemed confused about the terminology (first, second and third-pass vulnerability assessments) and about the methodological requirements for undertaking different scales of vulnerability and risk assessment. A few senior managers at the local government level felt that they didn't fully understand what the different scales of assessments were for and what they entailed in terms of data requirements, methodologies and outputs:

The consultants advised that this information cannot be used for planning and management decisions...and we need to fund more detailed assessments. How detailed these studies have to be in order to be defensible I am not sure. (Manager Infrastructure, City of Cockburn. Interview May 2011)

For the CGG it was more about the lack of willingness to fund coastal compartment level studies than a lack of understanding of the importance of such approach to coastal decision making. However, the interviews revealed strong differences between the point of view among the City's officers and elected members. The CEO felt that a lot was already known about coastal processes and the potential impacts of hazards and that the City's priority was to address the ministerial condition¹ and

¹ A Ministerial agreement was put in place in 2004 to delineate the GPA and the CGG's responsibilities

undertake detailed studies of the CBD and the foreshore area.

Whilst the CGG officers on the TAG were more of the opinion that coastal processes and hazard risk need to be better understood across the entire compartment; however not many understood exactly how this should be undertaken considering the lack of support from state government.

During the BROCC workshop councillors expressed their concern about the potential impacts of climate hazards on existing infrastructure and the lack of information provided to Council to support decision making on this matter:

Okay, what is the risk along this stretch of coastline? Well, we do not know yet. We know that Point Moore is very low so probably.. it will have coastal inundation when the sea level rises...but we have not got any studies pointing at that. (Councillor, CGG BROCC Workshop August 2012)

Interviews with the elected members also uncovered the strong influence that the CEO had on Council's decisions in regard to coastal adaptation planning and the lack of involvement of Council on coastal adaptation issues:

Trust me, it would not be that expensive to do it like a general vulnerability assessment or where the hot spots are so then when we approve it we are aware that maybe this needs to change. (Councillor, CGG. Interview April 2012)

According to the PNP coordinator the lack of coordination in hazard information collection has produced different assessment scales, methodologies and approaches which in turn can lead to low quality outputs or misleading information:

This is a big issue for us. Putting another layer of error on another layer of error is going to alter a study that's had some major compromises, because time frames and costs and knowledge and things. However, the level of detail and the accuracy of the methodologies is a major issue for us (PNP Coordinator, CoM. Interview January 2014)

The issue of scale mismatches was raised also by a PNP member during the follow-up interviews. He felt that the issue is worsened by the fact that state government does not know how to address it either and it is not offering clear methodologies and directions:

I have a feeling that neither DoT nor DoP really know what they are doing and they are using us [local governments] to test their methodologies and approaches. (Town Planner, CoB. Interview May 2015)

over coastal management following the construction of the port and the increase in beach erosion of downdrift beaches.

Several town planners expressed their concerns in regards to the accuracy and usefulness of broad scale versus detailed scale coastal hazard mapping for guiding planning decisions at the local level:

So.. I understand that we should look at the broader coastal processes level to better understand the dynamics of the whole system.. but what information do we need to collect for a regional study? (Director of Planning, Shire of Dandaragan. Interview March 2014)

According to a senior government officer at the WA DoP the scale and level of detail of these assessments depends on what level decision making they need to support:

They've got to be for the purpose, they have to be relevant to decision making processes. But also it depends who's done them and for what purpose. If you cannot use it in decision making in a practical way it's not much good for us. (Acting Director, Policy Coordination and Development, DoP. Interview May 2011)

The issue of capacity was common to both states. For small councils, inadequate resourcing and limited funds have always been the difficulty in managing the coast effectively. A CCC officer commented that for CCC taking the lead was easier because of the size of the local government and it is impossible to expect the same level of commitment from smaller local councils.

On this, a few respondents suggested that the management institutions operating at the scale that may seemed to match the scale of ecological processes may not be appropriate anymore as climate change forces to widen the spatial and temporal scales of coastal management and planning. Some commented that coastal management jurisdictions representing geographically larger areas could provide a better solution to scale mismatches issues and current local government capacity constraints. Some argued that larger jurisdictions (e.g. regional councils) based on ecosystem boundaries (as in the UK and in New Zealand) are more suited for aligning different scales.

PNP local government representatives felt that collaboration has played an important role in progressing coastal adaptation planning at the regional level in the absence of a formal regional statutory body. Overall adaptation planning partnerships were seen as a way to address scale matching issues by integrating and sharing knowledge and information across scales and creating better links between levels, and finally supporting decision making quickly and efficiently. However barriers to effective coordination of coastal adaptation planning across regional and local scales still exist. A CGG senior manager is that that without

adequate support from state government it is unlikely that coastal adaptation planning can be effectively implemented across jurisdictional boundaries:

When you talk about collaboration: I think that regional studies should focus on identifying key 'hotspots' where the risks of erosion and or inundation are particularly high'. In my opinion, these studies can be undertaken collaboratively by local governments but state government has to provide adequate support... I mean adequate financial support, advice and officers time. (Director of Planning, CGG. Interview May 2012)

According to a PNP respondent there is still not enough commitment from each local government partner to develop consistent decision making approaches across jurisdictional boundaries. The follow up interviews reveal that despite these good intents, hazard studies are still conducted at the local scale separately from the PNP work and only one local government has completed an adaptation plan:

No...we have not done an adaptation plan, we have a number of documents that operate at a different levels. We do not have a regional plan either. What we do not have is a coastal adaptation plan that is what it's envisaged in the SPP 2.6 to be a coastal adaptation plan. (Town Planner, CoB. Interview May 2015)

Another issue common to the three case studies was the problem of scale mismatch between the long-term strategies developed through a coastal adaptation planning process and the short-term responses (typically engineering), driven by urgency, value of the asset at risk and political pressures. This was a big issue for some of the local councils interviewed. According to some respondents councils are politically obliged to intervene and often in order to be seen to do something they have to prioritise short-term interventions over large-scale studies and long-term decisions. Other commented that, despite these broader scale studies being undertaken often through collaborative means, final decisions on controversial and complicated matters remain in the hand of the minister.

In summary, with regard to spatial scale mismatches typical of coastal adaptation planning, the key issues for the WA respondents, were: confusion over roles and responsibilities for undertaking cross-boundary assessment of vulnerability and hazard risk; overlapping responsibility for the management of ecological systems; lack of commitment from individual agencies to recognise the complexity, interconnectedness, and dynamism of coastal systems and consequently assess coastal processes and hazards across a range of spatial scales.

Temporal scale mismatches identified by the respondents included: inconsistency of timeframes used in coastal hazard assessments; the applicability and usefulness of such timeframes for adaptation responses at the local level (long-term timeframes recommended in the coastal policy were considered too conservative and unpractical by many respondents); and the lack of experience in using thresholds and triggers in determining priorities and timeframes for current and future adaptation responses. Multi-agency collaborative approaches were considered important within the current coastal governance system for solving scale mismatches issues but not yet fully effective at doing so due to lack of resources, formal recognition within a statutory framework and lack of clear directions from state government.

6.1.8 Principle 8: Adequate funding for adaptation

The majority of the comments about this principle reflect the same conclusion: inadequacy and inconsistency of resources for coastal adaptation planning and implementation. During the first round of interviews the majority of the respondents, from both Tasmania and WA argued that government funding mechanisms for the assessment of vulnerability and risk to climate hazards were too fragmented, uncoordinated and competitive.

Despite the progress made by some local governments in advancing coastal adaptation planning over the period of my research, the second round of interviews revealed that local governments were still struggling to find solutions to such shortfalls in funding, in particular regional and smaller councils. Interviews also showed that local government have been relying mostly on government funding and that contribution from the private sectors was uncommon.

Lack of adequate funding was a key issue for the Geraldton partnership. From the local government point of view some projects within the CVRAP weren't a local government responsibility to fund due to their broader scope or weren't a key priority. Local government respondents were of the view the State Government should have been providing adequate funding to support a framework that they had proposed and wanted a local government to refine and implement.

It was clear that neither the local government nor the Port Authority were particularly interested in supporting collaboration initiatives for climate adaptation planning as

demonstrated by the resolution of Council to dismiss the BROC partnership first and to terminate the CVRAP a few years later:

That Council (CGG) advises the members of the Batavia Regional Organisation of Councils (BROC) that it no longer supports the continuation of BROC as appropriate alternatives are available in respect to future local government collaboration, networking, funding and resource sharing. (Resolution of CGG Council, 2012)

The NACC tried to deal with the issue of lack of funds for the CVRAP framework by approaching new potential partners such as the regional development commission and other government agencies, but without success. The reaction was always the same: without a clear state policy framework and local government leadership these studies were simply not a priority for these organisations. NACC itself struggled to provide funding and staff resources due to the change in the national funding priorities of the new Caring for our Country Program.

The issue of inconsistency between the federal and state government climate adaptation funding programmes was raised by the majority the respondents across the three case studies.

The coordinator of the CSCA commented that national funding programs are either not available at all, or too competitive, or too researched based, or too targeted at particular projects of national significance. He commented that the most important thing is to achieve a balance of funding that's reliable and available over a long timeframe. He also suggested that under the current political regime adaptation planning requires a diversification of funding revenues:

It is, but it's disappointing to me because I asked the question 'where can we tap into federal government funding for our vulnerability studies and adaptation plans?' and the response was 'there is not currently a program available'. (CSCA Coordinator, City of Cockburn. Interview June 2013)

Furthermore, he suggested that grant funding for coastal adaptation planning have been too academic in approach and content for end users and disconnected from end users needs and priorities. Grant funding for adaptation should be more accessible for example by having fewer 'criteria' such as fixed co-contribution, relevance and timing and be part of an overall strategic approach to coastal adaptation so that funding for implementation is available for all stages of coastal adaptation planning and management.

The first round of interviews reveals that from the majority of the respondents' point of view state government has failed to provide adequate financial support and staff resources for coastal adaptation planning:

State government has got a role to play here, and a significant one. Local government cannot, particularly rural councils cannot resource themselves well enough to address issues like this that are a product of state government or federal government policy and planning. (CEO, CGG. Interview September 2011)

The PNP coordinator commented that support of the WA State Government during the initial work of the CoM was poor, both with regard to funding and staff time:

At the beginning the State wasn't interested... so, no they didn't chip in.. (PNP Coordinator, CoM. Interview September 2011)

Poor provision of funding from state government was also recognised as a key issue during the interviews conducted in Tasmania with the TCAP partners:

Well that's where the State Government's recalcitrance is standing out more and more. (Research Fellow, University of Tasmania. Interview May 2013)

Overall, the majority of respondents agreed with the statement below and suggested that there is a need for a coordinated funding approach between levels of government for coastal adaptation planning. A senior officer at the WA DoP suggested that coastal adaptation planning need similar funding partnership models to the NTH or the Coastcare which have proven to be quite successful in the past. Another state government officer commented that the funding issues arise when the Australian Government distributes funds directly to local governments bypassing state governments.

From another local government officer's point of view there is a need for combined infrastructure investment partnerships between levels of government. He also commented on the importance of being part of professional associations and involving them in the decision making about infrastructure planning.

A CGG elected member commented that the local government associations should better represent the local government's voice and provide a stronger coordination role for adaptation funding in the state:

Local governments expect more of WALGA, but because they're at risk of not having state government support, they're actually peeing in the pocket of state government to survive. So they're not truly representing local government, and that's another problem. (Councillor, CGG BROCC Workshop August 2012)

The issue of local government's capacity for funding coastal adaptation planning was brought up repeatedly throughout the interviews. Respondents were aware that for less resourced councils climate change and project work management costs often represent a large proportion of internal spending and argued that local governments prioritise and value resources differently and that costs could be reduced considerably by considering climate change impacts early in the planning process.

In Tasmania, local government and LGAT officers commented that the work undertaken by CCC was well and good but smaller councils in Tasmania are much more disadvantaged and require more support from state government:

At the end of the day a small council is not going to be able to afford to do assessments to the extent that we CCC managed. State Government needs to help these councils doing what we have done. (Climate Change Officer, CCC. Interview May 2013)

According to LGAT the work undertaken by CCC was exceptional; however funding for adaptation needs to be more consistent to support a higher number of councils developing and implementing local adaptation strategies in Tasmania.

Some respondents also commented that although resources in Tasmania for coastal adaptation planning are scarce, CCC was able to leverage funding from the Australian Government for joint activities and outcomes.

The follow up interviews reveal that local governments cannot rely merely on government grants. Consequently, more resources for coastal adaptation planning (particularly implementation) are being allocated internally either as a climate adaptation fund or through allocations spread across different operational expenditures. However, due to organisational capacity and priority issues, adaptation resources are not all available upfront but on an annual basis which makes it more difficult to fund adaptation initiatives from start to end.

Interviews also reveal that although local governments have started to explore potential alternative funding revenues and started to engage community and stakeholders in these discussions examples of revenues from alternative sources such as special area rates and taxes were still limited.

Another important consideration that arose from the interviews conducted with local government was about whose responsibility it is to fund and to source funding for the implementation of adaptation responses which are much more expensive than

the adaptation planning process itself. Both in Tasmania and WA local government seemed concerned about the possibility of having to pay for adaptation measures where the current risk is a result of a decision made on behalf of local government by state government or in case of a legacy of past planning decisions also approved by state government.

Respondents from local government felt strongly about this issue. A senior officer commented that when state government intervenes on a planning or adaptation decision process and makes the decision on behalf of local government (often against local government's advice) state government should be responsible for the potential impact of such decisions including all ongoing maintenance and management engineering interventions.

Other respondents commented that the responsibility for funding adaptation should also lie with the beneficiaries which include property owners, industry and private sector companies:

Sure, so far it is a cost for local government. In the long run it will be a cost for the effected people. In my view it should do, anyway. (Director, SGS Planning and Economics. Interview May 2013)

A few respondents from local government believed that funding for adaptation is needed not only for technical studies but also for undertaking community engagement activities, pilot studies and for trailing different implementation

On one hand, respondents agreed that collaboration is crucial (especially to less resourced local governments) for leveraging funding, sharing resources and increasing lobby influence on climate adaptation. For local government respondents, partnerships can more easily and quickly leverage funding when grants for coastal adaptation projects become available however this function is limited by lack of leadership for adaptation at the state and federal levels.

On the other hand, the role of individuals (referred to in the interviews as 'champions') in progressing coastal adaptation was considered critical for attracting start-up funding from the federal government and contributions from the other parties.

Champions are also important in beginning a series of discussions with community and stakeholders about the adaptation options available, or pathways, and the potential funding revenues for implementation of various adaptation scenarios.

In summary, respondents were in the opinion that funding for adaptation planning, from grants but also from internal state and local government budgets is inadequate. The majority agreed that the establishment of a coordinated funding mechanism between national, state and local government would ensure consistency and purposefulness of funding for adaptation but that unfortunately these type of agreements are no longer a priority particularly for the Australian Government. This was a view shared by the respondents from all levels of governments and non-government organisations and a sentiment that did not change over the years.

Respondents were particularly concerned about the excessive reliance of local government (and partnerships) on grant funding. Local government also expressed concerns that adaptation funding is not only required for ongoing data collection and refinement of model-based analysis but also for inclusive and participatory assessment and planning processes and for the assessment of societal values which seem to be always more difficult to justify as a priority. Collaboration was considered important particularly for smaller, less resourced local government; however partnerships must be supported at the local and state level through strong leadership and commitment to long-term support.

6.1.9 Principle 9: Shared responsibility and decision powers

The general consensus was that shared responsibility for coastal adaptation was important but difficult to achieve. Respondents felt that achieving shared responsibility would require greater clarity regarding the authority, legitimacy and accountability of government agencies and government decisions, the protection of citizen and property holders' rights, and around the impositions and benefits of risk and risk management activities.

Responsibilities for mitigating coastal hazard risk were described by local government respondents as overlapping, ambiguous and conflicting. Respondents in senior local government positions felt that responsibility sharing for climate adaptation is about governments and citizens working together to minimise the potential impact of coastal hazards. However many commented that responsibility is interconnected with other concepts such as obligation (moral and legal) authority and accountability, which are more difficult to be 'shared' across organisations, community or individuals.

During the first round of interviews respondents held different views also on who should be responsible for the different stages of a coastal adaptation planning

process, what coastal adaptation planning should achieve and how, thus what roles should be expected of various parties. This confusion was spawned from a lack of familiarity with risk management and adaptation planning frameworks for coastal hazard risk, lack of clear policy with regard to coastal hazard risk management and fear of commitment to an ongoing shared process.

Confusion about responsibility, accountability and authority for hazard risk management and fear of an ongoing commitment to a shared process was repetitively brought up as a key issue by the CVRAP partners. A local government officer member of the TAG commented that partners struggled with the understanding of their responsibility in regard to coastal adaptation planning and that state government, despite wanting the partnerships to take ownership of the framework, wasn't providing any clear directions:

I think that the problem is that the state government wants local government to lead a process without clearly articulating who has the authority, responsibility and accountability for the CVRAP. (Director of Planning, CGG. Interview April 2012)

From my observations responsibilities were poorly defined but also partners had a very poor understanding of their role within the partnership and poor commitment to those responsibilities that were assigned to them.

In Tasmania, respondents commented that although support from state government had been inconsistent and at times inadequate, and although responsibilities weren't that clear either, there was a strong commitment from the local government and its community to take initiative and lead a more inclusive and shared decision making process. A consultant commented:

It is extremely positive to see the progress Tasmanian local governments are making down their respective adaptation pathways. It is even more encouraging to see local governments working with their communities to identify key responsibilities but also opportunities. (Director, SGS Planning and Economics. Interview May 2013)

The follow-up interviews revealed that local government respondents were more aware of the new roles and increased responsibilities of local governments for coastal adaptation planning. However, respondents seemed still confused as to who should be responsible for its implementation. Concerns regarding responsibility and accountability of government were brought up also during the follow-up interviews; however the majority of the respondents felt that the discussion had to extend from

government responsibility only, to include citizen (e.g. 'community') responsibility for coastal adaptation.

In WA the members of the community interviewed felt that they didn't quite understand who is or should be responsible for protecting private and public assets from erosion and inundation hazards (including citizens themselves) but felt that governments and citizens should collaborate better on this issue that was considered poorly addressed. A respondent from WALGA called for an increased and more meaningful involvement of citizens and civil society in coastal adaptation decision making:

Government, emergency service agencies, policy makers, communities and individuals all need to be encouraged to discuss and explore what sharing responsibility means for them. They need to develop governance arrangements and processes that are more inclusive of civil society. (Climate Change Officer, WALGA. Interview August 2014)

The majority admitted that in WA the community has been poorly engaged in coastal adaptation decision making processes. They also commented that they would like to see environmental groups and not-for profit organisations working more closely with decision making bodies. Some made the point that people could not reasonably expect governments to fully protect them and that responsibility should also fall onto citizens, at least in some conditions.

Respondents also felt that state and federal government had increasingly delegated responsibilities for coastal adaptation planning to local government without providing adequate resources and clear policy guidance. The following statement from a senior officer at CCC shows that this was a key issue in Tasmania where the State Government grappling with developing an effective policy response had transferred greater responsibilities on local government:

Some of the problems that local government is facing in some vulnerable areas are really that they were relying on the state, or wanted the state government to make some definitive decisions but the state is telling us that they are not going to protect or pay for any works on crown land and so we are gradually acquiring crown land or managing a land that is not ours. (Senior NRM Officer, CCC. Interview June 2012)

A WA senior local government officer made a comment in regard to the issue of delegation of responsibility to local government. He felt that the major issue with adaptation decision making is that local government's decisions are still strongly

influenced by local and state politics as well as by a hierarchical, state driven, decision making framework:

It's all politics now. You've got the land exchange so the Minister of Lands is involved. There is an appeal with the Environment Minister because the EPA had a decision and you've got the rezoning with the Planning Minister. We do not have any input in this. It's going to be those three ministers who are going to work out what they're going to do. (CEO, CGG. Interview April 2014)

So even if a decision is made collaboratively between agencies and community state government can overrule the decision. A local government commented that this is very disheartening for the parties involved:

What is the point in making a collaborative decision if then the Minister overrules the decisions? What is the point in working together on a long-term Plan? (Director of Planning, Shire of Dandaragan. Interview March 2014)

From a local government's point of view adaptation planning partnerships have provided a great platform for initiating informal debates regarding responsibility sharing but that there are still many questions left unanswered. For example some questioned the authority of such partnerships. From a local government's point of view formal governance mechanisms are needed to effectively support shared adaptation decision making and that state government is not providing clear messages in this regard.

We need a mechanism in place that establish clear and appropriate moral and legal standards for determining obligations and assessing accountability. (Director Planning, City of Bunbury. Interview May 2015)

Some commented that shared responsibility between neighbouring local government boundaries is important and that coastal adaptation planning partnerships have been instrumental for sharing information and developed shared governance arrangements across jurisdictional boundaries. A few members of the PNP commented that although adaptation planning partnerships can be effective at sharing information and clarify responsibilities and policy needs among partners they cannot guarantee shared decision making processes and outcomes across boundaries. For example both the CVRAP and the PNP partners were encouraged by state government to share in the work but respondents commented that it wasn't made clear as to what role the partnership should play, if it was merely to collect and share information, or collect information and provide recommendations, or gather information provide recommendations and implement the preferred solution.

The PNP and the CSCA coordinators commented that although regional climate modelling and adaptation plans are a great tool to ensure consistency of decision making across jurisdictional boundaries, decisions regarding coastal hazard risk are still made at the local government level and there are no binding mechanisms for implementation of adaptation measures across jurisdictional boundaries.

Respondents commented that the TCAP project enabled key stakeholders to work collaboratively to achieve the project objectives through mutual understanding and decision sharing. From a local government point of view the TCAP initiative was effective at facilitating coastal adaptation planning and statutory change at the local level. It also provided a stimulus for state government to be more actively engaged in coastal adaptation planning and invest more resources into data collection and decision support tools.

Conversely, in the case of the CVRAP the decision making process was neither transparent nor equal or inclusive. The democratic and collaborative process was jeopardized by a few influential individuals who among many things derailed the decision process by creating a new committee and taking away decisions from the TAG and dismissed the CAG. It was also obvious that there were some power imbalances played between the parties. Respondents commented that statutory organisations were more powerful and influential than the non-profit organisations during the entire process.

7 DISCUSSION

7.1 Introduction

This doctoral research sets out to answer the following research questions:

1. *What are the current features of coastal adaptation planning in WA?*
2. *What are the key challenges to collaborative approaches to coastal adaptation planning in WA?*
3. *How can collaboration improve coastal adaptation planning in WA, and what lessons can be learnt from other collaborative approaches?*
4. *What set of governance principles can be established to guide collaborative approaches to coastal adaptation planning?*

Question 1 was answered in Chapter 4 and addressed further in this Chapter. The response to Question 4 is discussed below; responses to Questions 2 & 3 are subsumed into this discussion.

In Section 2.3 I presented a set of principles for collaborative coastal adaptation planning based on a synthesis of the literature. This Chapter further analyses these principles and proposes a revised set of principles for collaborative coastal adaptation planning based on the data analysis described in Chapter 6.

Table 4 summarises the revisions made on the traditional principles on climate adaptation taken from literature.

Table 4: Revised Coastal Adaptation Planning Principles based on Collaborative Governance

Traditional Principles	Revised principles	Renewed focus on coastal adaptation planning
Shared understanding, goals and priorities	Shared understanding, goals and priorities in coastal adaptation planning are mutually supportive/constitutive with collaboration	This principle strongly focuses on the importance of collaborative means to enhance common understanding of coastal adaptation issues and governance arrangements required to address them. It also suggests that through shared understanding is key to successful collaborative coastal adaptation planning.

Traditional Principles	Revised principles	Renewed focus on coastal adaptation planning
Policy integration and coordination	Collaborative approaches are crucial for the successful integration of coastal adaptation objectives into policy and into every day decision making processes, and for effective coordination across multiple levels of government	This principle stresses the importance that collaboration plays to the successful development and integration of adaptation objectives into coastal adaptation policy. It also stresses the importance of a policy coordination role to ensure a consistent policy approach.
Long-term political commitment and leadership for adaptation	Leadership and long-term political commitment are crucial for supporting collaborative coastal adaptation planning and collaboration can support effective leadership	This principle addresses the mutual relationship between political leadership and other types of leadership required to support coastal adaptation and the role of collaboration. Leaders and champions are key to successful collaborative coastal adaptation planning and collaboration is key to build and strengthen leadership for adaptation.
Clear, coherent and flexible policy directions	Collaboration is instrumental in developing and implementing adaptive policy, improved policy dialogues and policy learning	This revised principle suggests that collaboration plays a key role in the development and implementation of flexible coastal adaptation policy and adaptive management approaches. Through improved dialogue decision makers are more open to trial and experiment innovative approaches.
Embracing complexity and uncertainty through innovation, experimentation and reflexivity		
Uptake and use of evidence and value-based knowledge in adaptation decision making	A collaborative and transdisciplinary approach promotes better uptake and incorporation of evidence and value-based knowledge into adaptation decision making	This principle strongly advocates the importance of the role that collaborative and transdisciplinary approaches play for better uptake and incorporation of both evidence and value-based knowledge into coastal adaptation decision making. Collaboration among government organisations and within the same organisation reduces the rigidity of organisational structures based on historical contexts and leads to better inter-disciplinary skills in climate change adaptation.
Scale matching	Collaborative approaches to coastal	This revised principle broadens the discussion on the issues of scale

Traditional Principles	Revised principles	Renewed focus on coastal adaptation planning
	adaptation planning improve spatial and temporal scale matching	matches to take into consideration how collaboration can help improve spatial and temporal scale matching, particularly those ones between the scales of management and the scales of ecological processes which are typical in coastal adaptation.
Adequate funding for adaptation	Collaboration helps generate adequate, consistent, coherent and diversified sources of funding which are necessary for coastal adaptation planning	The revision stresses the importance of the role that collaborative initiatives at the local government level play in generating adequate, consistent, coherent and diversified sources of funding which are necessary for coastal adaptation planning.
Shared responsibility and decision powers	Collaboration increases shared responsibility and shared decision powers for coastal adaptation	This last principle discusses how collaboration increases shared responsibility and shared decision powers for coastal adaptation planning and in particular for policy implementation.

7.2 Revised Principles for Good Governance for Coastal Adaptation

7.2.1 Principle 1. Shared understanding, goals and priorities in coastal adaptation planning are mutually supportive/constitutive with collaboration

The literature of collaborative governance widely recognises that to be effective the partners in a partnership must share common goals (Considine 2006, Davidson and Lockwood 2008, McClelland 2002, Sullivan and Skelcher 2002): common goals lead to sharing of tasks, responsibilities and resources which ultimately lead to increased efficiency and effectiveness (Ansell and Gash 2008, Stocker et al. 2013). Governance scholars also argue that developing shared goals requires a common understanding of the problem (Ansell and Gash 2008), a set of shared values (Schusler, Decker and Pfeffer 2003) and a commitment from all partners to the process of joint working (Considine 2005, Tett 2005).

While the importance of developing shared goals and common understanding is frequently discussed in the literature of good governance and more specifically in the collaborative governance literature, these concepts remain fairly abstract

(Considine 2005, Renn and Schweizer 2009) and of particular complexity in the coastal adaptation context. The case study analysis shows that shared understanding, goals and priorities in coastal adaptation planning are mutually supportive/constitutive with collaboration.

The ability of coastal stakeholders (or adaptation partners) to develop a clear and common understanding of the problem is crucial to the establishment of shared goals and to strengthening commitment to joint working. However, uncertainty in coastal and climate science and complexity of adaptation decision making make the development of shared understanding and shared goals quite difficult.

The two WA case studies in particular show that partners faced many technical challenges in understanding of terminology, methodologies and tools for multi-hazard risk assessment including probabilistic hazard maps, data requirements, and the usage of risk assessment outputs. Yet the case studies show that genuine and effective collaborative approaches to coastal adaptation planning have shown to be key to achieve a common understanding of the problem.

The three case studies exposed five key factors that can inhibit shared understanding during a coastal adaptation planning process. First, partners need to collectively acknowledge that assessing climate change risk is not a one-off process and that ongoing investment in data and modeling exercises is crucial.

Secondly, stakeholders must also acknowledge that coastal processes operate at different temporal and spatial scales, which do not always correspond to the scales at which decisions are made. Hence, resource sharing among partners affected by the same coastal processes becomes vital to enable consistency and accuracy of climate hazard information produced, particularly in regional areas where processes are less influenced by human infrastructure.

The CoM was among the first local governments in WA to acknowledge that adaptation to climate change on the coast required a better understanding of coastal dynamics across different scales. The City recognised that issues of erosion and inundation and the potential impacts of climate change were not necessarily unique to one local government area and that sharing of knowledge and resources to deal with these issues was necessary and advantageous to all. Conversely, the CGG was lagging behind, displaying poor understanding of what assessing coastal hazard risk would require. In fact, the CVRAP partnership was seen by the CGG as

a means to address administrative political issues rather than as a mechanism to engage in a collective and multilateral process for improving knowledge and policy across multiple scales.

Further, the coastal compartment project developed by the WA state government to provide local governments with a framework for coastal vulnerability mapping was considered by the majority respondents as a useful tool. However, many also complained that it did not eliminate the ambiguity regarding roles and responsibilities for hazard mapping across different spatial scales.

Thirdly, a critical factor identified through the interviews was the development of shared understanding about the methodologies required for risk assessment and mapping. Developing the right methodological approach for assessing risk was, and still is today, a major barrier to adaptation decision making in WA despite the content of the latest coastal policy reform and specifically the CHRMAP guidelines.

The overall response from interviewees was that the CHRMAP process was poorly thought out, thus difficult to implement. Local governments expressed strong concerns about the lack of clarity and guidance from the WA state government surrounding the methodological approaches for assessing coastal hazards. Without a robust and defensible methodology, local governments fear an overall increase in litigation, ongoing conflicting debates with community and potential loss of development opportunities.

Further, local governments' lack of technical expertise in this policy area meant that most of the coastal adaptation planning work has been undertaken by independent consultants. However, given the unfamiliarity and complexity of these projects, the consultants themselves had limited or no experience in coastal hazard risk assessment and mapping and, particularly, in producing this information in a format that was useful to local decision making and that met planning policy requirements. Several local governments criticized the work undertaken by consultants for being either too technical, not robust or not user friendly. This is why some PNP partners felt that they were 'losing control over the process' and chose to run some of these projects internally.

The fourth factor is related to the understanding and applicability of the information provided by scientific studies particularly of the probabilistic hazard information

(coastal hazard lines). Local governments felt that there was still too much confusion surrounding coastal risk information. This is demonstrated by the slow commitment to developing adaptation plans by WA local government authorities (despite being a policy requirement) and the poor implementation of any of the plans developed to date.

Many local government respondents in WA raised the issue of the inadequacy of state policy in providing effective guidance on how to use coastal risk and hazard information to support the implementation of adaptation responses through existing regulatory frameworks. Respondents described this policy 'gap' as being one of the major challenges to the development and implementation of adaptation policies in WA. In Tasmania, the TCAP partners, driven by a stronger sense of urgency proved a stronger commitment to develop planning instruments using the information available despite sharing similar concerns regarding policy inadequacy, data availability and accuracy of hazard information.

The issue of suitability of high-level policy in dealing with wicked problems is not new. On one hand, highly prescriptive policies can reduce local government autonomy and inhibit technological innovation (Hascic, Johnstone and Kalamova 2009). On the other hand, less prescriptive policy prevent government from taking a definite position on highly complex and conflicting issues (Per and Rykkja 2014). This debate is still current: local governments argue that the support given by state government to the adaptation planning partnerships has been a smokescreen for the lack of the state's technical expertise in this policy area and lack of political support.

Conversely, state government respondents argued that it is local governments that need to take more responsibility for coastal adaptation planning through development of suitable policy. The interviews reveal that the WA State Government has attracted a lot of criticism among local governments for not being entirely genuine in collaborative arrangements and for expecting local governments to spend an endless amount of resources to test policy applicability.

Fifth, the case studies also confirm that the ability to define common ground depends on the partners' (organisation and/or individuals) capacity for collaboration which in turn depends on partners' ability to find common values and engage in a deep commitment to honour these values (Davidson and Lockwood 2008, Langford

2002, McClelland 2002, Stojanovic and Barker 2008). Shared values provide guidance on how partnership members behave and interact with one another and can help the partnership pursuing, through collaboration, long-term goals. Although values (of individuals and of the organisation partner) should be assessed as early as possible in the process, partnerships are often established without undertaking this important step.

The CVRAP partners had conflicting worldviews and values and ultimately diverging priorities and goals. The two individuals that were most opposed to the development of a strategic adaptation plan for the entire stretch of the Geraldton coast were the two executive officers from the GPA and the CGG. Both of them shared similar worldviews based on a technical understanding of problems (de Vries and Petersen 2009, Hedlund-de Witt 2012). Their approach to coastal management was based on a conservative, reductive and hierarchical worldview and on values associated with power, achievement and economic growth. These views conflicted with the other partners' (the NGO and the State Government) postmodern worldview and associated values which emphasises sustainability, integration and collaboration which were also the values of the TCAP partners.

Once shared understanding is achieved partners are more likely to develop stronger commitment to joint working. The case studies show that commitment to joint working was high where partners provided ongoing financial support, attended meetings regularly, reported to senior management with enthusiasm and precision, shared information and helped strengthen relationships within the partnership. The CVRAP partnership had a high turnover of individuals from the same organisation attending the CVRAP meetings. This demonstrated both confusion and a lack of commitment towards the CVRAP framework. The PNP had a strong collaborative structure but commitment to joint working gradually weakened over the years due to the lack of trust in the usefulness of a collaborative approach and loss of momentum due to funding restrictions and methodological challenges.

Complex societal problems like coastal adaptation place greater demand on local governments to develop their capacity to work jointly to address a common issue. According to Borgatti and Cross (2003) and Ansell and Gash (2008) strong interdependence among partners favours commitment to collaboration, goal achievement, learning and knowledge uptake.

The three case studies reveal that barriers to coastal adaptation planning such as inadequacy of policy, lack of technical expertise, and resource scarcity increased mutual dependency among local government authorities. However, the WA cases studies suggest that interdependence is stronger during the initial stages of a coastal adaptation planning process when a greater amount of resources are required for undertaking hazard modeling and risk assessments and where such assessments are undertaken at the regional scale. Interdependence for coastal adaptation planning decreases from the moment that projects start to focus on local scale impacts and local decisions. This goes to show that without a governance mechanism that supports ongoing adaptation decision making across jurisdictional boundaries, interdependence (hence collaboration) in coastal adaptation planning occurs mainly during the information sharing and development of common methodologies stages.

According to Borgatti and Cross (2003) interdependence requires partners to understand each other's capabilities and to overcome any history of antagonism and conflict. Interdependence between state and local governments was high in Tasmania where state government had a high stake in making sure that new planning policy instruments were appropriate and implementable. Whilst government grants usually involve a shift of power and control to the grants recipients. In WA the state government agencies used state grants to take greater control over project scope and deliverables of CHRMAP projects. This caused additional friction between local and state government without any substantial improvement in the current policy.

The case studies also showcase the importance of coastal champions (Kenchington, Stocker and Wood 2012a, Mumford and Harvey 2014, Taylor 2007) and boundary spanners (Guston 2001, O'Mahony and Bechky 2008, Shaw, Danese and Stocker 2013) in the development of shared understanding. The concepts of 'champions' and 'boundary spanners' come from a different body of literature but in some contexts, such difference can be blurred (Carr and Wilkinson 2005). According to the literature the main difference between the two concepts is that boundary organisations position themselves right at the boundary between science and policy and are able to project a form of authority (Guston 2001).

Champions possess specific skills and attributes that make them more effective at facilitating collaborative arrangements (Sullivan and Skelcher 2002). Champion

organisations or individuals have strong networking and mediating skills for communicating to a wide range of stakeholders and are committed to seeking new information and for conveying key messages. Coastal champions as described by Kenchington, Stocker and Wood (2012b) can be politicians, council staff, members of the community, consultants, non-government organisations and not-for-profit organisations (Shaw, Danese and Stocker 2013). Champions are trusted by a variety of stakeholders because of their expertise, knowledge and leadership role (Sullivan and Skelcher 2002).

In the TCAP a series of key 'champions' were identified: one being a senior manager from the CCC; one being an elected member at the CCC, one being a former policy advisor at the State Government and one being a consultant. The former in particular was recognised as being a crucial figure for his strong scientific knowledge, for his planning background and expertise in coastal adaptation governance. He also had a strong professional network at state and federal government levels. In WA, the majority of the coastal adaptation champions came from local government senior management levels with strong support from the elected members. State champions were also regarded as crucial but respondents felt that often these individuals were constrained by the department's policies and political agendas. This finding shows that effective collaboration for coastal adaptation requires a champion within each partner organisation and strong commitment from collaborators to support the process through ongoing investment of resources.

In literature, boundary organisations or boundary agents are described as individuals or cross-boundary groups that can perform the functions of convening, collaborating, translating and mediating (Cash, Borck and Patt 2006). The role facilitates the creation and use of boundary objects (e.g. adaptation plans) and development of 'standardized packages' (Guston 2001) (e.g. adaptation frameworks and policies). Boundary organisations facilitate dialogue among different actors from both sides of the 'boundary' such as scientists and decision makers or decision makers and community on complex societal issues (Guston 2001).

The PNP and NACC are examples of a cross-boundary group tasked to address specific operational and strategic issues. However, the case study shows that to be effective, boundary organisations have to establish strong linkages with the knowledge or decision makers. This was also a key finding in Shaw, Danese and

Stocker (2013). If such linkages are not in place or are not well established (e.g. NACC) the boundary organisation may not have the perceived legitimacy and authority to deal with complex and difficult issues such as climate adaptation.

In regard to shared goals, Brinkerhoff (2002) argues that shared and stated goals should be clear, specific, and measurable. However, in collaborative coastal adaptation planning it is important to differentiate goals in terms of process and outcome. Typically, complex problems are characterised by different and changing priorities, making clear goals difficult to pre-determine. Complex socio-environmental problems require goals to be flexible and adjustable as new information, policy and governance mechanisms come into play (Sullivan and Skelcher 2002). Thus, through flexible goals partnerships are able to modify and renegotiate priorities and approaches for the durability of the partnership ensuring transparency and legitimacy of the process (Davidson and Lockwood 2008).

Moreover, the goals of coastal adaptation planning partnerships can shift along the collaboration continuum (Himmelman 2001) from forms of collaboration which require less commitment such as networking and information sharing to more sophisticated and potentially formal forms of collaboration. These can include resource sharing for data acquisition, development of methodological approaches and of adaptation strategies, and development of public policy. The constant evolution of goals is also a common attribute of transition management (Kemp, Rotmans and Loorbach 2007, Loorbach and van Raak 2005).

Goals can also vary depending on funding availability. A strong reliance on external funding can be detrimental in two ways for achieving a partnership's goals. Firstly, funding can run out leaving the partnership without a reliable source for project completion. Secondly, in order to get funding for the continuation of the collaboration the partnership has to try to match the funder's objectives rather than the core partnership's objectives. Funding models often do not encourage long-term partnerships but rather are outcomes based.

7.2.2 Principle 2: Collaborative approaches are crucial for the successful integration of coastal adaptation objectives into policy and into every day decision making processes, and for effective coordination across multiple levels of government

Literature shows that integration of adaptation policy is central to the sustainable

development paradigm (Pinkse and Kolk 2012, Rammel and Van Den Bergh 2003, Urwin and Jordan 2008). Policy integration in the coastal adaptation planning context entails the integration of adaptation objectives into statutory planning frameworks (Macintosh 2013, Mukheibir, Gero and Herriman 2012, NCCARF 2012, Preston et al. 2007). It also requires the integration of economic, social and environmental concerns into decision making in order to foster development that is ecologically and socially more sustainable (Kenchington, Stocker and Wood 2012a, Lafferty 2004).

The interviews show that the majority of respondents recognised the need for improving the mainstreaming of adaptation in decision making processes and avoid inconsistent or 'maladaptive' decision making. However, many also recognised that, despite recent improvement in the way that policies take into account coastal hazards, practical evidence of successful policy integration for coastal adaptation is still limited.

These findings align with the views of policy scholars who argue that practical examples of integrated policy frameworks for climate adaptation in Australia that have proven to be effective, comprehensive and consistent are still uncommon (Gurran, Hamin and Norman 2008, Jordan 2008, Munasinghe 2003, Serrao-Neumann et al. 2014). The integration of environmental, economic and social considerations in decision making was considered a key challenge by local government respondents.

Literature tells us that policy integration for climate adaptation is easier to achieve if a diverse range of stakeholders are involved in the process of policy formulation and review (Mazurkiewicz 2005, Pinkse and Kolk 2012, Ross and Dovers 2008). Scholars also argue that although state governments are the key bodies for coordinating policy integration, multi-agency partnerships can provide an important forum for discussion of policy issues and have the potential to address the existing regulatory, participation, resource and learning gaps typical of adaptation policy making (Pinkse and Kolk 2012).

The status of policy integration for coastal adaptation and the role that collaborative governance plays in achieving greater policy integration and coordination are evaluated below using five key dimensions elaborated from Eggenberger and Partidário (2000), Candel and Biesbroek (2016) and Stead (2010):

- *policy frame*
- *policy goals and objectives*
- *methodologies and policy instruments* (which fall under the umbrella of policy design)
- *institutional design*
- *procedures, policy mechanisms and political influence* (which fall under the umbrella of governance processes and structure for policy integration and coordination).

Policy frame relates to how governments perceive coastal hazards as a cross-cutting problem and to what extent such issues are thought to require a more effective integrated and coordinated policy approach. There were varying views among the WA respondents about degree of commitment and leadership from state government to achieve effective policy integration and coordination. Some respondents felt that the progress made through the revision of the SPP2.6 and the introduction of the CHRMAP process affirmed a level of willingness to strengthen central level control to ensure that the 'new' adaptation objectives are incorporated into strategies policies across levels of government. However, the majority of respondents (including state government senior staff) felt that WA state government is yet to show strong commitment towards a formal coordination role that would ensure that local governments have the statutory competence, skills, tools and resources needed to effectively develop and implement informed and robust adaptation responses.

Respondents exemplified this by providing examples of decisions taken by state government which have been inconsistent with the state's own policy objectives. Further, inconsistency of decision making is more likely to occur when integration is pursued through a planning (and political) system which naturally favours economic growth and development over environmental and societal concerns.

The case study findings show that coastal partnerships have been instrumental in increasing the political demand for better integration and coordination of coastal adaptation policy. This confirms the existing literature that central governments are often unable to effectively address the complexity of policy problems without meaningful collaboration mechanisms between government at different levels and across sectors (Meijers and Stead 2004). Even the CVRAP partnership, which was

operating in an uncharted territory and seemingly failed to overcome the 'learning gap' (Pinkse and Kolk 2012), was still important in promoting critical reflection about the key challenges that coastal stakeholders face in coastal adaptation planning.

The second dimension of policy integration is that of *policy goals and objectives* (Candel and Biesbroek 2016). The case study findings show that, in WA, despite the introduction of high-level adaptation goals and objectives, the actual policy recommendations and the CHRMAP process lacked clarity and practicality, which ultimately hindered local adaptation.

Lack of confidence in the policy process and confusion over policy goals has led to a low number of adaptation plans and local policies being developed across the state, and to constant debates over the accuracy and applicability of hazard mapping outcomes. Further, the clear disconnection between state policy goals and local level needs was attributed by local government respondents to the state government top-down approach to policy formulation which involved minimal consultation with stakeholders for the development of policy objectives and guidelines.

By contrast, in Tasmania, the government's reluctance to provide an overarching strategic policy framework for coastal adaptation did not prevent local governments from achieving positive policy outcomes at the local level. This was achieved as a result of a positive attitude towards collaboration and participation from all levels of government involved. There is general consensus among governance scholars that overarching policy frameworks alone are not enough and that to be effective adaptation policy objectives must be mainstreamed into the organisation's every day operations such as budgeting and financing, implementation and monitoring (OECD 2010). The template developed by the TCAP partnership provides an example of effective integration of coastal hazard considerations into land use planning through a coordinated regional scale approach.

Policy integration requires the development and coordination of *policy instruments* that are coherent, consistent and implementable (Stead and Meijers 2009). One of the key barriers to policy implementation at the local level in WA (but as aforementioned not unique to WA) is the lack of clarity as to which planning instruments can effectively realise the integration of the adaptation objectives and which government mechanisms are needed to enable new instruments to be applied

within the existing statutory framework. Respondents from local government felt that state government has been increasingly delegating responsibility for coastal adaptation planning to local government without providing adequate guidance and coordination mechanisms with regard to the applicability of planning instruments within the legislative framework (Robb et al. 2017).

The WA case study findings also show that there is no government or other organisation that is prepared to provide a coordination role to ensuring a consistent approach to coastal adaptation planning and adaptation responses across jurisdictional boundaries. Achieving coordination of adaptation policy was not a key objective of the WA case study partnerships but perhaps this is a role that WALGA or Universities could have helped facilitate by acting as boundary organisations (Shaw, Danese & Stocker). In Tasmania, a coordination role provided by the Tasmania Climate Change Office in collaboration with the TCAP local government partners and the TPC has led to the development of a national planning scheme template.

The other dimension of policy instruments is *methodological* (Eggenberger and Partidário 2000). That is, the methodological frameworks for assessing and integrating climate risk considerations about hazard risk into policies, including the methodologies for integrating environmental, economic and social considerations into decision making.

In WA local government respondents felt that definitions, methodologies and approaches contained in SPP2.6 caused confusion, misunderstanding and implementation delays. The principles behind the SPP 2.6 adaptation hierarchy and the methodologies proposed for integrating economic, environmental and social domains into adaptation responses seemed articulate but their application in WA again caused confusion and have been largely untested.

The case study findings show that in WA coastal partnerships have been instrumental in helping state government to trial and refine different methodological approaches with the majority of these projects being partly state government funded. However, this process has been very frustrating for local governments who complained about the large amount of local government's time and resources invested in this process.

Another complaint included the top-heavy management control of central government over adaptation planning projects' scopes, methodologies and outcomes through the role of state government agencies on funding committees. This is a contentious issue from an 'adaptive governance' point of view. On the one hand, state government's control over the process streams from a high stake in making sure that policy is correctly interpreted and implemented (Bell and Hindmoor 2009). These projects effectively are used by state government as policy experiments to test the feasibility of methodological approaches and the effects of a policy in a real-world setting (Smith and Lazarow 2006, Walker, Rahman and Cave 2001).

On the other hand, if decentralization of adaptation planning must occur, state governments need to support the devolution of responsibilities to local government, which in turn enables the development of methodologies and approaches that are tailored to local conditions and community needs (Fieldman 2011). Collaboration was somewhat successful at intensifying dialogue on methodological issues between the two parties. However, the case study findings show that in hierarchical and command and control governance models, policy integration can be achieved as government ensures comprehensiveness in inputs and consistency between policy implementation and intentions.

The fourth dimension of policy integration relates to *procedures, policy mechanisms and political influence*. This policy dimension is about developing governance mechanisms that can help achieve policy integration and coordination. Some of the mechanisms suggested by the respondents during the interviews include: adequate funding mechanisms to assist local government with refinement of climate hazard assessments and for the implementation of policy objectives; effective mechanisms for the review of policy that involve all affected stakeholders; and adequate internal resources to provide support and technical advice to local governments. Candel and Biesbroek (2016) argue that the need for collaboration among relevant stakeholders for policy integration is particularly high where these governance mechanisms are missing. The case studies show that coastal partnerships played a strong role (with some degree of success) in advocating for these mechanisms to be put in place. However, more work is needed on this front.

The *institutional aspect of the fourth dimension* is about policy integration being supported by a clear governance structure which defines roles and responsibilities

of institutions for policy development and implementation, horizontally between government departments and government sectors, and vertically between levels of government. This seems to be an issue for both the WA and the Tasmanian state governments as demonstrated by a systematic streamlining (reduction) of coastal planning and management roles (hence coastal expertise) within government agencies.

In WA the decision to reduce the number of advisory committees such as the Coastal Planning Council was seen by respondents as a 'step backwards' in achieving policy integration. This strategy, according to Stead (2010), can stifle innovation, reduce technical expertise and reduce credibility within a department. Stead (2010) also argues that working groups, advisory bodies and steering committees can be useful platforms for promoting policy objectives, clarify requirements and promote horizontal and vertical cooperation. In WA respondents felt that there was a need for a more formal coordination role of state government, for example through an independent board, rather than involvement through projects committees.

The *political aspect of the fourth dimension* is still a major factor that influences all aspects of adaptation policy development and adaptation decision making for the coastal zone in Australia (Stead 2010). The interviews reveal that many of the coastal management and planning decisions made to date in WA are still based on political interest and worldviews rather than scientific information or collective deliberations. Respondents from local government felt that new political leaders are needed who can understand the complexity of adaptation decision making and support decisions that are consistent with policy's objectives. Leaders that are innovative and that effectively integrate values of the broader community and not just the interest of a few. Deliberative and participatory processes are key instruments for politicians to ensure that these values are taken into considerations in decision making processes (Backstrand, Khan and Kronsell 2010, Hartz-Karp and Stocker 2013, Squires and Renn 2011, Wood and Stocker 2009). The Tasmanian case study shows that positive attitude among actors involved in the policy making process is of vital importance in the process of policy integration.

This study agrees with literature that complex cross-cutting issues often go beyond the institutional responsibilities of individual government departments and thus collaboration can help improve inter-organisational-cooperation and achieve better

policy integration (Davidson and Lockwood 2008, Schermerhorn 1975, Stead and Meijers 2009). However, the fact that should not be ignored is that coastal adaptation policy development is still in its infancy and that there are still numerous barriers to effective integration and coordination of adaptation planning policy as summarised in the above analysis.

In the coastal adaptation planning context, the key prerequisite for collaborative policy making is: a shared understanding of policy issues, goals, objectives and methodologies; strong political commitment at all levels of government to improve policy making instruments and outcomes; and institutional conditions in place to steer the adaptation policy integration (Nilsson 2005). Collaborative approaches to policy design and implementation depends on the institutional capacity of organisations (or multiple organisations) to deal with cross-cutting problems, including having the financial capacity to sustain cross-cutting working arrangements such as complex studies, ongoing monitoring and review, and methodology testing (Meijers and Stead 2004).

Most importantly the case studies showed us that policy integration requires a cultural change among staff and decision makers to improve knowledge, build capacity and promote innovation. Partnerships have been shown to be particularly useful in the policy-learning context by supporting technical learning, for example, through co-development of methodological approaches or through feedback on policy instruments that would pursue policy objectives better. Collaboration can also improve conceptual learning and critical thinking by challenging basic beliefs and worldviews. Lastly, partnerships can support political learning by offering more palatable and innovative pathways developed in consultation with community and other key stakeholders.

To conclude effective policy integration and coordination for coastal adaptation planning requires, at the state level: i) high-level policy with clear and explicit objectives and clear implementation mechanisms; ii) strong motivation (political and organisational) for improving coastal policy and achieving long-term goals; iii) strong overview and coordination capacity; iv) availability of resources for policy implementation; v) mechanisms for ongoing policy review and feedback; vi) willingness to cooperate and learn from one another; vii) flexible implementation mechanisms which are legally feasible; and at the local or regional level; viii) ability of local government to involve relevant actors and improve policy dialogue; ix) ability

of local government to work cross-boundaries and develop shared understanding and common policies; and x) governance mechanisms with adaptation as a priority; and xi) a positive attitude towards innovation.

7.2.3 Principle 3: Leadership and long-term political commitment are crucial for supporting collaborative coastal adaptation planning and collaboration can support effective leadership

There is a wide body of literature that suggests that leadership is instrumental in driving climate adaptation action (Avolio, Walumbwa and Weber 2009, Folke et al. 2005, Meijerink and Stiller 2013, van Nieuwaal et al. 2009). A considerable number of theories and models have been developed to explain the theoretical concept and the practical application of adaptation leadership. Sabatier (1991) examines the role that leadership plays in the policy process; Crosby and Bryson (2010) in cross-sector collaborative policy making; Lichtenstein et al. (2006) and Uhl-Bien, Marion and McKelvey (2007) in governing in complexity; and Metcalf and Benn (2013) in fostering sustainability outcomes.

While the trait theory of leadership has certainly gained popularity in the national coastal adaptation literature (Department of Climate Change and Energy Efficiency 2010, Kenchington, Stocker and Wood 2012a, Productivity Commission 2010a), the complexity of adaptation decision making makes adaptation leadership features, objectives and challenges difficult to attain, but also to measure and to evaluate (Meijerink and Stiller 2013).

In general respondents considered leadership to be important in order to achieve adaptation goals in the coastal zone, however, there were different views as to where leadership for coastal adaptation should come from. Some respondents acknowledge that coastal adaptation requires leadership at all levels of government, as also suggested by scholars such as Meijerink and Stiller (2013) and Folke et al. (2005). Further, it was suggested that a variety of leadership types are required to successfully lead and support different stages of a coastal adaptation planning process such as political leadership, administrative leadership and community leadership. The case studies also provide insights into the role that 'leaders' (political, administrative, community) play in the success of collaborative coastal adaptation planning, but also the role that collaboration plays in influencing leadership for adaptation.

Political leadership was considered critical by the majority of the respondents to giving an impetus for the integration of climate adaptation objectives into policy and in championing adaptation at the state and local level. However, the consensus view was that defining effective political leadership was difficult given that political leadership varies across institutions and across time, and is driven and influenced by different legislative frameworks as well as political leaders' personalities and agendas. Overall, political support for coastal adaptation was considered to be inadequate and inconsistent across the different tiers of government although some improvement, especially at the local level, was reported.

Long-term political leadership was repeatedly mentioned as being particularly important for the success of adaptation planning processes which continuously evolve and are enacted through cycles of studies, policies and adaptation responses. This view is also shared by Kemp, Rotmans and Loorbach (2007) and Ford, Berrang-Ford and Paterson (2011) who argue that political short-termism poses a significant barrier to coastal adaptation.

Long-term political commitment was considered crucial for ensuring operational and financial continuity of coastal adaptation planning initiatives and for supporting long-term strategies to adaptation issues. According to Uittenbroek, Janssen-Jansen and Runhaar (2013) long-term political commitment can be compromised by competing priorities and interests, uncertainties about the risks and impacts of climate change, limited resources available and undefined roles and responsibilities (including legal). For Christoplos, Mitchell and Liljelund (2001) where political action is triggered by a natural disaster it is important that commitment is genuine and not just a short-term political move while waiting for the next big disaster.

Many interviews touched on the need for stronger leadership from the Australian Government. According to local government respondents, high-profile national political leadership would encourage states and local governments to embed climate hazard risk into policies and increase practical delivery of adaptation measures on the ground through funding mechanisms, research programmes and government incentives. These views align with the literature that suggests that there is a need for stronger national leadership on coastal adaptation issues (Department of Climate Change and Energy Efficiency 2010, HRSCCCWEA 2009, Thom 2010). However, there was also an overall acceptance that national leadership for coastal adaptation

was weak and that it probably would not change any time soon under the current government direction. In the absence of national leadership for coastal adaptation, respondents felt that it was up to state and local governments to provide a leadership role in support of climate hazard adaptation research, risk mitigation projects and policies. Furthermore, the case studies show that not just the Australian Government but also state governments have been hesitant to make bold policy changes, calling instead for greater responsibility at the local level.

The cases studies enable the identification of two key functions of political leadership for coastal adaptation. The first one is supporting coastal adaptation planning initiatives. Effective political leadership for coastal adaptation is attained when Council acknowledges climate adaptation planning as a priority. That is, endorses strategic plans and commits to the allocation of ongoing resources for coastal adaptation planning studies, either undertaken individually by a local government, or through collaborative initiatives such as coastal adaptation planning partnerships. The CCC's approach provides an example of councillors' strong leadership through the entire coastal adaptation planning process. Conversely, the CVRAP case study shows that if a climate change study or action is not accepted as a priority and backed by the Council and its executives, its implementation is less likely to take place.

According to Blass and Ferris (2007) political will and commitment for adaptation depends upon the degree of exposure of political leaders to the adaptation discourse and their understanding of the issue and the social, cultural and economic contexts in which these decisions are made. In WA, some of the politicians interviewed appeared to be familiar with the adaptation planning discourse and acknowledged the need for more strategic long-term policy, while others (particularly from local councils in the regions) still denied that climate change is occurring. However, the majority of local elected members commented that it was too risky for them to take a position on this issue without a strong political commitment at higher levels of government and particularly at the state level. This is demonstrated by the WA case studies where the level of awareness about coastal hazard issues and commitment for coastal adaptation planning among local level politicians improved considerably following the revision of the SPP2.6 and the introduction of the CHRMAP process.

The CVRAP case study shows that a traditional approach to decision making by which councillors are informed at the end of a project or a project cycle, to seek formal endorsement is not conducive to coastal adaptation. In the case of the CVRAP the local government fearing the release of hazard risk information kept elected members in the dark over the adaptation planning process. On the contrary, the CoM and CCC respective Councils have been instrumental to the establishment of the PNP and the TCAP-Clarence partnerships.

According to Meijerink and Stiller (2013) political commitment is influenced by the role of 'political champions' such as Mayors or Councillors, who are already at the forefront of the climate adaptation agenda, or by executives or senior managers who work closely to politicians and are able to drive the adaptation agenda into political discussions. Champions within the community play a leadership role in empowering politicians. In the case of the CCC, Mayors and Councillors took the lead and demonstrated willingness to be involved in the adaptation planning process right from the beginning. In the case of the CoM it was the mayor who played a crucial role in promoting, advocating and leading the CoM initial adaptation work bypassing a quite inactive state government. The CVRAP case study shows that lack of political leadership, or lack of involvement of political leaders, can create barriers to adaptation.

Political commitment also requires a willingness to take into account the majority of views of the constituents, which is an issue of political accountability (Moser and Ekstrom 2010). The issue of politicians diverging from their constituents' preferences was felt strongly among the WA respondents. The WA case studies show that elected members were not overly familiar with community concerns and views in regard to coastal adaptation issues, as demonstrated by the limited number of coastal values studies conducted in the state to date.

By contrast, in Tasmania the CCC Councillors were well informed about the science, the challenges and the community attitudes and concerns. This was a key strength of the Tasmanian case study which ultimately influenced the effectiveness of policy development and implementation. Hence it is important that political leaders are not just driven by a small vocal group of constituents (which is quite typical in the case of coastal management issues) but instead are provided with a broad spectrum of information about community adaptation concerns, values and priorities.

The second function of political leadership is to provide support for policy implementation. Political leadership for policy implementation is as important as leadership required for the other stages of an adaptation planning process (Biesbroek et al. 2009). Leadership for implementation is crucial because policy formulation does not always mean that policies are put into effect (Smith 1973). Lack of policy implementation can result in inconsistent management approaches and non-compliance with regulatory frameworks, potentially exposing local governments to legal problems.

In regard to effective leadership for policy implementation, the case studies can only provide a preliminary level of analysis given that at the time of interviews in WA local scale adaptation plans and policies were still in the process of being developed. The PNP case study reveals that the implementation of state policy, hence the consideration of a full gamut of adaptation measures, was hindered by five major factors: i) governments' lack of understanding of the instruments available to implement such options (poor understanding of, and disagreement on, policy objectives); ii) governments' fear that some of these decisions would carry liability into the future; iii) concerns that some measures are just not politically palatable for council and/or community; iv) lack of resources; v) circumstances external to the implementing agency imposing constraints such as political agendas, elections, etc.).

By contrast, the CCC was the first local government in Tasmania to have committed to the implementation of local coastal adaptation policy through the new town planning scheme provisions. This case study has provided invaluable insights into leadership for successful coastal adaptation policy implementation.

Respondents felt that adaptation decisions for the coastal zone are still strongly influenced by political agendas which are not informed by an adaptation planning process. High-level political influence on local decision making was described as being particularly frustrating where the decision making process had been conducted through ongoing and resource intense multi-agency collaborative arrangements. Some respondents commented that high-level politicians are less likely to have a long-term perspective, are more likely to be influenced by alternative agendas and have less understanding of the community's priorities and values. This attitude is likely to compromise collaborative and innovative initiatives. In fact, some

respondents pointed out that 'political decisions' are more likely to support 'business as usual' approaches, which in the coastal adaptation context can set dangerous decision making precedents.

The case studies also show that where political leadership is crucial for effective policy formulation and implementation, legislation can play a key role in motivating political leaders (Prutsch et al. 2014). At the state level leadership for adaptation encourages the development of high-level policy principles, frameworks and guiding documents for coastal hazard adaptation planning. At the local level leadership for adaptation enables the effective integration of climate change considerations into town planning schemes and local planning policies.

Meijerink and Stiller (2013) argue that policy innovation is often driven by 'entrepreneurs' such as politicians, bureaucrats and experts who have influence over policy development or have the authority to initiate policy. In Tasmania, the development of policy for coastal adaptation has been driven mainly by local government staff and elected members with expert advice from universities and private consultants. In WA, policy entrepreneurs in state government senior roles played a key role in influencing the integration of climate hazards into policy.

Scholars also argue that the way issues are framed influences the way the issues are handled in the political process. (Uittenbroek et al. 2014, p.1046) make a distinction between "political commitment as a 'dedicated approach' (in which climate adaptation is framed as the main objective) and as a 'mainstreaming approach' (in which climate adaptation is considered as an added value to another objective)". The leadership role played by the CoM shows that in the absence of clear state policy political leaders directed 'special' efforts and resources towards new knowledge and towards the development and implementation of new policy objectives.

My findings suggest that although this approach was key to putting coastal adaptation planning on the political agenda it led to unclear policy positions and responses. In a mainstreaming approach, which is what we should be expecting, as integration of climate adaptation objectives into sectoral policies improves, political commitment is still required, but it can be achieved indirectly through the support of policy implementation across various policy sectors.

The case studies also show that collaboration played an important role in supporting or enabling political leadership. In Tasmania, the TCAP partnership helped overcome *political* barriers to progress through the different coastal adaptation planning stages. The TCAP increased political leaders' knowledge through ongoing debates on coastal hazard issues and was instrumental in broadening politicians' views on the range of potential adaptation solutions.

The collaborative initiatives were particularly important because they confirmed the message among politicians and decision makers that management and investment decisions taken today will have implications beyond their immediate political function. To the contrary, the PNP case study shows that although local level political leadership can be crucial to support coastal adaptation, often it is not sufficient to overcome institutional or higher level political barriers.

Literature also suggests that climate adaptation requires other types of leadership roles other than political and those linked to positional power within government. Administrative leadership influences the planning, organizing, resourcing, directing, coordinating and evaluating of coastal adaptation planning initiatives (Cramer 1974). The case studies show that effective administrative leadership for coastal adaptation rests on motivated and dedicated individuals who are good at bringing people together, communicating innovative ideas, sourcing additional funding and persuading people with authority to engage in collaborative work. In contrast, 'negative leadership' or 'ineffective leadership' (Schilling 2009) does not contribute to partnership success and can compromise the interests, cooperation and fulfilment of the partners.

According to Stocker et al. (2013) leadership can also come from scientists, coastal champions, community groups and NGOs. Scientists and consultants played an important role as advisers and providers of evidence and value based knowledge in the TCAP. Consultants to TCAP were chosen specifically for their knowledge and experience in adaptation planning but also for their knowledge of key institutional and governance issues for coastal adaptation and for their acquaintance with community values and concerns. The CCC was able to create a reliable and highly trusted network of 'champions' to support them throughout the entire adaptation planning process. These individuals were also instrumental in the establishment of collaborative relationships with community and various levels of government through

the ability to create a climate of trust and the ability to facilitate relationships (Kouzes and Posner 2002).

NGOs can have a role to play as boundary organisations that improve science-policy dialogue by undertaking key institutional processes, namely: convening, translating, mediating and collaborating to co-produce knowledge and pathways for coastal adaptation (Shaw, Danese and Stocker 2013). The CVRAP case study illustrates how NACC played this important role in bringing people together to solve a common issue, by providing resources to undertake studies and to promote sharing of new information. NACC also tried to translate and interpret scientific information, however, the complexity of the CVRAP framework and the novelty of the process made this task very difficult. Perhaps this was also due to a lack of expertise within consultancy firms.

Despite these achievements the CVRAP case study shows some limitations of NGOs leadership for coastal adaptation planning. First, NGOs are non-government bodies which means that they have no decision making powers and non-binding advisory functions. Although NGOs can in some instances benefit from being dissociated from government structure and processes, the CVRAP case study shows two key challenges experienced by the NACC. One was the unfamiliarity with the specific regulatory and legal frameworks that applies to land use planning, and secondly with the various aspects of coastal decision making processes. NGOs like NRM bodies can be highly respected by the local community. However, the risk of raising community expectations for decisions that are strongly driven by other priorities and local politics is high and should be carefully considered by decision makers. The inconsistent nature of NGOs funding can lead to further expectations among partners and community.

To conclude, the case study analysis confirms that traditional authoritative models of leadership are not conducive to an adaptation planning process where adaptive solutions should be reached through careful consideration of the environmental, social and economic impacts of each option without undermining future generations and by balancing a multiplicity of interests, values, and views. Rather, leadership models that support the effective formulation and implementation of adaptation policies, promote knowledge uptake, enhance connectivity and focus on long-term strategic goals are preferred (Avolio, Walumbwa and Weber 2009, Meijerink and Stiller 2013). Leadership that supports collaboration and encourages feedback from

different parties is far more effective in responding to climate adaptation risk (Crosby and Bryson 2010, Folke et al. 2005).

'New' political leaders must first construct adaptation to climate hazards in the coastal zone as a complexity discourse (Fleming et al. 2014). Secondly, they must recognise the importance of collaborative adaptation planning as a process that improves knowledge on a complex issue, that enables the integration of multiple views, that favours innovation and that requires an ongoing process of monitoring and reviewing. Thirdly, political leaders must encourage the effective implementation of adaptation policies or at least encourage the development of a range of genuine and viable alternative policy options. Fourthly, political leaders must acknowledge that policies and decisions should be taken with the final aim to provide a net public benefit to the community rather than private owners. Embracing a collaborative approach means that adaptation leaders should develop behavioural flexibility and adaptability so that change in views and behaviour can occur in appropriate ways as the situation changes (Blass and Ferris 2007).

Other leaders, such as administrative leaders, are also crucial to progress the coastal adaptation discourse. Administrative leaders must demonstrate strong connective leadership skills (Meijers and Stead 2004) the ability to engage with relevant stakeholders in an open dialogue while acknowledging individual needs, opinions and perspectives. As suggested by leadership scholars such as Hoppe, van den Berg and Coenen (2014) and Brown, Furneaux and Gudmundsson (2012) leadership for sustainability can come from a wide range of positions within an organisation from staff to executives and elected members.

The case study analysis shows that individuals within local government organisations play a critical role in initiating and coordinating collaborative coastal adaptation planning. These individuals shared some common skills and attributes: they acted as moderators or negotiators by facilitating communication and mutual understanding among partners and within their own organisation; they successfully established a climate conducive to the development of new ideas and solutions; they were successful at project steering; and they made substantial progress in within the context of their own organisational setting. These leaders embraced new approaches to management and decision making such as adaptive learning (Kouzes and Posner 2002) reflexivity (Kemp and Loorbach 2006, Schippers et al. 2008) and flexibility (Fuerth 2009, Rammel and Van Den Bergh 2003).

7.2.4 Principle 4: Collaboration is instrumental in developing and implementing adaptive policy, improved policy dialogues and policy learning

In the literature, collaboration is considered instrumental in enhancing innovation, experimentation and learning in adaptation policy making (Matland 1995, Mirfenderesk and Corkill 2009, Richardson 2002, Stojanovic, Ballinger and Lalwani 2004). While this notion is widely accepted among scholars, its application requires further elaboration and practical examples.

The case study analysis discloses some of the challenges that adaptation planning partnerships may experience in fostering adaptive policy approaches and in coordinating the development of adaptation frameworks that are both adaptive and achievable. In particular, the role that collaboration plays in linking policy formation to implementation and in promoting policy dialogue.

One of the key issues raised in the interviews was the dichotomy between the need for comprehensive and unambiguous policy objectives (in order to reduce risk of legal and improve adaptation outcomes) and the need for policy frameworks that enable flexibility of application according to local needs. That is frameworks that can be implemented through a range of flexible planning tools and that can be refined as new information, through stakeholder feedback and studies becomes available (Macintosh 2013, Productivity Commission 2010a). The case studies show that achieving policy clarity and coherency as well as adaptive practices in coastal adaptation policy making has proved difficult.

On this issue some scholars argue that to be effective climate adaptation policy must be prescriptive, clear and coherent policy (Corfee-Morlot et al. 2010, Dovers 2005, Nilsson 2005). Others argue that traditional policy models that are too rigid and that do not allow flexibility in policy interpretation and application are inadequate to deal (effectively) with the uncertainties and dynamics of climate adaptation problems (IISD 2006, Richardson and Wood 2006, Smit and Wandel 2006, Smith and Lazarow 2006).

Recent scholarship suggests that the uncertainty and complexity of climate adaptation problems will always implicate a degree of ambiguity and 'conflict play' in policy making (Richardson et al. 2009). Ambiguity of policy must be dealt with through ongoing cycles of experimentation and evaluation (Richardson et al. 2009).

This research confirms that to achieve system transformation policy making processes must be clear but also flexible, experimental and innovative and supportive of frameworks for action, evaluation and reflection (Haasnoot et al. 2013, Hargroves and Smith 2006, Holling 1978, Lee 1993a, OECD & The World Bank 2014, Richardson 2002, Swanson and Bhadwal 2009, Walker, Rahman and Cave 2001). However, the case studies showcase that this is not a simple task. First of all, developing a clear and coherent coastal adaptation policy framework has proved to be a difficult task involving complex interactions of problems, actors and approaches. In fact, this is not unique to WA and Tasmania: numerous coastal adaptation policy frameworks produced in Australia to date have failed to produce the intended outcomes or have not accomplished their goals (Macintosh 2013).

Secondly, while a transition to sustainability in public policy making is underway in many policy sectors including climate adaptation (Kemp, Parto and Gibson 2005, Urwin and Jordan 2008, Walker, Rahman and Cave 2001), integrating adaptive paradigms in coastal adaptation policy making, such as *flexibility, experimentation, innovation and learning* has not proved to be simple either. Again, a common trend throughout Australia where examples of flexible adaptation land use planning instruments being successfully implemented to prepare for and manage coastal hazards are still limited today (Macintosh, Foerster and McDonald 2013, Robb et al. 2017).

The following sections discuss the challenges of applying adaptive management principles of policy flexibility, innovation, experimentation (Haasnoot et al. 2013, Hascic, Johnstone and Kalamova 2009, Middle 2010, Rammel and Van Den Bergh 2003, Schultz et al. 2015, Steele and Ruming 2012, Tasan-Kok 2008, Walker, Rahman and Cave 2001), policy learning (Borrá 2011, Brunner et al. 2005, Busenberg 2001) and reflexivity (van Mierlo, Arkesteijn and Leeuwis 2010) in the coastal adaptation planning context and examine how collaboration has contributed to this process.

Policy flexibility and innovation

The ability to achieve policy flexibility is particularly important in public policy arenas (Haasnoot et al. 2013, Kenchington, Stocker and Wood 2012b, Macintosh 2013, Macintosh, Foerster and McDonald 2013). The importance of policy flexibility in land use planning is not a new concept. In the mid 70's Strangert (1977) already described the benefits of introducing flexibility in planning as a way to provide versatility of a defence at a particular time.

Policy flexibility in the context of coastal adaptation is discussed in terms of the ability of a policy to embrace the dynamic nature of coastal processes and allows policy makers to make adjustments as new conditions arise or in response to certain events (Macintosh 2013, Macintosh, Foerster and McDonald 2013).

Furthermore, it refers to the ability to support flexible interpretation and application, hence flexible decision making approaches the benefit of flexible policy and consequently decision making approaches (Haasnoot et al. 2013). According to Haasnoot et al. (2013) the benefit of flexible policy and consequently decision making approaches is the ability to keep options open and avoid ‘lock-in’ decisions. This is quite an innovative view given that coastal adaptation decision making is often driven by short-term economic interests and by expectations that problems must be addressed now rather than later (often at expenses of good planning).

Innovation is also discussed in the literature of climate adaptation and considered important not just in policy making but also in climate modeling, decision making tools, risk mitigation strategies, and mechanisms for the uptake of new practices and approaches and improvement of existing ones (Hascic, Johnstone and Kalamova 2009, OECD & The World Bank 2014).

The case studies show that adaptation planning partnerships have played a major role in simulating innovation in the field of policy making for coastal adaptation, but also science and adaptation planning. However, while over the past decade there has been a proliferation of new tools and innovative approaches it remains difficult to determine if decision making outcomes are being informed by these collaborative initiatives. Throughout Australia examples of innovative decisions or solutions for coastal hazard problems are still fairly limited (Macintosh 2013, Preston, Westaway and Yuen 2011) or limited to engineering responses or only a few spatial planning instruments (Robb et al. 2017). This is because pioneering planning solutions (or untested in similar conditions) or untraditional engineering solutions can be politically unpalatable or too costly or too risky due to potential liability.

In regard to policy flexibility, the case studies findings agree with recent scholarly literature that achieving flexibility through land use planning can be very difficult (Haasnoot et al. 2013). The case studies point to the fact that, despite the importance attributed by the academic literature, there are still limited examples of flexible planning instruments and policy responses being developed at the local level for managing coastal hazard risk (WA), and if there are (Tasmania) they

remain still fairly untested. Issues with regard to applicability of flexibility in planning were already discussed in the 1990's (Alterman 1988, Strangert 1977).

Alterman (1988, p.393) asked: "how can an adaptive planner refit an old plan in order to meet the demands of some new planning situation?" Policy scholars argue that climate adaptation cannot be achieved through the use of regulatory instruments alone (Bonyhady, Macintosh and McDonald 2010, Macintosh 2013, Macintosh, Foerster and McDonald 2013). These instruments are usually *inflexible* instruments that leave planning authorities with limited options for modifying land use and development or reviewing past decisions and can present problems later on for decision makers. On the latter, Macintosh (2013, p.1043) argues that the use of "fixed regulatory responses can later be judged to be an under-or-over-reaction". Scholars also argue that legislation would be a stronger instrument for regulating coastal adaptation planning, whilst other argue that a policy alone would provide that degree of flexibility.

Other scholars such as Steele and Ruming (2012) argue that the prescriptive and rigid nature of zoning as a policy tool is inadequate in dealing with climate hazard risk in the coastal zone and suggest that modern planning systems need to pursue both flexibility, through discretionary planning mechanisms, and certainty, through regulatory mechanisms such as zoning. Hence, land use planning in the coastal zone should be considered as a 'hybrid system', characterised by both regulatory and discretionary mechanisms.

The issue with policy flexibility is exhibited by the WA case study. The SPP2.6 undoubtedly represented an attempt at producing a coastal policy that was more innovative in its content and methodologies. The accompanying policy guidelines were intended to be a flexible document that can be adjusted as new information arise or contexts change. The idea behind the introduction of the guidelines and CHRMAP was to provide an adaptive framework for the development of planning instruments that can be tailored to local circumstances and revised as new information becomes available. The SPP 2.6 adaptation hierarchy was developed specifically to assist local governments and proponents with the identification and comparison of a gamut of adaptation measures within the adaptation strategies of *avoid, relocate, accommodate and protect* and its applicability would be based on local needs and priorities.

State government respondents while acknowledging that the SPP2.6 was conceived to be a flexible, incremental and conditional policy, also admitted that it was 'a work in progress'. However, in the follow-up interviews (hence a few later from the revision of the policy) the opinion among the majority of WA local government respondents was that, despite some progress, many aspects of the SPP2.6 had been ill designed, implementation mechanisms overlooked and evaluation process either not in place or badly coordinated by state government.

People felt that while the objectives of the SPP2.6 have noticeably improved from predecessor policies, the revised policy and associated documents are yet to provide clear guidance for achieving these objectives. Firstly, the adaptation hierarchy has been extremely difficult to understand and apply, signifying issues in the 'thinking phase' and in the 'implementation phase' of the policy design process (Walker, Rahman and Cave 2001). This shows how important it is in a policy making process to carefully consider all four dimensions of a policy design (conceptual, technical, ethical, and practical) in order to avoid difficulties in the policy implementation phase (Brewer 1973, Walker, Rahman and Cave 2001). For Urwin and Jordan (2008) consistency between policy design and policy implementation is key to ensure that policy users are familiar with the policy requirements and have access to implementation mechanisms. For Sabatier (1980) it is at this stage that the success or failure of the policy is determined.

Secondly, the policy was designed to enable the application of flexible policy instruments such as time and event contingent approvals, notifications on titles, and special area rates (Macintosh 2013). However, this was hindered by the lack of clarity provided by state government over the legal applicability of such instruments within the current overarching legislative framework. Without a legislative framework that supports novel flexible instruments, decisions made by local governments on this basis would be considered unlawful, hence potentially rejected by state government at time of approval or challenged in Court (Robb et al. 2017). Macintosh (2013) argues that lack of robust legislative framework to support flexible approaches can lead to uncoordinated and inconsistent policy implementation. The WA case studies show that this confusion was responsible for the lack of action at the local level. Without clear guidance from state legislation WA local governments have shown to be extremely cautious about the potential for litigation associated with the introduction of 'untested' and potentially 'not feasible' flexible regulatory instruments.

On this issue Macintosh, Foerster and McDonald (2013) argue that appeals to state tribunal are becoming more frequent throughout Australia, and states that broad discretionary instruments can lead to conflict and excessive planning appeals that increase transaction costs and inconsistencies in policy responses. According to Rigby (2005) concerns over liability exposure is exacerbated by poorly defined hazard information and by ambiguous or inconsistent legislation in regard to exemptions from liability.

In WA, local government respondents also argued that local governments must be provided with adequate financial support if they were to be driving policy experimentations in this field. Local government respondents complained about the lack of financial and human capacity as well as technical expertise to drive groundbreaking work in adaptation policy making. Some also mentioned the costs for increased monitoring and evaluation activities that inevitable flexibility would require. Respondents from local government senior positions complained that this type of work should have been carried out by state government before releasing the new policy or at least better coordinated through an evaluation process after the policy was released.

The shift in the WA coastal planning policy from “an instrument of control to an instrument of innovation and action” (Tasan-Kok 2008, p.186) coincided with the recent trend to delegate the majority of responsibilities for assessing and mitigating coastal hazard risk to local government authorities. Decentralisation of responsibilities and powers without a supportive and adaptive governance system was certainly an issue in WA. Poor integration between policy design and policy implementation occurs typically when the institution or organization which designs the policy is different from the one responsible for implementing the policy, and when coordination and collaboration efforts are poor (IISD 2006). Swanson et al. (2010) argue that decentralization of policy responsibilities may not be appropriate for policies on complex societal issues that require a uniform and consistent approach.

While local government respondents acknowledged their increased responsibilities for policy development for coastal adaptation, their preference was still for an overarching policy that provides clear and useful guidance and reduces ambiguity in local decision making. Without such clear, credible and implementable policy

objectives, local governments are more inclined, as demonstrated by the WA findings, to prefer to maintain the status quo.

The interviews reveal that local governments are more inclined to continue to adopt traditional or reactive management and policy approaches until other organisations have led the way, or proof or efficacy is obtained through technical studies or it becomes a policy requirement. In some cases, local governments commented that there is a reluctance to lead innovative approaches due to the belief that either state government would not support them or that state government will act as an 'insurer of last resort'. This raises the question as to whether innovation in coastal planning is either hindered or enabled by decentralization.

Another factor that affected policy implementation in WA has been the strong reliance on external expertise. Given the lack of in house expertise within government agencies, consultants (particularly coastal engineering specialists firms) have been appointed to provide advice on policy measures and ways to implement them. However, the case study shows that coastal adaptation planning is a new process also for consultants and their knowledge and practical experience in this field is still limited. While there is little evidence in literature on the role of consultants in the policy making process, Saint-martin (1998) argues that the influence of private sector consultants over the policy making process can be detrimental particularly for those decision making issues that are not just about economic values.

In WA, the majority of the adaptation planning studies have been conducted by engineering firms whose core expertise is modeling of coastal processes, monitoring and 'hard' interventions. These firms, however, demonstrated limited knowledge and experience particularly in land-use adaptation planning, in the integration of other values such as social, ecological and cultural and in community engagement.

The PNP case study shows that the prevalence of engineering knowledge among the chosen consultants did not help shedding light on feasible changes to existing planning frameworks and hindered successful public participation in the coastal adaptation planning process and adaptation debates. A problem where policymakers have been perceived to use consultants to legitimize and give

credibility to policy reforms. In Tasmania, the consultants engaged in the TCAP process possessed a wider range of expertise embracing the transdisciplinary nature of coastal adaptation planning. These consultants were highly trusted by the community. Across the three case studies universities played an important role in advocating cross-knowledge transfer, policy learning participatory practices. However, they were not as successful at producing practical management advice.

Policies as experiments

Scholars argue that policy should be continuously informed through a review process and through feedback mechanisms sought through an iterative decision making framework (OECD & The World Bank 2014). Experimentation for example through testing of different policy instruments and trailing of different risk mitigation techniques avoids locking in certain decisions which could have a detrimental impact on environmental, social and economic values (Nurse-Bray 2010). However, practical examples of how these concepts are being successfully applied in the coastal planning context are still limited.

WA respondents discussed the importance of regarding policies as experiments but questioned the way state government has been testing policy effectiveness and gathering policy-relevant evidence. The principle mechanism to test policy in WA has been through pilot studies *partly* funded through state grants. While this seems consistent with an adaptive policy approach by which policies are treated as experiments with the aim of promoting continual learning (Busenberg 2001), respondents felt that many of these pilot studies were undertaken on an ad hoc basis reflecting issues of poor policy dialogue and lack of clarity regarding policy objectives, methodologies and implementation instruments.

Respondents complained that a proper evaluation process should have been built into the policy design instead of solely relying on local governments to test methodologies and policy applicability. There is also little evidence that evaluations have been collated and used to improve the department's knowledge and that an internal process was established to gain feedback on policy effectiveness.

Respondents were also adamant that policy experimentation requires strong collaboration among all parties involved including scientists, non-government organisations and community actors and adequate financial support. The TCAP case study shows that non-government actors can play a key role in the policy

making process by enriching the policy dialogue (Ansell and Gash 2008, Hajer and Wagenaar 2003, Innes and Booher 2003). One of the key challenges experienced by the WA participants was to find technical ‘experts’ who had a deep understanding of the governance context in which adaptation plans and policies are developed or tested. According to Orr (2013) implementation of environmental policy goes beyond the availability of scientific knowledge and expertise.

The case studies also show that policy-dialogue is needed throughout the entire coastal adaptation planning process. This is because, as policy scholars point out, policy making does not stop with the formulation of policies but continues to their implementation (OECD & The World Bank 2014, Thomas and Grindle 1990). The TCAP partnership for example was able to unlock policy innovation through experimentation and learning. Through the TCAP collaborative initiative the partners (including community) were able to reach agreement on policy outputs and enhance joint ownership of policy decisions.

In WA coastal adaptation planning partnerships made a significant contribution at broadening policy dialogue and facilitating knowledge sharing through the provisions of skills, resources and pilot studies. However, collaboration efforts weakened during the policy implementation phase. Despite the realization that coastal adaptation planning requires adaptive policy approaches, there was still a general preconception among governments that decisions can only be made once the ‘appropriate’ knowledge is available as demonstrated by the continued search for more accurate and detailed hazard information. According to Hajer and Wagenaar (2003) this is typical of issues who can easily increase legal exposure or cause political backlash.

Reflexivity

According to van Mierlo, Arkesteijn and Leeuwis (2010, p.143) scholars adaptive policy making practices that are innovative and flexible must be “accompanied by a monitoring and evaluation approach that supports and maintains reflexivity to be able to deal with uncertainties and conflicts while challenging current practices and related institutions”. This evaluation process should include a variety of actors who are part and parcel of the problematic context. In this perspective, policy development should not aim at establishing a ‘perfect’ policy framework, but rather at fostering self-reflection (Sandri 2009). To achieve this, policies must be conceived within a governance system that encourage self-reflection and learning within

groups of diverse actors that seek to contribute to system change. This approach, according to scholars, helps to stimulate collective learning and to design more effective policy solutions (Hendriks and Grin 2007, Voß and Bornemann 2011, Voß, Bauknecht and Kemp 2006). Reflexive practices enable 'the rules of the game' to change as innovation concepts and initiatives emerge. It also enables reflections on the institutional settings in relation to long-term goals and objectives originally posed through policy and the effectiveness of such objectives on concrete actions and their effects.

The case studies show that level of reflexivity was significantly higher in the TCAP partnership than in the WA ones. The issue experienced in WA is a lack of willingness by state government departments to look introspectively and to encourage participation of different actors (and particularly local governments) in the development and refinement of relevant policies. On the local government side, there seemed to be a lack of critical reflection and action with regard to problem framing and problem solving for coastal adaptation with an expectation that someone will eventually lead the way in producing the 'right' methodology or policy approach. This was also demonstrated by the slow progress by both local and state government agencies in recognizing the need to embrace transdisciplinary collaborations, which bring together scientific and extra-scientific expertise (Popa, Guillermin and Dedeurwaerdere 2015), hence a variety of different views, knowledge and values.

Collaborative policy making

Scholars argue that, in a climate of policy uncertainty and ambiguity governance, collaborative governance can be instrumental in fostering innovation, experimentation and shared learning in coastal adaptation decision making (Bentrup 2001, de Loë et al. 2009, Folke 2006) and in facilitating policy implementation (Bentrup 2001). The case study analysis showcases some of the barriers to effective collaborative coastal adaptation policy making.

The first reflection is about how in WA informal collaborative arrangements came about as a consequence of policy ambiguity and their evolution as the policy was revised. Prior to the policy review, when state policy was not geared to take into account the emerging challenges of coastal adaptation, policy ambiguity is an impetus for collaborative 'bottom-up' initiatives which are established to provide stimuli for innovative and more adaptive and flexible policy changes. After the review, the persistence of policy ambiguity and the lack of constructive dialogue with

state government (particularly with regard to policy implementation), such collaboration arrangements may weaken leaving local governments with a greater need for clarity and leadership from state government. This indicates that to be effective, collaboration must be supported by, or must support the development of, a governance system that is better equipped to support adaptive strategic planning, adaptive policymaking and adaptive implementation and administration of strategies and policies. The Tasmanian case study shows how through multi-agency and multi-level collaboration a more prepared and more adaptive coastal governance system was achieved.

The second reflection concerns the ability of adaptation planning partnerships to foster policy innovation through experimentation. Organisations that are willing to collaborate, share and learn from each other are more likely to support innovation as demonstrated by the TCAP case study. In WA, issues with policy dialogue among the different parties hindered innovation and led to implementation difficulties. What was lacking, according to the PNP respondents, is a transparent and open policy dialogue and a strong commitment from all parties to policy learning to help reducing the 'implementation deficit'. That is, (Innes and Booher 2003, p.37) "to achieve collaboration among players with differing interests and a history of conflict, the dialogue must be authentic". Hajer and Wagenaar (2003, p.17) argue that "politics and policymaking is not simply about finding solutions for pressing problems, it is as much about finding formats that generate trust among mutually interdependent actors". Respondents felt that despite the work undertaken by the partnerships there was still a high level of distrust among the organisations involved.

The case studies also show that innovation and collaboration are not mutually exclusive; they feed and build upon each other (Dietz, Ostrom and Stern 2003). According to Lawrence, Bennett and Barchiesi (2004) and Swanson and Bhadwal (2009) organisations that support experimentation and innovation (such as the CCC and CoM) and challenge traditional approaches to decision making are more likely to develop a positive attitude towards shared learning and collaborative approaches to decision making. For example, the CVRAP coastal managers (the CGG and GPA) did not seem particularly interested in abandoning traditional decision making processes to venture into new, more costly and still poorly understood collaborative projects endeavours. The CVRAP framework, presented as an innovative tool for coastal planning which would have required ongoing financial commitment, was perceived by the local government as an expensive exercise particularly without

secure and ongoing financial support from state government and other key stakeholders.

Further, policy experimentation was seen as a risky activity for local governments potentially exposing them to increased liability risk. Members were also reluctant to share information due to lack of trust; this was an opportunity foregone to gain major new skills or knowledge in this new field. In the case of the CVRAP partnership, collaboration was not successful at fostering innovative ideas and practices because partners were not committed to the goal of the CVRAP or to sustaining the partnership itself. With such an internal instability and without clear guidance from state government in support of it, innovation and experimentation were perceived as an additional burden on the local government.

In Tasmania, the TCAP partners were able to jointly achieve policy flexibility through the introduction of flexible planning requirements such as codes and guidelines that enable planners to assess each development application in high vulnerable areas through a diversity of development control measures. Through strong support from the elected members, the partnership achieved effective collaborative arrangements with other government agencies and with the community. Meaningful and ongoing dialogue with community enabled gaining support from the constituency on 'trailing' different hazard mitigation options.

Another key difference between the PNP and the TCAP partnerships is the degree of urgency in relation to coastal hazard impacts. The TCAP case study shows that the partners had a much stronger commitment towards innovation, experimentation and shared learning because of the greater sense of urgency in addressing these issues within the Clarence community and a strong consensus among stakeholders with a legitimate stake in the issues to find a joint solution.

The third reflection concerns the role that collaboration can play in supporting policy implementation. The importance of policy collaboration among government agencies is discussed by Middle (2010) who argue that collaboration involving several government agencies at different levels can be effective at solving complex policy problems which involve different interests and views. Policy implementation requires better communication and dialogue, adequate financial support for trials, and a clear adaptive policy framework. Through this, local governments are better supported for the development of a common understanding of what adaptation instruments are available, what type of information is required to inform them, how

they can be implemented within the existing regulatory framework, what resources are required to implement them and how they can be adjusted over time.

To conclude, to be effective at supporting policy innovation, experimentation and implementability collaborative governance must involve organisations that are inherently adaptive. This includes the organisations that are responsible for policy design and implementation working together. Building on Lee (1993b) institutional conditions favouring adaptive management, collaborative governance requires partners to:

- share a mandate to take action in the face of uncertainty, which include developing joint knowledge, plans and strategies
- be aware that experimenting is part of the adaptation planning process
- encourage a coordinated approach to policy implementation
- care about improving outcomes over longer time scales
- acknowledge that coastal adaptation requires the consideration of alternative practices which can be trailed and evaluated
- have access to (share) adequate resources to measure systems' behaviour and to measure effectiveness of adaptation pathways over a long-term period
- have access to the latest modeling and monitoring techniques to estimate likelihood and consequence of risk
- partners to foster a culture (within the partnership and within each organisation) that encourages learning from experience.

7.2.5 Principle 5: A collaborative and transdisciplinary approach promotes better uptake and incorporation of evidence and value-based knowledge into adaptation decision making

It has been argued that in Australia policy decisions should be made on the basis of the best evidence available at the time and decision makers are required to disclose such evidence to the public (Eburn and Handmer 2012). The so-called 'evidence-based approach' (Banks 2009b) helps improve the efficiency, effectiveness and legitimacy of policy processes (Argyrous 2009) which in turn, *should* lead to better decision making outcomes in the long term (Banks 2009a).

Over the past decade the proliferation of coastal hazard risk assessments showcase the 'evidence-based' nature of coastal adaptation planning in Australia (Preston,

Danese and Yuen 2011). High-quality and most up to date evidence on coastal processes and climatic changes is being attained to facilitate the understanding of coastal processes and the identification of areas at risk of erosion and flooding (HRSCCWEA 2009); to improve the reliability of advice to policy makers (Productivity Commission 2010b); to facilitate the development of mitigation responses (Australian Government 2006); and to improve disaster preparedness (Klein, Nicholls and Thomalla 2003).

For these reasons, over the last decade, assessing the risk that climate hazards pose to coastal communities has become a legislative requirement in most states (Macintosh, Foerster and McDonald 2013). Hazard evidence is produced not only by governments and agencies for emergency-response and development-control purposes, but also by the private sectors with an interest in assessing the vulnerability of private assets and investments on the impact of coastal erosion and inundation. While gathering information on community values and preferences with regard to climate risk is gaining momentum in the process, and the effective use of this information in decision making processes is more frequently debated, scholars argue that effective uptake of value-based knowledge in coastal adaptation planning is still too infrequently realised (Adger et al. 2009).

Whilst some literature suggests that *rigorous* and *reliable* evidence is a key pre-requisite for effective decision making (Banks 2009a, Head 2010), a growing body of research argues that due to the deep uncertainty and complexity of climate hazard science, it is unlikely that such information only would entirely fulfil the expectations of decision makers (Adger et al. 2009, Dessai et al. 2009). For this reason, adaptation scholars argue that lack of accurate and robust information should not represent a limit to effective adaptation decision making. Dessai et al. (2009, p.112) conclude that “a *predict-then-act* approach to science in support of climate change adaptation is significantly flawed”. This is also the rationale of the precautionary principle (EEA 1999).

The contentious issue between the need for government to make decisions based on the best possible science and the significant uncertainties that hazard risk assessments carry, is well exemplified by the case studies. In WA while decision makers are bound by the precautionary principle, there has been an excessive focus on reducing uncertainty of climate information as opposed to producing ‘reasonable’ information upon which management decisions can be made. As a result, the need to produce accurate, robust and credible hazard mapping

information has prevailed over adaptation action at the local level and meaningful engagement with community.

This was also demonstrated by the allocation of funding that favoured engineering projects rather than social studies and community engagement projects – a function of the dominant world view that seeks to find technical answers to complex issues and of a reluctance to support transdisciplinary approaches. Local government respondents were of the opinion that to be effective planning policies must be based on robust prediction of uncertainties and accuracy in assessments of future climate change particularly in regard to regional weather and climate extreme events. Overall, the accuracy of hazard information was considered crucial by local governments in order to minimise exposure to future liability.

The PNP case study shows that the inherent uncertainty of climate information and an overall lack of expertise within local government in interpreting this information have resulted in a continuous cycle of data collection and validation and ad hoc approaches to coastal adaptation planning. This has resulted in lack of, or delays in, incorporation of coastal hazard considerations into local policy and in the development of adaptation plans. For Preston, Danese and Yuen (2011) this is an example of a 'knowledge deficit model' where knowledge is perceived to be the constraint on decision making resulting in a continual cycle of investigation. O'Dwyer (2004) argues that knowledge in complex decision making can be used as a delaying tactic to avoid responsibility for unpopular policy outcomes.

Hence, the WA approach follows the so called 'reductionist approach' to science which has been criticized by scholars such as Brunner et al. (2005) and Hulme (2011). These scholars argue that oversimplifying a system can result in the loss of important information such interactions, feedback and linkages between system's elements. (Hulme 2011, p.249) for example, argues that "simulations of future climate from climate models are inappropriately elevated as universal predictors of future social performance and human destiny" suggesting that reductionism fails to consider the transdisciplinary nature of a societal problem and limits the integration of other knowledges such as local and traditional.

In Tasmania, much of the burden of gathering detailed information on coastal hazard risk has been passed onto development proponents who have to demonstrate that the specific decision requirements set by the Coastal Erosion Hazard Overlay are met. Despite the recognition of the importance of detailed and

accurate information on current and future climate hazards, the focus of the TCAP decision makers was to develop policy solutions whose likelihood of achieving desired ends is only weakly affected by information uncertainties.

The case studies also show that local governments were concerned not just with gaining access to information on coastal hazard risk that is not just reliable and accurate, but also in a format that is useful for decision making, thus easy to interpret, use and communicate. Hence, effective knowledge uptake depends on the way evidence is delivered and translated (O'Toole and Coffey 2013). The CVRAP case study for example, shows that knowledge wasn't effectively delivered and translated, and that the end-users weren't sufficiently receptive or skilled (most likely both).

A study conducted by Melkonyan (2011) on the effective use and communication of climate risk information shows that considerable effort must be spent on the part of both the producers (e.g. consultants, academics) and the users of the information (e.g. planners, policy makers) to understand the project scope and the key deliverables. For Banks (2009a) an evidence-based approach requires a policy making process that is receptive to evidence. Hence climate adaptation policy making requires policy makers and managers to have strong capability and expertise to interpret the information at hand, and can discriminate between evidence which is reliable and useful from evidence that is not. The CVRAP and PNP case studies reveal that it was not just the 'end users' that did not have the technical background and the interpretation skills to translate and use the information for their own purposes, but the lack of expertise was found also among coastal consultants and state government staff.

Given that decisions affecting the coastal zone are primarily based on a background of complex and often conflicting values, effective 'evidence-based' decision making cannot merely consist of empirical information on coastal vulnerability and climate hazard risk, but must incorporate information on people's knowledge, values, beliefs, and practices. According to Koetz, Farrell and Bridgewater (2012) communicating risk to people who are likely to be affected by the policy provides important information which in itself constitutes evidence. Further, values not only consist of non-climatic factors (Füssel and Klein 2006), but also individual and subjective dimensions of risk (Head 2010, Wolf, Alice and Bell 2013).

Climate change adaptation literature shows that scientific assessments only (i.e.

vulnerability assessments) cannot explain what values people attach to places and activities and how these might be affected by the changing climate (Wolf, Alice and Bell 2013). As a result, “it cannot produce insight into the goals people might pursue through adaptation” (Wolf, Alice and Bell 2013, p.549). A study conducted by Wolfe (2010) shows that views on adaptation diverged significantly both within and between communities when distinct values were at play.

Thus, the inherent uncertainty and ambiguity of hazard maps, the potential long-term implications of maladaptive responses and the increasing conflict of interests generated by a rapidly changing coastline are the reasons why ‘coastal values’ studies are becoming increasingly popular. This is demonstrated by the increasing popularity of ‘sustainable’ decision assessment methods that can effectively combine multi-criteria analysis with the more traditional cost-benefit analysis (Banks 2009a).

This research confirms that a combined value-evidence approach is more effective at driving forward the adaptation policy agendas as demonstrated by the success of the TCAP case study. However, it also shows that despite the widespread recognition of the importance of integrating stakeholder’s values to ensure that there is buy-in and support from those affected by decisions (Clarke et al. 2013, Tompkins, Few and Brown 2008, Tompkins and Adger 2005), the development of feasible and equitable adaptation responses based on such values is still a major challenge for local governments. It also shows that despite stakeholder engagement in adaptation planning becoming a key policy requirement, communication of climate hazard risk and public engagement in coastal adaptation decision making are still poorly implemented (Renn 2006, Serrao-Neumann et al. 2015).

In WA, for example, values have not been adequately recognised and incorporated into coastal adaptation planning as demonstrated by the limited number of community engagement initiatives or poor community engagement outcomes undertaken across the State. According to the respondents what differentiated the TCAP approach to the PNP approach to community engagement in coastal adaptation planning was the lack of understanding of the science and the instruments available to implement adaptation responses; lack of involvement of community right from the beginning of the process and foremost concern over legal liability, as it relates to coastal land use planning decision making. The Clarence-TCAP shows that addressing knowledge deficits through hazard mapping alone is

not sufficient. In order to be successful and effective coastal adaptation planning must allow for diverse inputs of knowledge across multiple scales, sectors, disciplines and jurisdictions.

Literature also suggests that while adaptation requires a deeper involvement of citizens for the co-production of services (Bovaird 2007, Sayce et al. 2013), simple community engagement approaches are no longer effective. On these issues, the case studies demonstrate that community participation and engagement in coastal adaptation is still a relatively recent phenomenon. Equally that not all engagement processes have been successful and effective in genuinely and meaningfully empowering or involving communities in adaptation planning. This is despite the proliferation of coastal adaptation planning projects that include guidelines and strategies to support community engagement efforts during the process, and state policy encouragement to local government to take forward their role in community based coastal adaptation planning.

The common barriers to meaningful community engagement specific to coastal adaptation planning that emerged from the case studies include:

- timing of engagement
- level of engagement
- the target audience
- strategies and tools
- resources availability
- relationship and trust among actors
- integration of information acquired.

Local government respondents regarded the issue of timing of community engagement in coastal adaptation planning as an inhibiting factor. In WA, local governments appeared particularly concerned about involving citizens too early in the adaptation planning process. This is because of their fear of releasing information about hazards to the public due to their low confidence in the reliability, robustness and applicability of the hazard information. In addition, because of the potential stakeholder and public reaction to the disclosure of hazard information before the development of an adequate strategy to address these issues. For example, in WA some local governments decided not to disclose in full coastal vulnerability reports and hazards to the public until the final stages of the adaptation

planning process. This clearly contrasts with the tort claim Act which says that there is no significant legal risk in providing “reasonably accurate” hazard information in “order for people to make their own choices about what risks they will accept and how they will prepare for those risks” Eburn and Handmer (2012, p.19). It also contrasts with the literature that suggests that for engagement to be meaningful and effective citizens must be involved in both the definition of the problems and the development of solutions (Maibach and Priest 2009, Tompkins, Few and Brown 2008).

During the interviews a minority of local government officers voiced the opinion that citizens do not have the skills to understand the complexity of climate hazard science in full, and that their opinions and priorities are too driven by personal interests. Some respondents also seemed to believe that citizens are only interested in participating if there are obvious or imminent threats. Hence, it is better to ‘consult’ with them once the information is ‘robust enough’ and once ‘solutions’ have been prepared. These opinions are in contrast to scholars’ views that setting the scene and providing transparent and relevant information in a timely manner is crucial to the success of community engagement processes (Smith, Leitch and Thomsen 2016).

By contrast to WA’s reaction, the CCC led an extensive community engagement process through which the local government elicited participants’ views and opinions on coastal erosion and inundation issues; incorporated participants’ views and priorities in the identification of management solutions; and encouraged participants to take responsibility for their contribution to solutions (Smith, Leitch and Thomsen 2016, Tompkins, Few and Brown 2008). The incorporation of stakeholders’ knowledge and values into the adaptation planning process gave the TCAP process much more credibility and strength compared to the WA adaptation planning approaches. The community and stakeholder engagement process undertaken as part of the TCAP project was successful because it provided a basic but adequate level of information to the public. This consisted of a mix of scientific evidence as well as economic and political decision making factors designed to enable people to understand the issues involved in assessing and managing coastal hazard risk and to explore a gamut of adaptation options. This success can be attributed to the decision to engage community at a deeper level in which citizens are involved in joint decision making, shared leadership and common goals (Cavaye 2004).

Establishing how 'much engagement' is necessary and on what scale was another challenge raised by the respondents. Most of the community engagement initiatives undertaken by the PNP involved a small number of representatives from the public and occurred only once during the coastal adaptation planning process. 'How much' community engagement depends on availability of resources; on expertise in risk communication and facilitation sought; and on the relationship (trust) between local government and its constituents particularly on coastal management related matters place (Smith, Leitch and Thomsen 2016). Wider forms of engagement often seem too risky or impractical especially considering that typically, public servants have limited public engagement and facilitation skills. The timing and frequency of an engagement process depends on how much value local government is putting on the engagement process itself. If there is no belief that raising community awareness and involvement can influence decision making outcomes, then engagement will not be a priority.

Community engagement processes also require effective and fit for purpose strategies given that the capacity to understand and adapt to coastal hazard risk varies greatly within and among communities, depending on socio-economic background, exposure to information and risk (Smith, Leitch and Thomsen 2016) and attachment to place (Manzo and Perkins 2006). Scenario planning and participatory visual tools have proven to be very effective at fostering dialogue and enhance learning with community about climate adaptation (Grant et al. 2015, McCall 2004, Stocker and Burke 2006, Stocker et al. 2012a). However, limitations of these techniques and also of overall governance, particularly when engagement is an ongoing process include: a limited number of participants (hence low representativeness); high costs associated with providing material and human resources; poor integration of existing knowledge; not enough time to gather deeper knowledge and reflections; poor follow up activities; and lastly poor incorporation of citizen input into agency decision making.

Effective community engagement can be limited or hindered by the lack of financial support. The PNP case study shows how community engagement can suffer from competition for funding with the other components of the adaptation planning process such as modeling and hazard mapping exercises. For example, in WA it is only recently that more resources are available to local government to gather information on social values. While some respondents felt that a lack of funding was a key barrier to successful engagement processes, the majority were of the opinion

that funding cannot be used as an excuse for postponing or excluding community participation in adaptation planning.

Because of the limited coastal expertise within local government external consultants and researchers are typically engaged to translate the information to community and facilitate the engagement process. The case studies illustrate that consultants play an important role in community engagement processes for coastal adaptation planning. Highly trusted individuals who understand community needs and are able to translate technical information into a format that is understandable, are key to the success of the engagement process. The same consultant appointed by CCC facilitated each stage of the community engagement process and was able to transpose his skills and knowledge into a new context and to work together with other scientists or experts to achieve meaningful results.

Another key issue raised during the interviews was about what to do with the information gathered through the engagement process. Scholars argue that it is pointless asking the community what their opinions and priorities are if this information is not taken into consideration in the decision making process (Bovaird 2007). It is not uncommon that the results of the dialogue around values and priorities are fed into the final project report but do not instigate any further engagement or policy action. At the same time, it is important that the community understands what factors may impact on a council final decisions such as budget considerations, political agendas, environmental and social concerns (Cavaye 2004).

The level of engagement selected for a process will also depend upon how the information is going to be used within Council and in the decision making process. It is not uncommon in coastal decision making that the community's perspectives and views are gathered and then not taken into account into final decisions or that final decisions do not match community expectations (O'Toole and Coffey 2013). Hence, local governments have to be upfront in regard to the engagement process enabling a genuine devolution of power and decision making to the public. The inclusion of elected members and politicians in the engagement process is crucial to establish trust between the constituency and the decision makers and to ensure that decision makers have ownership over the process (Gilmour, Coffey and O'Toole 2015). The consultants used to run the community engagement must be highly trusted people with excellent communication skills and knowledge, not just on adaptation planning

processes, but also on governance for adaptation if they are to avoid sending inconsistent, overly complex, confusing, or incomplete risk messages to community.

This study also demonstrates that availability of empirical evidence collected through coastal vulnerability and hazard risk studies is not enough without adequate governance mechanisms that encourage the integration of new knowledge into policy making processes and that facilitate dialogue between scientists and practitioners (Preston, Westaway and Yuen 2011, Wood and Stocker 2009, Young 2010). Young (2010) argues that it is the 'institutional void' within the governance system that puts the burden of decision making on knowledge rather than institutions themselves. The CVRAP case study shows that the capacity to undertake a comprehensive and detailed local scale risk assessment was strongly influenced by the governance system, which ultimately constrained the capacity of the program partners to successfully carry out the process.

Scholars argue that traditional top-down models of governance are less equipped at using scientific evidence effectively to address complex societal problems (Brunner and Lynch 2010, Clarke et al. 2013). This is because in traditional decision making approaches, science is perceived as clear, linear and objective facts and policy making is a rational process that relies on technical information. For Connick and Innes (2003) there is often an incorrect assumption that policies should always produce predictable outcomes. Science and policy interface literature suggests that alternative governance models are needed to enable better uptake of evidence (technical and values based) and facilitate policy actions in support of climate change adaptation (Adger et al. 2003, Cash et al. 2003, Dessai et al. 2009, Wood and Stocker 2009).

Adaptation scholars argue that collaborative governance arrangements are more effective at producing salient, credible, legitimate evidence and develop suitable adaptation policy alternatives (Clarke et al. 2013, Leith et al. 2012, Wood and Stocker 2009). Connick and Innes (2003), Pielke (2007) and Jasanoff (2002) concur that governance systems that encourage collaborative dialogues are more effective at taking into account salient, credible and legitimate evidence on coastal hazard risk into decision making.

In summary, this research shows that multi-agency partnerships can play an important role in ensuring that engagement processes are more meaningful and

effective by bringing people from different backgrounds and interests together, presenting information into lay language and mediating conflicts or helping to reach agreements (Shaw, Danese and Stocker 2013). Being part of a collaborative process may in fact increase people's disposition to actively participate (Jude et al. 2006). The information provided through collaborative means can be perceived as being more salient, credible and legitimate by the participants (Carr and Wilkinson 2005). Being part of a collaborative process can help restoring public trust in government on conflicting issues (Carr and Wilkinson 2005, Christopher et al. 2008).

Scholars have argued that partnerships can act as boundary organizations in the knowledge-policy interface and fulfil four distinct roles (Carr and Wilkinson 2005, Shaw, Danese and Stocker 2013): (1) provide access to and translate climate change information to science makers, decision makers and coastal communities; (2) negotiate and mediate among stakeholders; (3) improve or establish dialogue among concerned parties to facilitate collaborative outcomes; and (4) identifying knowledge gaps and prioritise future research.

This research also shows that although adaptation planning partnerships have been quite successful at bringing a wide range of stakeholders together in the effort to co-produce knowledge, barriers to effective knowledge uptake (both in terms of evidence based and knowledge based) through collaboration still exist. For example, the CVRAP and the PNP case studies show that partnerships faced great challenges in helping local governments *gather*, *interpret* and *uptake* technical knowledge useful for local level decision making. The PNP and the CVRAP also experienced great difficulties in coordinating the uptake of value-based information through studies and community engagement processes.

Common concerns expressed by the WA local government respondents include: uncertainty and scientific disagreement in regard to methodologies and data requirements; divergences over the scale for assessment or unit of analysis; and inability of local government authorities to evaluate the credibility and usefulness of the information produced. The latter being credibility and relevance of hazard information. This research shows that adaptation planning partnerships need to be able to source the right expertise for the production and translation of technical information and for facilitating community engagement processes with the goal of improving capacity building internally within government organisations and

externally among stakeholders. This process is facilitated if there is a strong leadership role for adaptation within governments and adequate resources.

The PNP and the CVRAP case studies make us also reflect on the challenges that partnerships face in providing a *negotiation* and *mediation* role for coastal adaptation for example, between the industry sector and the government sector, or between sections of the community and government; or between different levels of government, particularly when guidance from state government is inadequate. The effectiveness of multi-agency collaborative arrangements in providing a mediation role on conflictual issues can be debated. On one hand, given that decision making for the coastal zone ultimately materialises at the local level (where local knowledge, interests and political discourses interact to shape decisions), partnerships can be less effective at addressing localised 'hidden' or alternative agendas and guarantee a role for citizens in the decision making or implementation of solutions within their jurisdiction (Ansell and Gash 2008).

Several examples of these situations occurring in WA have been reported (e.g. the Seabird coastal erosion case) but poorly documented in the literature. On the other hand, partnerships can be seen as the 'good guys' delivering a common message to the community especially where public tensions at the local level exist (Koetz, Farrell and Bridgewater 2012), hence generating more politically acceptable outputs. Collaboration can help parties improve engagement and communication processes, for example, by developing a common approach that works well in a particular area. However, to be effective and credible at negotiating and mediating for coastal adaptation outcomes, partnerships must be able to offer a new set of skills such as relationship building, conflict resolution, negotiation, communication and knowledge management.

With regard to the ability of enhancing or establishing communication channels among coastal stakeholders the most successful partnerships were those who were able to facilitate a balance between community expectations and governments' resources in addressing adaptation issues. This brings up again the issue of salience and legitimacy of science. Pielke (2007, p.140) suggests that in complex policy situations, "policy-makers frequently need new options, and not more science". According to Cash et al. (2003) information is salient if provided when it is needed for a decision. However, the urgent and dynamic nature of coastal adaptation planning means that knowledge production and management / planning

decisions can be out of sync. Among the major impediments to the effective and timely use of science to inform decisions raised by the respondents are: the data and information required to undertake useful hazard risk assessments; the level of detail useful to local planning decision making; the type of information (technical and value based) required for different decision making processes and the timeframe for information to be reacquired (triggers).

Multi-agency collaboration can help enhancing the salience and credibility of information produced (Cash et al. 2002, Funtowicz and Ravetz 1994a) by supporting the exchange of needs, lessons learnt and best practices among partners. This confirms that credibility of evidence does not rely solely on the ability to meet scientific methodological standards, but relies also on the reputation of the source, on the ability of external providers to present the findings clearly and in a palatable format, and on the ability of decision makers to learn from the new process and information and adopt new values (Cash et al. 2002). On the contrary, the case study analysis shows that collaboration can fail to enhance the salience of coastal hazard information as a result of poor policy clarity, confusion over type of information required for certain decisions, confusion over decision making processes and mechanisms, and unfeasible timeframes.

7.2.6 Principle 6: Collaborative approaches to coastal adaptation planning improve spatial and temporal scale matching

Section 4.2 of this thesis illustrates how coastal adaptation has rapidly moved from being addressed on large scales (national or broad state wide case studies) to becoming primarily a local level issue. It is now widely recognised that local governments have the key responsibility for developing adaptation responses in the coastal zone as they are the entities closer to the needs and expectations of local communities. They also have the capacity of governing the delivery of resources to facilitate adaptation and have legal responsibility to consider climate risks in their decision making processes (England 2008, Measham et al. 2011, Preston et al. 2008, SMEC Australia 2007).

With that being said, numerous government and non-government agencies beside local government authorities play a key part in the way the coast is developed and managed. As a result, there is often a duplication of roles and responsibilities, confusion over jurisdictional powers, and a lack of continuity in decision making

processes for the coastal zone. Hence, coastal adaptation is characterised by a wide range of spatial, institutional and temporal scale mismatches (Lazarow et al. 2006, Stocker et al. 2012c). Spatial scale mismatch in coastal adaptation planning occurs frequently where planning and management decisions are undertaken at a scale (management scale) that does not match the scale(s) required to solve the problem (ecological scale). For example, local government management boundaries may not be the most appropriate scale for addressing coastal hazard risk that occurs over a broader geographical scale.

Temporal scale mismatches represent an issue in coastal zone management and planning. For example, temporal mismatches can arise when the timescales at which coastal change manifest do not align with the timescales at which policies are developed or management decisions are implemented (Crowder et al. 2006). These mismatches can lead either to quick fix responses to respond to abrupt hazard events or to policies that do not reflect longer timeframes typical of coastal change. For example, coastal hazard events can occur too fast for policy responses or too slow (Macintosh 2013). The effectiveness of engineering responses often reveals itself after a 10 to 30 period depending on the frequency of hazards which is usually a too distant future hence often not evaluated.

The issue of scale mismatch between ecological and human systems has been discussed by several scholars (Folke et al. 2007, Lee 1993b, Levin 1998) particularly in the context of natural resource management systems (Borgström et al. 2006, Christensen et al. 1996, Cumming, Cumming and Redman 2006, Folke et al. 1998). For example, Cumming, Cumming and Redman (2006) argue that scale mismatches give rise to problems in either the organisation responsible for management or in the ecological systems that are being managed or both. Because of these problems, Cumming, Cumming and Redman (2006) suggest that the inability of an organisation to respond appropriately is more likely to lead to loss of adaptive capacity in the system. Kenchington, Stocker and Wood (2012b, p.47) argue that scale problems can be perceived differently by different actors involved: "policy-makers, planners and politicians may have different attitudes from scientists in relation to the relative importance of scale". In 1974 Davies (1974) was already discussing the issue of spatial mismatch between the boundaries of decision making and the boundaries of the ecological processes and the need for a coastal classification that reflected variation in coastal environments relevant to coastal planning. In WA, the classification of coastal geomorphological units, defined by

common natural features, was developed to achieve a more integrated approach to coastal planning and management (Eliot et al. 2011).

Scholars such as Gunderson and Holling (2002) and Cumming, Cumming and Redman (2006) argue that issues of scales mismatches in socio-ecological systems must be addressed in order to respond appropriately, effectively and in a timely manner to the impacts of climate change. Scales issues specific to coastal adaptation are seldom described in the literature, which seems to focus on definitions and description of the issues rather than offering practical solutions. For example, Stocker et al. (2012d) refer to the complexity and fragmented nature of coastal governance across jurisdictions, sectors and agencies and discuss the lack of cross-scale interactions between ecosystems and between ecosystems and governance. Crowder et al. (2006, p.617) argue that decision making regarding the coastal zone is often ad hoc, and there is a lack of clarity as to “who has the authority to resolve conflicts across sectors or to deal with cumulative effects”.

In WA respondents considered the issue of spatial mismatch between the boundaries of decision making and the boundaries of the ecological processes a significant issue. Here, exposed and less developed coasts (as opposed to more convoluted, closed coastal systems for example of Tasmania) require greater understanding of how coastal processes operate on a broader scale, and how human interventions to mitigate erosion in one area may have a knock-off effect on adjacent coasts (Eliot et al. 2011, Nutley, Davies and Walter 2003).

The case study findings raised the question (also discussed by governance scholars such as Costanza et al. (1998) and Cash et al. (2006) as to whether local government scale management is the most appropriate scale for the successful management of hazard risk and the effect of climate change on the coastal zone. The three case studies exemplify how local authorities’ objectives have been for many years narrowly focused on localised erosion issues, failing to address how greater scale processes influence local scale ones and vice versa. To complicate things further, Tasmania and WA have had a history of poor understanding of coastal processes due to lack of resources but also because coastal monitoring has been a low priority.

The majority of the respondents considered a tool developed from a geomorphological study, the Coastal Compartment Project developed by the WA

State Government (Eliot et al. 2011) (see Section 4.2), as important for aligning planning scales with management scales and improving the understanding of cross-boundary-scale processes and adaptation issues. The coastal compartment approach requires to acknowledge the complexity, interconnectedness, and dynamism of coastal systems and consequently assess coastal processes and hazards across a range of spatial scales. However, from the 'end users' point of view (local authorities) the coastal compartment approach was introduced without a clear scope, a tailored methodology or appropriate governance mechanisms for its use.

This deficiency caused further confusion over what is 'the right scale' at which to undertake hazard risk assessments and over who is responsible for carrying out such assessments at the different scales (particularly at the regional scale). According to Folke et al. (2005) and Cumming, Cumming and Redman (2006) these types of problems occur when there is a disjunction between the hierarchical ecological assessment framework and the governance system in which the framework should be carried out.

Further, whilst the coastal compartment approach aimed to provide a framework for coastal hazard mapping at several scales, the interviews revealed that there is still a high degree of confusion regarding cross-scale / boundary hazard assessment and adaptation planning. For example, the majority of local government authorities in WA are still uncertain as to what unit of assessment to use and how to effectively integrate this information into planning responses. Most of the adaptation plans developed in WA are considered to be lacking in detail to be useful for local planning decision making. Further, ecosystem interconnectedness is still poorly considered in adaptation decision making as demonstrated by the number of interventions on the coast which give limited considerations for cross-scaling impacts.

Another important governance aspect mentioned by the respondents was the issue of subsidiarity, which contemplates that decisions made by government are taken as closely as possible to the citizens. This is an issue of areas of competence, which in coastal adaptation planning is still very blurred. The WA case study shows that state government has a role to play in ensuring that decisions made at the local level ensure the interests of the greater good but that clarity and consistency of this role varies. This research shows that coastal decision making, both at the state and local

level, is subject to local politics which is not always in the interest of the broader community. In some cases (i.e. Geraldton, Seabird) decisions made contravened the state policy. Alternative governance models which sees a third party playing a planning authority role (i.e. the Catchment Management Authorities in Victoria) could provide alternative to the current planning regimes of WA and Tasmania. The third party, composed of unelected 'experts' may not be viewed as democratic however they are recognised in the legislation and can be very effective at assessing development subject to erosion and inundation. Provisions would be required that allow parties with a significant interest (not just anyone) to make an appeal. Hence, in WA, it would require a change in the third party appeal rights. A similar role it will be played in NSW by the regional planning panels which are about to come into effect under the 2016 Act.

With regard to temporal scale mismatches, the key issues for the WA respondents, were: inconsistency of timeframes used in coastal hazard assessments; the applicability and usefulness of such timeframes for adaptation responses at the local level (long-term timeframes recommended in the coastal policy were considered too conservative and unpractical by many respondents); and the lack of experience in using thresholds and triggers in determining priorities and timeframes for current and future adaptation responses (Baker & McKenzie 2011, Macintosh 2013). The case studies show that whilst long-term sustainability of the coast was recognised as a key goal, adaptation plans are still not aligned with long-term goals and as a result many of the decisions taken today still focus on short term fixes rather than long-term solutions. The issue with this is that long-term and more conservative plans are perceived to be too conservative and 'in the way' of addressing urgent and politically 'sensitive' problems.

Despite the widespread acknowledgment that local government is the key player in the implementation of adaptation policy and the coordination of on-ground responses (Baker & McKenzie 2011, Macintosh, Foerster and McDonald 2013), the issue of scale mismatches challenges the effectiveness of local scale adaptation planning, particularly where the broader multi-governance system fails to provide effective support. Hence, to the question: what are the most appropriate scales of governance for facilitating coastal adaptation planning and enabling effective coastal adaptation outcomes? Costanza et al. (1998, p.198) argue that the appropriate scales of governance are those that "have the most relevant information, can respond quickly and efficiently, and are able to integrate across scale boundaries".

The interpretation provided by Costanza et al. (1998) in the coastal adaptation context requires further elaboration. The case studies show that local government authorities do not always have the most relevant information because of resources constraints and because local governments are still having issues defining what 'the most relevant' information is, and what are the most effective scales for management purposes. The findings also show that local governments cannot always respond quickly either, as coastal adaptation planning is a complex process which involves a wide range of stakeholders, hence different interests and views. Responding quickly doesn't necessarily mean efficiently as quick responses are often developed through non-inclusive processes and with limited analysis of future impacts. Local governments are certainly less equipped to deal with cross-boundary issues as resources are already scarce and the focus is usually on individual local government areas.

The capacity to effectively plan for coastal hazards differs significantly from local government to local government depending on size, resources, location, governance arrangements and community support (Bulkeley and Kern 2006). However, overall, scholars argue that regional collaboration has significant potential for addressing cross-scale barriers and scale mismatch issues, particularly the mismatches between governance and ecological scales (Davidson and Lockwood 2008). For Cumming, Cumming and Redman (2006, p.19) 'bottom-up' initiatives to solve scale issues is typical of top-down governance systems where "centralized institutions lack of multi-scale outlook and associated flexibility to solve unusual problems or those that occur at scales that they are not used to considering".

The case studies show that coastal adaptation planning partnerships have played an active role in addressing spatial and temporal scale mismatches issues. According to Mukheibir, Gero and Herriman (2012, p.37) successful adaptation planning at the local level is "contingent on efforts across other spheres of government". For Crowder et al. (2006, p.618) "spatial mismatches typically arise from jurisdictional boundaries too small for effective ocean management". Several scholars have described volunteer based regional partnerships as popular governance mechanisms for achieving sustainability goals and for optimizing opportunities presented by climate change (Davidson and Lockwood 2008, Marshall, Dollery and Witherby 2003, Measham et al. 2011, Stojanovic and Barker 2008).

The PNP, for example, was quite effective in this context, acting as a bridging (Folke et al. 2005) or boundary entity (Cash, Borck and Patt 2006, Guston 2001, Hoppe 2010) to facilitate cross-scale ecological assessments, trial new methodologies for multi-scale hazard assessment and share information among the various levels of government. The PNP partners understood the importance of identifying ecological interconnections and assessing the impacts of land-use and other human interventions between adjoining coasts.

The case studies show that, despite partnerships being established with a view to adopt an integrated and coordinated regional approach to coastal adaptation planning, decisions on the coastal zone in WA occur at the local government level, strongly driven by local policies, values and knowledge, local institutional capacity and local political settings, and do not (yet) occur within a regional context or geophysical unit (e.g. coastal compartment). In fact, there are no mechanisms in place which compel local governments to implement adaptation measures developed through collaborative means. Stojanovic and Ballinger (2009, p.50) agree by saying that, although regional partnerships can be very effective as repositories for coastal information and initiatives for public engagement, “it is at the local level that operational goals are set to maintain, improve, and conserve coastal areas”. According to Marshall, Dollery and Witherby (2003) and Davidson and Lockwood (2008) regional collaboration enables integration of diverse views into decision making and the identification of new knowledge. However, the lack of institutionalization or a formal recognition by state government makes collaborative approaches less effective at influencing policy implementation at the local level (Marshall, Dollery and Witherby 2003). For the same reason Stojanovic and Ballinger (2009) question the effectiveness of local and regional non-statutory partnerships in the overall contribution to sustainability and good governance.

In WA, adaptation planning partnerships represent an informal type of governance arrangement with no statutory powers and formal recognition under state legislation. However, there are a few examples nationally and internationally of regional adaptation planning achieved through formal statutory governance arrangements. These include: The New Zealand Regional councils, statutory bodies with responsibility for environmental and other regional issues including climate change adaptation (Local Government in New Zealand 2016) and coastal boards in Victoria, also statutory bodies with responsibility for the development and implementation of

adaptation actions plans within a certain geographic unit. In Tasmania regional partnerships are formally recognised under the State and Local Government Partnership Agreements program (Pitt&Sherry 2012) as a mechanism for delivering consistent outcomes across boundaries through the development of regional adaptation plans and policy templates (Crowder et al. 2006, Davidson et al. 2008).

To conclude, while more formal governance arrangements for broader scale adaptation planning would enable a stronger association between ecological scales and management scales so that decisions are undertaken at the scale that reflects ecological change, informal collaborations such as local government partnerships, can still be a successful vehicle for addressing scale mismatches. To achieve this partners must commit to develop strategies and actions for addressing cross-boundary issues collaboratively, and then apply such strategies at temporal and spatial scales that are appropriate for the scale of the problem. Implementation in this case could involve cross-boundary agreements and joint action.

7.2.7 Principle 7: Collaboration helps generate adequate, consistent, coherent and diversified sources of funding which are necessary for coastal adaptation planning

According to Crowder et al. (2006), Davidson and Lockwood (2008) funding is a key component of institutional capacity to adapt to climate change on the coast. Insufficiency, inadequacy and inconsistency of funding are frequently cited in the literature as one of the biggest barriers to coastal adaptation planning. This is also acknowledged by several coastal adaptation scholars (Measham et al. 2011, Norman 2009, Preston, Westaway and Yuen 2011). Ongoing studies, monitoring and implementation have created new and additional costs for local governments which are already under increasing financial pressure to deliver a wide range of services to their communities (Macintosh 2013, Smith et al. 2008b).

Across the three case studies respondents identified lack of resources not just in the form of financial resources, but also technology, skills and knowledge. Lack of funding was perceived by local government respondents as a large impediment to local scale coastal adaptation. However, the case study findings reveal that lack of funding can be often used as an excuse not to act. In literature, poor funding availability is usually described as a result of coastal adaptation being a relatively low priority on governments' agendas, a reduction in federal and/or state-based funding (Lazarow et al. 2006) and uncoordinated funding efforts between government tiers

(Aven 2011) and (Measham et al. 2011). The interviews in fact revealed deeper causes that inhibit adaptation at the local level (whether or not funding is available), in particular: lack of political support; fear of legal repercussions; lack of capacity within the organisation to use the funds effectively and purposefully; inconsistent approaches to coastal adaptation planning across other local government areas; and ultimately lack of willingness to make decisions now in relation to risk information which is subject to considerable uncertainty.

Respondents also commented that to date funding for coastal adaptation has been primarily provided through federal and state competitive grant programs. However, accessing the available funds is difficult particularly for smaller local governments or local governments located outside 'priority areas'. Respondents described the current funding support for coastal adaptation planning as being inconsistent, highly political and detached from local decision makers' needs. There was a 'low level' of satisfaction among the respondents with the government (both federal and state) funding programs to assist local government in their adaptation planning with some respondents commenting that the adaptation grants have been too focused on achieving research outcomes. Others felt that grants were too competitive and biased toward better resourced Councils rather than those that are in most need of the funding, while a third group felt that funding requirements were 'unreasonable' (too complicated and demanding) for the amount of resources provided. This was an issue felt particularly among smaller, regional local governments that do not have the capacity or resources available to undertake a full cycle of investigations, prepare a detailed adaptation plan and then implement the recommendations from the plan.

There was a strong belief among local government respondents that both the Australia Government and state governments must continue to provide financial support to local government. However, coordinated funding mechanisms across all three levels of government to ensure that resources are provided, allocated and used effectively is crucial. Almost all the people interviewed commented that ongoing joint funding programs between federal and state government were really successful in the past to support *coastcare* activities and should be re-introduced. This is in line with the majority of the recommendations in recent government reports and inquiries on barriers to coastal adaptation (HRSCCCWEA 2009, SMEC Australia 2006).

Respondents across the three case studies felt that government grants failed to provide adequate and sustained financial support to local government throughout all stages of a coastal adaptation planning process. For example, rather than providing consistent and accessible support to local government, federal grants have been targeting only specific stages of adaptation planning, leaving it to state and local governments to allocate more funding towards coastal adaptation planning studies. However, this has been happening slowly.

From the respondents' point of view, there were too many constraints in meeting the criteria associated with the grant funding, including focus, timing and government's priorities. In WA, state government grants funding that for years has been allocated to planning and designing for engineering shoreline defences, recently redirected its focus towards coastal adaptation planning projects. While this was a critical step towards providing less support to local governments for coastal 'protection' works and more for adaptation planning, the total amount of financial resources available to local governments on an annual basis remained largely the same.

At the local level, state funding has been allocated primarily to undertake coastal vulnerability assessments and hazard mapping based on the assumption that more information leads to better outcomes and decreases exposure to liability. However, fewer funds have been allocated towards monitoring, community engagement and value assessment projects.

Adaptation scholars warn that effective adaptation requires funding not only for on-going data collection and refinement of hazard mapping, but also for inclusive and participatory planning processes and for the assessment of societal values (Moser and Ekstrom 2010). Burton (2009) argues that there is a government tendency to invest the majority of funding into data collection and engineering responses adaptation, but that governance must also provide up-front and adequate resources for learning, evaluation, experimentation and communication activities. Ignoring these activities throughout the adaptation planning process could lead to maladaptation.

Respondents also commented that there is limited funding for the implementation of adaptation measures at the local level. On this, scholars suggest that funding for adaptation should come from different sources and that inconsistent and that insufficient funding for implementation can lead to poor continuity and poor quality of

decision making outcomes (Stocker and Burke 2009). However, the case study shows that local governments are yet to explore (let alone implement) funding and financial mechanisms that would allow them to source funds for ongoing coastal adaptation planning activities, particularly for implementation of adaptation measures.

Ware (2016) argues that there is limited evidence of funding mechanisms (such as special area rates) being applied across Australia, and even less evidence of local government exploring financial mechanisms. Among the PNP local governments only the CoB has set up a dedicated climate adaptation fund. However, it seems that most of the funds raised are being allocated towards the treatment of uncertainty through more detailed technical studies. By contrast, as part of the TCAP project, the CCC explored various funding models to address the costs of protecting community values and private property in hazard areas by spreading costs across beneficiaries of adaptation responses, the broader community, private parties and government.

We cannot underestimate, however, that allocating more funding precludes an understanding of how much adaptation is going to cost. Although there is widespread understanding that adaptation strategies are needed to limit the risks posed by climate change, there is no clear agreement as how much adaptation should cost or how it will be paid for. According to Costanza et al. (1998) the full cost of all decisions should be determined and available mechanisms for financing the implementation of adaptation measures fully investigated (SGS Economics & Planning 2012a). According to Macintosh (2013) adaptation related costs such as those of legal expenses, stakeholder consultations, scenario planning and hazard mapping cannot be ignored as they are becoming increasingly significant.

Determining how much adaptation will cost at various timeframes and according to different scenarios is extremely complex (Macintosh 2013). Adger and Vincent (2005) argue that decision support tools for climate adaptation need to be effective, efficient, equitable, and legitimate. Support tools that enable governments to fully cost decision pathways have only recently become popular. None of the local governments within the case study areas has actually undertaken such analysis at the local level. The PNP for example, undertook an economic analysis of the potential costs brought by climate hazards but, first it was undertaken at a broad scale, and secondly it failed to consider the value of ecosystem services and other

non-economic values. This shows that well known methodological approaches such as the cost benefit analysis and the multi-criteria analysis are difficult to apply (meaningfully) in a complex area, especially where we have relatively little experience.

Funding allocation should also prioritise decisions that have the approval of those who are affected by the decision. Randall et al. (2012) argue that a legitimate decision making process must involve stakeholders in the assessment of the costs and benefits of decisions. For Preece (2013) community engagement in discussion around costs and funding are vital to create ownership and to achieve long-term outcomes towards climate change impacts. The case studies show how community engagement in WA has been limited to informing the community about potential risk, whereas discussions around costs and benefits have been virtually inexistent. Full cost allocation should also include transaction costs which are inevitably associated to changes in strategic and statutory planning processes (Macintosh 2013).

Adaptation decisions should also consider which activities are generating direct benefits for local communities versus the protection of public good and how to achieve equity in the distribution of costs across the beneficiaries (Wreford and Moran 2015). Determining which decisions would maximize social net benefits has been difficult for local governments often guided by ambiguous policy directions in this regard. Some states for examples have a policy with respect to coastal protection that very clearly states that no public funding is made available for coastal protection works to protect new development (Coastal Protection Board 2012).

The Victorian Coastal Board “does not provide funding or grants for protection of private property unless there is an associated public benefit; there is simultaneous protection of public property; a large number of separately owned properties are at risk; or where the cause cannot be easily identified” (Coastal Protection Board 2012, p.26). Despite this, many decisions taken across Australia do not seem to align with these policy directions and funding is allocated to protect private benefits rather than public.

Although not delivered through a joint or coordinated approach, state and federal grants funding has been a major driver of the evolution and staged delivery of the coastal adaptation planning partnerships’ initiatives both in WA and in Tasmania. For a decade grants funding has been quite successful at fostering inter-agency

collaboration and favouring partnership arrangements between local governments (such as regional groups of councils or adaptation planning partnerships). The case study analysis shows that establishing funding partnerships has enabled local governments to leverage additional financial contributions and attract in kind contributions from key stakeholder to progress the initial steps of a coastal adaptation planning process.

However, local government respondents felt that adaptation planning partnerships have been relying too heavily on one source of funding (such as grants funding) as a change of government can easily lead to variations, fluctuations, gaps and reductions of funding, in turn causing delays or major changes to project scopes and methodological approaches. The issue of whose responsibility it is to consider and fund research into coastal adaptation was brought up in almost every interview. There was an expectation that parties that could or should have an interest in adaptation planning include the Australian Government, NRM groups, state governments, infrastructure owners, industrial companies, individual property owners and property developers. The view was that whilst these parties would benefit from the activities of the partnerships and should be involved, their level of interest is still very low. Some, like insurance companies and industry, are likely to have done their own assessments and have come to their own conclusions. Some respondents felt that some parties do not come on board because they believe that ultimately the State will provide any coastal protection required. As a result, over the recent years several local governments in WA have started to detach from grant funding and start financing adaptation initiatives independently.

To conclude, partnerships can be effective to foster ongoing funding relationships among government agencies, but also between government and the private sector. However, strong reliance on government funding can be detrimental in the long term. Funding for adaptation must be diversified to ensure ongoing financial support for each step of a coastal adaptation planning process. Further, funding per se is meaningless without a strong governance framework that provides ongoing support for successful programs that: prioritize programmes that builds capacity among project partners; enable the involvement in the planning process of people who will be involved/affected by adaptation responses to make them more informed and responsive; and lastly, support a diversification of funding revenues such as an adaptation fund, special levies and area rates.

7.2.8 Principle 8: Collaboration increases shared responsibility and shared decision powers for coastal adaptation

The lack of clarity around roles and responsibilities for coastal adaptation planning and the challenges for shared responsibility was among one of the primary concerns among the people interviewed. Despite the theoretical appeal of shared governance, respondents felt that government authorities are experiencing great difficulty in ensuring that risk is appropriately recognised and the responsibility for its management apportioned and communicated. There was an overwhelming perception among respondents that policy instruments failed to clarify and strengthen responsibilities with regard to government protecting private property and the private sector protecting private assets and incomes.

From the coastal adaptation literature, the term *responsibility* has been typically used to describe the legal obligation of a government body (local government or state government) to minimize the impacts associated with climate hazards in the coastal zone (Pellizzoni 2004). However, as coastal adaptation is increasingly perceived and conceptualized as a multi-scale, multi-factor and multi-actor process (Daniell et al. 2011), the term responsibility has started to be used more generally to describe the need for joint involvement of government agencies, the private sector and the community in the identification of hazard risk and in the implementation of actions that are necessary to manage such risks. The scholarly argument is that problems which entail cross boundaries of responsibility need a joint action between state, private sector and society in order to overcome the institutional and political inertia of decision making and produce more responsive and effective delivery of sustainability goals (COAG 2013). The concept of shared responsibility becomes, or should become therefore strongly linked to that one of multi-level and multi-sector collaboration (Cavaye 2004).

The case study analysis shows that collaborative approaches to coastal adaptation planning process can help strengthen shared responsibility and shared decision making among different actors through joint action. To be effective, collaborative decision making must be supported by decision making mechanisms at the local and state level and obtain credibility among politicians. Further, collaboration leads to shared responsibility if community is meaningfully engaged, and most importantly, informed of the decision making mechanisms and limitations so that unrealistic expectations are not created or fuelled.

Recent debates around responsibility for mitigating climate hazard risk strongly support the need to strengthen, and in many instance to create, *collective* or *shared responsibility* (COAG 2013, Jamieson 2010). Shared responsibility may occur through a variety of pathways and involve a number of different approaches, but basically the meaning behind it is that we must all take steps to mitigate our collective contributions to the climate change problem (Pellizzoni 2004). The respondents did not bring this concept forward during the initial interviews. At that time respondents seemed mostly concerned about identifying whose responsibility it is to conduct coastal adaptation planning whilst responsibility for implementation and specifically for decision making across local government boundaries was not addressed.

The majority of respondents were highly critical of the current governance systems for producing excessive fragmentation of roles, responsibilities and powers for coastal adaptation and for not being conducive of shared responsibility and decision making. Some were in the view that less fragmentation of responsibility would lead to better decision making and others thought that a further sharing of responsibility across sectors, across levels of government, and with the community at risk would increase shared ownership and provide better outcomes for the broader community. Coastal adaptation literature seems to suggest that in order to reduce barriers to adaptation de-fragmentation and clarification of different stakeholders' roles and responsibilities is paramount (Stojanovic and Ballinger 2009, Wood and Stocker 2009). Although the interviews show that stronger coordination and leadership roles from higher levels of government are crucial.

For Nollkaemper and Jacobs (2013) shared responsibility, collaboration and inclusiveness are all equally important for finding solutions for issues where individual responsibility cannot be determined or assigned and that have a public benefit. Follow-up interviews revealed a major shift in thinking and priorities by the respondents. The focus of the discussion shifted from the need for shared responsibility to conduct coastal adaptation planning studies, to the need to think coastal adaptation as a collective problem that needs everyone knowledge and input to be effectively carried out.

The majority of the respondents were of the view that the cost and responsibility of adaptation should be shared across all tiers of government, industry and

community, and that understanding risk is an important part of determining cost and responsibility. However, some respondents raised concerns about the ability of individuals from the public and politicians, to think through the lens of collective moral responsibility rather than individual needs and interests.

In WA community respondents felt that there was still a strong expectation from the community that government (state or local) should be fully responsible for mitigating coastal hazard risk. While from a state and local government's point of view this was not feasible and that community should be bought into the adaptation planning process. When asked to explain how this could have been achieved WA respondents commented that community involvement is key. However, some local government respondents commented that there is still strong uncertainty as to what extent responsibility for adaptation action and costs should be shared through the whole community as opposed to the affected communities. On the contrary, in Tasmania, the CCC first and TCAP partnership later have been pioneers in this field by commissioning several studies which looked into the issue of shared responsibility for coastal adaptation (SGS Economics & Planning 2007, SGS Economics & Planning 2012b).

In order to explore the limitations and opportunities of collaborative governance for shared responsibility and decision making in coastal adaptation planning, it is important to clarify the different 'types' of responsibility which are involved. In Australia, whilst governments at all levels, industry, and the community all have a role in adapting to the impacts of climate change in the coastal zone, it is local governments that hold *legal responsibility* to consider climate risks and minimize the risk of harm to population and public assets.

The Federal Government exerts its primary influence through funding research programs and providing coordination for natural disaster recovery and response. State governments must ensure that regulatory frameworks are in place, particularly with regard to planning and development, and that adequate funding is available and that technical support and data are collected and shared with key stakeholders.

The role of the local government is to implement on-ground management. In many instances, however, the state government directly exerts statutory decision making powers and overturns a local government decision. Respondents from local government felt that these situations showcase examples of a somewhat shared

responsibility. However, according to the principle of subsidiarity (Lazarow et al. 2006), decisions that do not reflect local level needs, priorities and shared values are more likely to lead to poor outcomes for the community in the long-term.

The above description shows that neither local government nor state government have a legal obligation to protect private property from coastal risks. While there is a point at which a series of private problems can be constructed as a public problem (Gusfield 1981), a government's willingness to convert private liability into public liability could create precedents which become very expensive. Although this seemed to be common knowledge among the respondents, many felt that in practice it was very hard to apply, and that decision making outcomes regarding coastal hazard risk, often turns out to be inconsistent with this imperative. This is because the climate adaptation issue is often approached as a problem of moral responsibility (Jamieson 2010) which is in turn influenced by cultural expectations about the role of government.

Respondents commented that the coastal adaptation discourse is dominated by economic and political interests. That local or state governments seem to feel they have no choice but to exercise a duty of care to alleviate potential risk to private property, and prevent any further conflict and disappointment among the community.

Tasmanian local government respondents seemed to be of the view that although the law 'seems' to protect them from having to take action on coastal climate hazards, in practice this concept still requires a strong level of (central) government intervention. On this, Trück et al. (2010, p.13) argue that local governments' responsibility in relation to climate change is an evolving concept which may "require councils to act with due diligence in a manner that is consistent with shifting legal and community expectations". At the same time citizens and the private sector will need to take on more responsibility for adapting to anticipated changes in the future. Depending on the state legislative requirements this may mean assuming responsibility for protecting private property and assets (SGS Economics & Planning 2012a).

The case studies provide interesting insights into the barriers to shared decision making as opposed to shared responsibility. Respondents felt that shared responsibility could lead to a community expectation of shared decision making and

collaboration which may or may not be met. For example, citizens' responsibilities typically include understanding the local climate change risks and providing feedback on solutions. However, citizens do not always get to work with agencies throughout an adaptation planning process. The case study analysis shows that, despite an increased community involvement in the climate risk debates through workshops and online information, decision making responsibility for adaptation remains strongly with government. The WA case studies reveal that citizen participation in coastal adaptation decision making has been debated and in some instances attempted, but positive outcomes have been quite sporadic. During the interviews, some local government respondents still had mixed feelings about involving citizens in a policymaking process particularly local government planners and elected members.

Perhaps the most important impediment to shared decision making is the disconnect between the engagement process and the actual decision making process which in the case of coastal planning and management is strongly influenced by politics, legislative frameworks and institutional capacity. Citizens involved in the process have often a poor understanding about the different roles and responsibilities involved in managing risk, and the restrictions that local government face around policy and resources (Scally and Wescott 2011, Smith, Leitch and Thomsen 2016).

This research shows that engagement processes must ensure that information is provided and translated so the process is transparent. The TCAP case study shows that the most effective way to approach shared decision making for adaptation is to instil the concept of decision pathways. This enables local government to conduct a responsible and accountable decision making process and to minimise participants' disillusion or disaffection if their preferred actions are not taken.

Another argument raised by the respondents related to shared decision making was the issue of *representativeness*. Petersen and Tjalve (2013, p.3) state that shared responsibility is a politics of "collectivism and obligation, of affect over interest, and virtue over rights". Shared decision making implies that power and resources do not accumulate in the hands of one person or a single group and decisions are discussed and made collectively (OECD 2010). Hence, an engagement process must ensure that the people involved are from the broader society and adequately consider the interests of those with most at stake. This was perceived as a key

challenge by the respondents who felt that there was a risk that community engagement processes are not truly representative of the broader community. On the other hand, this approach could be in conflict with the fact that the people with most at stake may be those right on the coast, not the broader community.

The case study analysis shows that a collaborative approach to coastal adaptation planning process can help strengthen shared responsibility and shared decision making among different actors through joint action. The three coastal adaptation planning partnerships, like other similar arrangements throughout Australia, played a key role in supporting shared responsibility for coastal adaptation. First, these partnerships were formed specifically to address a gap in institutional responsibilities of existing governance arrangements (local and state government) for identifying and managing coastal hazard risk. No one else at that time was taking responsibility for embedding climate hazard information into decision making frameworks. Secondly, partnerships have been instrumental in encouraging shared responsibility across government sectors and levels, and sharing of information through the joint work. Thirdly, some partnerships like the TCAP have been very successful at conveying the concept of shared responsibility among the community by communicating better knowledge about risk and using a more supportive policy framework. The TCAP partners successfully worked together to find a common solution and to determine the cost of adaptation and how to distribute it. Their governance model was successful because it was framed by shared vision and responsibilities and relied strongly on inclusive and participatory processes. This aligns with literature which suggests that accessibility of information on risk is a key condition for determining cost and responsibility for adaptation (Scully and Wescott 2011).

The case study analysis also reveals that shared roles and responsibilities, even equal distribution of decision powers and representativeness, were considered important prerequisites for adaptation planning partnerships, but not always in place. In the case of the PNP, for example, internal decision powers were fairly evenly distributed. However, respondents reported issues of power imbalances between local and higher levels of government. The problem of power imbalances was perceived as problematic by local government respondents. On the one hand the WA state government showed disinterest and detachment from local contexts and local government needs, but on the other hand it still wanted to perform a command and control function over local coastal adaptation planning processes.

8 CONCLUSIONS

Despite the increasing supply and accuracy of climate information and adaptation planning tools and progress in coastal hazard adaptation policies, WA local governments are facing great difficulties in adapting to climate change in the coastal zone. A resistance to change is still apparent among local decision makers, whereby traditional views and practices prevail over alternative and more innovative approaches despite the new information at hand.

The results of this study show that in WA the slow and overcautious approach to change to coastal adaptation decision making (at the local but also at the state level) is caused by a combination of factors such as: uncertainty with regard to accuracy and salience of information hazards, fear of legal liability, fear of political backlash, strong neoliberal ideology governing coastal development and confusion about roles and responsibilities. Lack of adequate policy guidance, particularly with regard to implementation of spatial planning mechanisms, and poor policy coordination efforts on behalf of state government have been the key factors affecting local policy development and implementation. In addition, WA local governments have shown to be particularly cautious of engaging the constituency in coastal adaptation planning due to a combination of the abovementioned factors.

This research shows that collaboration, in the form of coastal adaptation partnerships, has been critical in progressing coastal adaptation planning both at the state and at the local level and overcome such a resistance to change. It also shows that the success of collaborative coastal adaptation planning does not depend solely on the effectiveness of a partnership arrangement, but also so on the broader governance system in which the partnership operates.

These findings align with the adaptation literature which portrays collaborative governance as an effective way to identify and implement a collective solution to complex and multi-dimensional problems. This study, however, looks beyond the well-described broad benefits of collaboration for climate adaptation and explores the meanings, dimensions, effectiveness and shortfalls of collaborative governance specifically for coastal adaptation planning drawing on three coastal adaptation partnership case studies.

In order to explore the challenges of collaborative coastal adaptation planning not so much from a technical point of view but rather from a governance point of view, a set of principles defining good governance practice, with a strong focus on collaboration for coastal adaptation, are elaborated from literature and tested through the case studies. The refined set of principles of good governance for coastal adaptation are aimed at policy makers, decision makers and researchers who are willing to evaluate existing and potential governance arrangements in order to achieve adaptation in the coastal zone more effectively.

Overall, this research reveals that the success of collaborative coastal adaptation planning depends on three key factors. The first factor is the nature of the governance arrangement. For example, the 'informal' nature of voluntary coastal adaptation partnerships makes them more vulnerable to change in government leadership and funding regimes hence potentially less effective over the long-term or at the implementation stage of an adaptation planning process. The PNP case study demonstrated how often these types of partnership arrangements are most effective at the initial stages of an adaptation planning process which involves gathering data, sharing information and resources and advocating for policy change. However, collaborative efforts weaken at the later stages of an adaptation planning process which involve communicating risk to the public, policy development and implementation of policy measures.

The second influencing factor is the stability and efficiency of partnerships which depends upon several attributes such as: the participation of actors with different knowledge and skills including political leaders and the broader community; clarity of goals, priorities, roles and responsibilities within the partnership; shared leadership; interdependence; and mutual trust. These were key success factors for both the PNP and the TCAP partnerships. However, the CVRAP case study shows that even weak or short-lived collaborative arrangements can still play an important role in progressing coastal adaptation by providing feedback on local decision makers' needs, challenges and constraints.

Lastly, this research shows that coastal adaptation partnerships rely strongly on the ability of the governance system in which they operate to support adaptive and collaborative approaches. The role of state government has shown to be particularly important for creating an enabling environment for collaborative and reflexive policy dialogue. The WA case studies also demonstrate that policy flexibility, innovation

and experimentation - key features of an adaptive governance system - are difficult to achieve without overarching policy frameworks that are clear, consistent and implementable.

The features of good governance for coastal adaptation that have emerged from the case studies and their significance for adaptation scholars and practitioners are summarised below.

Principle 1 (*shared understanding, goals and priorities in coastal adaptation planning are mutually supportive/constitutive with collaboration*) examines the importance of developing shared understanding and goals as the first step of a collaborative adaptation planning process. It is frequently discussed in the literature of adaptation governance and more so in the collaborative governance literature. While this may appear to be an easy task, this research shows that, in the coastal adaptation planning context, the development a common understanding of the problem and shared goals among adaptation players has proven difficult. The WA case studies show that the common inhibiting factors are: uncertainty regarding data requirements; lack of guidance with regard to state of the art methodologies; policy ambiguity; complexity of adaptation decision making; and fear of legal of liability. Lack of resources and expertise are also a key impediment to driving innovative and collaborative approaches to coastal adaptation planning.

Both in WA and in Tasmania costal adaptation partnerships have played a key role in facilitating shared understanding among coastal adaptation actors. Through collaboration, actors who typically hold different backgrounds, interests, priorities and values are exposed to different worldviews and are encouraged to find common values and establish an ongoing commitment to honour these values. This study also shows that collaboration and development of shared understanding and goals are mutually supportive. Without such initial effort of defining common values and goals a collaborative coastal adaptation planning process is likely to fail as demonstrated by the CVRAP case study.

Collaborative approach to coastal adaptation planning does not mean that goals are 'locked in' and cannot change over time. Because of the uncertainty and complexity of the tasks ahead common goals should be adjust to new information, approaches and governance mechanisms. This of course requires partners to be open to dialogue and embrace flexibility and innovation. A positive attitude to learning and

change was one of the key strengths of the Tasmanian case study.

Two additional aspects of collaborative adaptation planning emerged from this research study. First, partnerships can be characterised by different levels of commitment to collaboration: from less committed forms of networking and information sharing to more sophisticated forms of collaboration which can include resource sharing for data acquisition, development of methodological approaches, development of common adaptation strategies and development of public policy. Secondly, the level of commitment can shift. This can depend on changes in: policy, funding availability, political agenda, urgency and community values. Not matter what the different level of commitment is, partners must understand where along this continuum the partnership is operating and what the implications and opportunities for that particular level of commitment are.

The roles of *adaptation facilitators* which can be referred to as champions have proven to be crucial in facilitating shared understanding and development of shared goals. Literature suggests that ‘champions’ are individuals who possess a strong will for seeking new information and promote change, strong networking skills and the ability to use their positions of influence or leadership to get others to collaborate.

This study indicates that in coastal adaptation planning these skills are essential but not enough as demonstrated by the CVRAP and PNP partnerships. Facilitators must also possess a good level of understanding of the governance processes and structure in which these assessments are conducted and collaboration is pursued. The findings also show that one organisation or one individual alone is often not enough to support such complex and multi-disciplinary processes. To be more effective collaboration for coastal adaptation requires a champion within each partner organisation and ideally a champion at different levels within the same organisation. This is so adequate support is provided throughout all stages of the collaborative process.

According to this research adaptation planning partnerships can be seen as types of cross-boundary organisations, a more elaborated form of champions, who work at the policy-knowledge interface through the functions of convening, collaborating, translating and mediating. The case studies demonstrate that the ability of adaptation planning partnerships to perform all these roles, and to encourage or facilitate a certain level of commitment along the collaboration continuum, varies.

The PNP has shown to be effective at facilitating dialogue among different actors from both sides of the 'boundary' such as scientists and decision makers or decision makers and community on complex societal issues, thus to perform the role of convening and collaborating quite well. However, the PNP was less effective at translating technical information, facilitate policy dialogue and foster change.

This study shows that to be effective as cross-boundary spanners adaptation planning partnerships have to establish trust and mutual respect among actors (particularly with key decision makers) and develop strong linkages with the different knowledges involved in coastal adaptation decision making particularly land use planning policy, coastal engineering and social sciences. If such linkages are not in place or are not well established the boundary organisation/partnership may not have the perceived ability, legitimacy and authority to deal with complex and difficult issues such as climate adaptation. Once a shared understanding is achieved partners are more likely to develop stronger commitment to joint working.

This study shows that in coastal adaptation planning the willingness to commit to joint work, hence commit to shared goals, is higher where there is stronger interdependence among parties. The case studies show that this willingness to joint working tends to weaken as clarity with regard to technical and policy considerations improves. However, collaboration across jurisdictional boundaries and across levels of government should be pursued regardless in order to achieve a more consistent approach to coastal adaptation.

The role that collaboration plays in supporting policy integration for adaptation is addressed in Principle 2 (*collaborative approaches are crucial for the successful integration of coastal adaptation objectives into policy and into every day decision making processes, and for effective coordination across multiple levels of government*). Adaptation literature suggests that integration of adaptation policy objectives between different policy areas (horizontal integration) and across different policy making levels (vertical integration) is crucial to ensuring consistency of policy objectives and on-ground measures. In Australia, policy integration of coastal hazard considerations occurs almost exclusively vertically through land use planning. However, examples of successful policy integration particularly for coastal adaptation are limited.

This research shows that to be effective vertical policy integration requires overarching (state) planning policies to incorporate adaptation principles and objectives comprehensively and effectively so that consistency can be achieved across policy levels and clear guidance provided with regard to policy implementation. This process is often inhibited by governments' fear of providing policy that is too specific, by the lack of understanding of how adaptation objectives can be actualized, and by poor coordination leadership from both state and local governments. The case studies reveal that this was a key challenge for state governments both in Tasmania and in WA. The case studies also suggest that such coastal adaptation policy provisions should be legislated. However, where experimentation is still needed, policy and guidelines may suffice.

Furthermore, in order to satisfy sustainability paradigms, policy integration requires the effective uptake and integration of economic, social, cultural and environmental considerations into local policies and every day decision making processes. The case studies show that this can be challenging for local government authorities (especially those with limited resources and capacity) who typically misunderstand sustainability as a trade-off among competing interests that causes problems rather than a potential synergy that creates solutions.

This study confirms that state governments on their own cannot effectively deal with the complexity of adaptation policy problems alone and that collaboration is crucial for the successful integration of coastal adaptation objectives into local policy and into every day decision making processes. It also suggests that policy integration requires stronger collaborative arrangements horizontally across government departments responsible for the development of adaptation policy (e.g. DoT and DoP in WA) and across government levels to ensure policy consistency and clarity. The latter is particularly important as more functions and responsibilities for coastal adaptation planning are being devolved to local government and more expectations are placed on them to integrate adaptation objectives into every day decision making and deliver effective adaptation policy solutions.

Another important aspect of policy integration for coastal adaptation is policy coordination. The case studies show that the absence of a state-wide policy coordination role puts pressure on coastal adaptation partnerships to facilitate policy dialogue and build political demand for better integration of coastal adaptation policy. However, local governments' lack of expertise and resources coupled with resistance from state government to collaborate on policy development means that

partnerships have not been able to create a shift in formal governance arrangements that would enable better policy integration. This demonstrates that achieving policy integration requires state government to provide or support a policy coordination role and to be fully supportive of collaborative policy development approaches.

An extensive literature on the importance of leadership for climate (and coastal) adaptation exists. However, the complexity of governance for coastal adaptation makes adaptation leadership features, objectives and challenges difficult to define and measure. Principle 3 (*leadership and long-term political commitment are crucial for supporting collaborative coastal adaptation planning and collaboration can support effective leadership*) focuses on the role that leadership plays in supporting coastal adaptation planning with a strong focus on political leadership. This Principle also looks at the specific role of leadership in supporting collaborative adaptation planning and vice versa, and explores the importance of other types of leadership, such as institutional or administrative leadership but also leadership from scientists, individuals, community groups and NGOs.

Political leadership was considered critical by the majority of the respondents to championing adaptation at the state and local level. This research shows that securing long-term support from elected members and politicians is crucial to coastal adaptation especially to the success of collaborative coastal adaptation planning processes which continuously evolve and are enacted through cycles of research, policy development and adaptation responses. Political leadership is not only important to support investigations and knowledge uptake but also to provide support for the development and implementation of a range of genuine and viable alternative adaptation measures.

It is crucial that political leaders recognise collaborative adaptation planning as an approach that improves knowledge on complex issues across government boundaries, that enables the integration of multiple views, that favours innovation and that requires an ongoing process of monitoring and reviewing. However, political leaders are still hesitant to commit to a long-term process which is resource intensive, complex and subject to many uncertainties. Furthermore, there are powerful private sector interests promoting coastal development who exert considerable political influence and who highlight climate change uncertainties as reasons for not proceeding with plans for long-term coastal retreat.

This study shows that collaborative approaches to coastal adaptation planning can improve political leadership and support for coastal adaptation by increasing political leaders' awareness about coastal hazards and risks and also about constituents' values, priorities and needs. The TCAP and the PNP case studies showed that involving politicians in collaborative adaptation planning approaches is far more effective in developing responses to climate adaptation risk than in cases where elected members are engaged at the end of the process. Political leaders who are meaningfully engaged throughout a collaborative adaptation planning process (as opposed to at the end of the planning process) are more likely to share views with other in the same political position and adopt a progressive approach. Higher awareness of leaders across different aspects of adaptation issues is also more likely to translate into stronger political and financial commitment for implementation.

Political leaders who are provided with a broad spectrum of information about community adaptation concerns, values and priorities through collaborative processes are also less likely to be influenced by a small vocal group of constituents or developers and less likely to support path-dependence and lock-in solutions. The new adaptation leaders must have strong motivation to learn, to meet new policy objectives, to encourage innovation and to acknowledge other people's views and opinions.

Administrative leadership has also proven to be crucial for initiating and progressing coastal adaptation and even more for supporting collaborative adaptation planning initiatives. Administrative leaders such as CEOs and senior managers influence the way collaborative initiatives are planned, organized, resourced, coordinated and implemented. Effective administrative leadership rests on motivated and dedicated individuals who are effective at bringing people together, at communicating innovative ideas, at sourcing additional funding and at persuading people with higher or similar authority to engage in collaborative work. However, even in the administrative domain, individual motivation for supporting adaptation should occur at all levels within an organisation (including amongst low level officers) to ensure consistent and effective support to the collaborative process, particularly the implementation phase. The CVRAP case study demonstrated the importance of clear and continuous commitment and support from administrative leaders (CEO and executives) but also from subordinate positions who play a key role in conducting a coastal adaptation planning process.

Principle 4 (*collaboration is instrumental in developing and implementing adaptive policy, improved policy dialogues and policy learning*) explores the role that collaboration plays in improving policy dialogues and learning and consequently developing and implementing adaptive policy. Policy implementation is tightly connected to the ability of policy makers to foster collaborative policy dialogue. Improving policy dialogue between relevant actors is likely to lead to the development of clearer, more consistent and more useful policy guidance for local coastal adaptation decision making which in turn favour policy implementation.

This study shows that some state governments are still reluctant to foster collaboration in all four dimensions of policy design (conceptual, technical, ethical, and practical) for coastal adaptation. Without such commitment or with only a partial commitment to collaboration (for example seeking feedback only at the end of a policy making process) coastal adaptation partnerships are limited in what they can do to shape or influence adaptation policy. The development of clear policy, I argue, relies on the ability of governments to support collaborative policy learning approaches.

The same applies for adaptive policy practices such as policy flexibility, experimentation and innovation. These concepts are elusive ideals: difficult to define, harder to implement and evaluate. This study shows that attempting policy experimentation and innovation for coastal adaptation requires buy-in support from all parties involved. Local governments are extremely cautious when it comes to deviating from standard and well-tested policy rules and instruments. This study shows that coastal adaptation policy making requires governance mechanisms that support initiatives to test the effects of a policy in a real-world setting. These mechanisms include funding, policy monitoring and evaluation processes, and overall leadership support for such initiatives. Organisations that are willing to collaborate, share and learn from each other are more likely to support innovation. This is also true for policy flexibility.

Collaboration is therefore integral to a governance system that is equipped to support adaptive strategic planning, adaptive policymaking and adaptive implementation of strategies and policies. An organisation that is inherently adaptive is more likely to include in the policy making process a variety of actors who are part and parcel of the problematic context. In this perspective, policy development should not aim at establishing a 'perfect' policy framework, but rather

at fostering self-reflection. To achieve this, policies must be conceived within a governance system that encourage self-reflection and learning within groups of diverse actors that seek to contribute to system change.

Principle 5 (*a collaborative and transdisciplinary approach promotes better uptake and incorporation of evidence and value-based knowledge into adaptation decision making*) examines the importance of collaborative governance for achieving a more comprehensive knowledge uptake which include not just technical information but also information on values, attitudes and aspirations.

This research shows that for many years, both in WA and in Tasmania, there has been confusion and lack of clarity around assessing coastal erosion and inundation risk, what constitutes 'salient information' and how to use it. This is mainly due to the complexity of hazards modeling and mapping but also to the uncertainty associated with the information produced.

According to this study findings, coastal adaptation partnerships have proven instrumental in developing and trailing new methodologies, enhancing adaptation decision makers' ability to interpret the information at hand, and discriminating between evidence that is reliable and useful from evidence that is not. Despite the increased amount of hazard information available, local governments are still deeply concerned about its accuracy, credibility and salience. The PNP case study shows that this is still felt so strongly among the partners to result in a continuous cycles of investigations and in the deferral of policy development and on-ground action.

The TCAP case study provides interesting insights into the challenges of science uptake. In Tasmania the TCAP partnership proved to be particularly effective at fostering transdisciplinary by involving a range of expertise in knowledge production including local knowledge from non-government actors and community. Furthermore, the TCAP shows that adaptation partnerships that have proven successful at generating and using new knowledge to inform decision making processes are those that have been more effective at the knowledge-policy interface by sourcing the right expertise for the translation of technical information into clear and implementable policy.

This study also reveals that one of the crucial factors to a successful coastal adaptation planning process is the ability to source and integrate value-based information. In fact, the development of feasible and equitable adaptation responses

should take into consideration the full range of social, environmental and cultural values. However, this process is not simple. It is not uncommon that either value based information is not collected or that the results of the dialogue around values and priorities with community and stakeholders are fed into final project reports but do not instigate any further engagement or policy action. This has been a key issue in WA. These findings suggest that, in order to avoid confusion among the community or raising of false expectations, better clarity has to be provided to participants during an engagement process. This so participants have a better understanding of how decisions are made and what factors may impact on a council final decisions such as financial and political considerations. Most importantly, participants need to know how their input will be used.

Thus, this research shows that collaboration among government agencies and particularly local governments can help ensuring that engagement processes are more meaningful and legitimate. Adaptation planning partnerships that are able to facilitate or encourage more meaningful public engagement processes hence that are able to bring people from different backgrounds and interests together, present information clearly and into lay language, mediate conflicts and help reach agreements, are more likely to generate information that is more salient, credible and legitimate. However, the case study analysis shows that collaboration can fail to enhance the salience of coastal hazard information as a result of poor policy clarity, confusion over type of information required for certain decisions and over decision making processes.

Principle 6 (*collaborative approaches to coastal adaptation planning improve spatial and temporal scale matching*) examines the role that collaborative governance plays in addressing spatial and temporal scale mismatches of coastal adaptation decision making. It is quite typical of coastal adaptation decision making that planning and management decisions are undertaken at a scale that does not match the scale(s) required to solve the problem or that does not reflect the scale of ecological processes. It also quite common that addressing coastal hazards issues involves a number of governmental agencies which do not always operate on the same scale and in a cohesively way. Approaching coastal adaptation issues as a cross-scale issue is therefore particularly challenging for local governments who are constraint by lack of resources. Furthermore, traditionally the focus of coastal decision making has been within local government boundaries or even smaller management units such as individual beaches.

On this issue, academic literature suggests that the 'right governance scale' for addressing climate adaptation is the scale at which information is more readily available and decisions can be made quickly and efficiently. According to this theory local governments would be the favourite candidates. However, this study shows that local government authorities do not always have the most relevant information at hand because of capacity constraints. Local governments have shown to struggle defining what 'the most relevant' information is and identifying the most effective scales for hazard risk mitigation purposes. Furthermore, local governments cannot always respond quickly to relevant information as coastal adaptation planning is a complex process which involves a wide range of stakeholders, hence different interests and views. The findings also suggest that a quick response is not necessarily effective, given that quick responses are often developed through non-inclusive processes and with limited analysis of future impacts or indeed of evidence about any impacts.

This research suggests that alternative governance approaches that can facilitate cross-boundary knowledge generation and information sharing as well as mechanisms that foster consistent decision making approaches across boundaries could be more effective at supporting cross-scale problem solving. Coastal adaptation planning partnerships, like the PNP, have played a key role in trying to address adaptation issues across spatial scales. However, they have encountered some limitations particularly at the policy development and implementation phase. This is because there are no formal governance arrangements that require local decision making to develop and implement (e.g. cross-boundary or regional) adaptation planning strategies. Often collaboration efforts stop with the completion of an adaptation plan. This goes to show that formal governance arrangements that address coastal adaptation planning at the regional levels are fairly uncommon and adaptation decision making still occurs primarily within local government boundaries.

This study concludes that to effectively operate across boundaries and scale partners must show strong commitment to developing local strategies and actions collaboratively and apply such strategies at temporal and spatial scales that are appropriate for the scale of the problem. For example, once the adaptation plans developed across multiple local government boundaries are developed each local government should commit to include the recommendations or actions in the local foreshore management plans and local strategies. Voluntary collaboration for

implementation therefore relies even more on shared values, cross-boundary agreements and long-term commitment to joint action.

Principle 7 (Collaboration helps generate adequate, consistent, coherent and diversified sources of funding which are necessary for coastal adaptation planning) addresses the issue of funding for adaptation which is widely perceived as being insufficient to support the different stages of coastal adaptation planning. Lack of funding normally stems from coastal adaptation being a low priority on governments' agenda and with weak collaborative and coordinated funding efforts between government tiers.

The case studies show that to date there has been a strong reliance on behalf of local governments on government grant programs to fund the different stages of coastal adaptation planning. Furthermore, these grants have proven to be very competitive, inconsistent and insufficient for supporting ongoing adaptation planning processes. Funding for implementation of adaptation plans through grants has been even harder to access. However, this study also shows that lack of funding can be sometimes used as an excuse by local government officers for postponing adaptation action. The case studies reveal that deeper causes are in play, such as an overwhelming fear of legal implications, fear of making unpopular decisions and fear of impacting on economic growth.

This study suggests that collaboration can play a key role in enhancing current coastal adaptation funding arrangements. A collaborative approach to funding for adaptation is key to delivering more effective, consistent and targeted funding mechanisms. For instance, the establishment of ongoing coordinated funding mechanisms across all three levels of government would help ensure that resources for adaptation are provided, allocated and used effectively. Adaptation planning partnerships have shown to be effective at increasing the amount of resources available to local governments for undertaking adaptation studies, for supporting less resourced councils and for lobbying state and federal governments to play a more significant role in helping with adaptation challenges and associated costs. Adaptation planning partnerships can also foster ongoing funding relationships not just among government agencies but also between government and the private sector.

This research also suggests that increased funding per se can be meaningless

without a strong governance framework that: provides ongoing support for successful programs; prioritize programmes that builds capacity among project partners; enables the involvement in the planning process of people who will be involved/affected by adaptation responses to make them more informed and responsive; and lastly, that supports a diversification of funding revenues such as an adaptation fund, special levies and area rates. It also suggests that coastal adaptation planning requires local governments to become less grant-dependent as strong reliance on government funding can be detrimental in the long term. Local governments must explore other mechanisms to ensure that funding for adaptation is diversified and therefore more adequate and consistent. These may include environmental levies, development bonds, and dedicated coastal adaptation funds.

The results from this study also indicate that coastal adaptation planning requires a more equal distribution of funding for each step of the process with particular focus on those stages that typically are less resourced such as ongoing monitoring activities, community engagement activities, value assessments as well as trailing of innovative approaches and pathways implementation.

Principle 8 (*Collaboration increases shared responsibility and shared decision powers for coastal adaptation*) builds upon recent scholarly knowledge that shared responsibility in climate adaptation is crucial. The results from this study show that, while this concept is becoming increasingly common in the adaptation discourse, fundamental questions remain regarding how the apportionment of responsibility for coastal adaptation planning and implementation among multiple actors should occur.

This study indicates that the concept of shared responsibility is challenged by two popular assumptions: the first one is that governments should be fully responsible for mitigating coastal hazard risk; and the second one is that local governments should be fully responsible for conducting coastal adaptation planning. In reality government authorities are experiencing great difficulty in ensuring that risk is appropriately recognised and the responsibility for its management communicated and apportioned, particularly given the limited resources available and policy instruments failing to clarify such responsibilities. Confusion still reigns over who should bear the responsibility for protecting private property between the government and the private sector and who would benefit from adaptation

interventions. Further, examples of equitable models that allow to determine and raise contributions towards the costs of coastal adaptation are still limited.

This study concludes that collaboration is undoubtedly crucial for strengthening or creating collective and shared responsibility through joint action. The most successful example provided by the Tasmanian case study shows that a collaborative approach to coastal adaptation planning can help developing a better understanding of the risks that climate change poses on coastal assets and values, of the governance frameworks in which decisions are made and of the costs of adaptation and the key implications across a broad spectrum of values.

Table 6 provides a summary of the above recommendations.

8.1 Limitations of the research and recommendations for future work

These research findings are largely based on the WA governance but all principles can be extrapolated to national and international scales where improvement to coastal adaptation planning decision making is sought. Further, while the principles used to examine the different aspects of governance have been identified among a vast literature, I acknowledge that there might be additional principles, hence elements of governance, that could be further explored in future research. For example, the issue of litigation and public liability with regard to coastal development on climate hazards vulnerable areas (which was brought up by the majority of respondents) requires further investigation.

This study generates important findings in the field of collaborative governance for coastal adaptation by comparing three types of *informal* and *voluntary* collaborative governance arrangements. This decision was based on the fact that at the time of the research not many other types of collaborative arrangements for coastal adaptation (perhaps more formal ones) existed in WA. Other partnership models or partnership models within different governance frameworks might produce different reflections and findings.

Whilst similar, each adaptation arrangement is unique and uniquely influenced by the broader governance mechanisms in which they operate. The understanding of each partnership model and governance system was based on my active involvement both as a professional and as a researcher. For practical reasons my closer involvement with the WA adaptation planning partnerships has resulted in a stronger understanding of the WA governance compared to the Tasmanian one.

In undertaking this study I also acknowledge that, whilst some interesting work has been conducted over the past decade by the Coastal Collaboration Cluster (of which this study is part of), governance remains an aspect of coastal adaptation that to date has received limited attention compared to the technical ones.

Building on my findings, further research is needed to explore the practical application (including strengths and limitations) of the principles of good governance for coastal adaptation developed in this thesis in order to achieve a more collaborative approach to climate adaptation in the coastal zone.

Table 6: Summary of recommendations

Collaborative governance principles for coastal adaptation planning	A collaborative approach to coastal adaptation planning requires/leads to:
<i>Principle 1: Shared understanding, goals and priorities in coastal adaptation planning are mutually supportive/constitutive with collaboration</i>	Clear understanding of the issue, of responsibilities and of adaptation policy frameworks. Clear understanding of partners' values, long-term goals and priorities. On-going commitment from parties involved to provide adequate and resources and expertise. Openness to adjust views and common goals as new information, approaches and governance mechanisms become available. Clarity regarding: the role of the partnership arrangements along the collaboration continuum, limitations and opportunities. Facilitators / champions that facilitate the process and create linkages with the different knowledges involved. Formal recognition at the state level.
<i>Principle 2: Collaborative approaches are crucial for the successful integration of coastal adaptation objectives into policy and into every day decision making processes, and for effective coordination across multiple levels of government</i>	Overarching policies that incorporate adaptation principles and objectives comprehensively and effectively so that consistency can be achieved across policy levels and clear guidance can be provided with regard to policy implementation. Strong collaborative arrangements horizontally across government departments responsible for the development of adaptation policy and across government levels to ensure policy consistency and clarity. This is to guarantee better policy consistency and consistency of decision making, and reduce influence of single voices within the community. A state-wide policy coordination role is also key to ensure that policy is understood, translated and applicable. Coastal adaptation policy provisions should be legislated, however, where policy experimentation is still needed, policy and guidelines may be more effective.

Collaborative governance principles for coastal adaptation planning	A collaborative approach to coastal adaptation planning requires/leads to:
<p><i>Principle 3: Leadership and long-term political commitment are crucial for supporting collaborative coastal adaptation planning and collaboration can support effective leadership</i></p>	<p>Many types of leadership are required to support coastal adaptation planning processes and outcomes. Political leadership is required to support investigations and knowledge uptake. It also required to provide support for the development and implementation of a range of genuine and viable alternative adaptation measures. Collaboration helps political leaders to be less influenced by individual voices within the community. Political leaders should be meaningfully engaged throughout a collaborative adaptation planning process.</p> <p>Administrative leadership is also crucial for initiating and progressing coastal adaptation and even more for supporting collaborative adaptation planning initiatives. Administrative leaders such as CEOs and senior managers influence the way collaborative initiatives are planned, organized, resourced, coordinated and implemented. Effective administrative leadership rests on motivated and dedicated individuals who are effective at bringing people together, at communicating innovative ideas, at sourcing additional funding and at persuading people with higher or similar authority to engage in collaborative work. Clear and continuous commitment and support from administrative leaders (CEO and executives) but also from subordinate positions who play a key role in conducting a coastal adaptation planning process is key.</p>
<p><i>Principle 4: Collaboration is instrumental in developing and implementing adaptive policy, improved policy dialogues and policy learning</i></p>	<p>That input and collaboration is realised in all four dimensions of policy design (conceptual, technical, ethical, and practical) for coastal adaptation. Features of adaptive policy such as policy experimentation and innovation require buy-in support from all parties involved. Governance mechanisms that support initiatives to test the effects of a policy in a real-world setting are key and must be driven by state government agencies. Coastal adaptation policies must be conceived within a governance system that encourage self-reflection and learning within groups of diverse actors that seek to contribute to system change.</p>
<p><i>Principle 5: A collaborative and transdisciplinary approach promotes better uptake and incorporation of evidence and value-based knowledge into adaptation decision making</i></p>	<p>The pursue of development and trailing of new methodologies; the enhancement of adaptation decision makers' ability to interpret the information at hand; and the discrimination between evidence that is reliable and useful from evidence that is not for coastal adaptation. Collaboration also enables actors involved to address prevalent concerns about</p>

Collaborative governance principles for coastal adaptation planning	A collaborative approach to coastal adaptation planning requires/leads to:
	<p>information accuracy, credibility and salience. Clear methodologies should be developed in order to take into consideration the full range of social, environmental and cultural values in the development of feasible and equitable adaptation responses.</p>
<p><i>Principle 6: Collaborative approaches to coastal adaptation planning improve spatial and temporal scale matching</i></p>	<p>Commitment to address a problem at the scale of which common cross-boundary ecological processes occur. Also commitment to address issues at the right temporal scale in order to avoid problems being addressed too late or addressed through quick fixes. Governance approaches that can facilitate cross-boundary knowledge generation and information sharing as well as mechanisms that foster consistent decision making approaches across boundaries are more effective at supporting cross-scale problem solving typical coastal decision making. Strong commitment among cross-boundary actors is required to develop local strategies and actions collaboratively and apply such strategies at temporal and spatial scales that are appropriate for the scale of the problem. The issues of competence in the coastal adaptation decision making could be addressed by a third party, recognised in the legislation and composed of unelected 'experts', assessing development subject to erosion and inundation. Provisions would be required in the legislation to allow parties with a significant interest to make an appeal.</p>
<p><i>Principle 7: Collaboration helps generate adequate, consistent, coherent and diversified sources of funding which are necessary for coastal adaptation planning</i></p>	<p>A commitment to a collaborative approach to funding for adaptation is key to delivering more effective, consistent and targeted funding mechanisms. The establishment of ongoing coordinated funding mechanisms across all three levels of government would help ensure that resources for adaptation are provided, allocated and used effectively. A governance framework that provides ongoing support for successful programs, prioritize programmes that builds capacity among project partners, enables the involvement in the planning process of people who will be involved/affected by adaptation responses to make them more informed and responsive and lastly, that supports a diversification of funding revenues such as an adaptation fund, special levies and area rates is key. Other mechanisms other than grant funds should be explored to ensure that funding for adaptation is diversified and therefore more adequate and consistent. Coastal adaptation planning requires a more equal distribution of funding for each step of</p>

Collaborative governance principles for coastal adaptation planning	A collaborative approach to coastal adaptation planning requires/leads to:
	the process with particular focus on those stages that typically are less resourced such as ongoing monitoring activities, community engagement activities, value assessments as well as trailing of innovative approaches and pathways implementation.
<i>Principle 8: Collaboration increases shared responsibility and shared decision powers for coastal adaptation</i>	In a governance system where fear of legal repercussions and increased responsibilities (and costs) is the norm, collaboration can help reduce blame shifting and help develop equitable models that allow to determine and raise contributions towards the costs of coastal adaptation.

BIBLIOGRAPHY

- ACIL TASMAN 2013. *Climate Change Adaptation Options Assessment*. Peron Naturaliste Partnership, Perth, WA.
- ADAM, L., JAMES, T. & WANJIRA, M. A. 2007. *Frequently Asked Questions about Multi-Stakeholder Partnerships in ICTs for Development: A guide for national ICT policy animators*. Association for Progressive Communications, Melville, South Africa.
- ADGER, N., BROWN, K., FAIRBRASS, J., JORDAN, A., PAAVOLA, J., ROSENDO, S. & SEYFANG, G. (2003). Governance for sustainability: towards a 'thick' analysis of environmental decisionmaking, *Environment and Planning A*, 35, 6, pp.1095 - 1110.
- ADGER, N., LORENZONI, I. & O'BRIEN, K. 2009, Adaptation now. In: ADGER, N., LORENZONI, I. & O'BRIEN, K. (eds.) *Adapting to Climate Change: Thresholds, Values, Governance*, 1, pp.1-22, Cambridge University Press: New York.
- ADGER, W. N. (2003). Social capital, collective action, and adaptation to climate change, *Economic Geography*, 79, 4, pp.387-404.
- ADGER, W. N., ARNELLA, N. W. & TOMPKINS, E. L. (2005). Successful adaptation to climate change across scales, *Global Environmental Change*, 15, 2, pp.77 - 86.
- ADGER, W. N., DESSAI, S., GOULDEN, M., NELSON, D. R. & WREFORD, A. (2009). Are there social limits to adaptation to climate change?, *Climatic Change*, 93, 3-4, pp.335-354.
- ADGER, W. N. & VINCENT, K. (2005). Uncertainty in Adaptive Capacity, *Comptes Rendus Geoscience*, 337, 4, pp.399-410.
- AECOM AUSTRALIA 2010. *Climate Change Adaptation Action Plan*. Batavia Regional Organisation of Councils, Fortitude Valley, QLD.
- AGRANOFF, R. & MCGUIRE, M. (2003). *Collaborative Public Management - New Strategies for Local Governments*, Georgetown University Press: Washington DC.
- AHLBORG, H. & NIGHTINGALE, A. (2012). Mismatch Between Scales of Knowledge in Nepalese Forestry: Epistemology, Power, and Policy Implications, *Ecology and Society*, 17, 4, p.16.
- ALTERMAN, R. (1988). Adaptive planning, *Cognitive Science*, 12, 3, pp.393-421.
- AMUNDSEN, H., BERGLUND, F. & WESTSKOGÔ, H. (2010). Overcoming barriers to climate change adaptation - a question of multilevel governance?, *Environment and Planning C: Government and Policy*, 28, 2, pp.276 - 289.
- ANNING, D., 2012. *Estimation of the economic importance of beaches in Sydney, Australia, and implications for management*, PhD, Faculty of Science, University of New South Wales.
http://www.unsworks.unsw.edu.au/primo_library/libweb/action/dlDisplay.do?v_id=UNSWORKS&docId=unsworks_10467.
- ANSELL, C. & GASH, A. (2008). Collaborative Governance in Theory and Practice, *Journal of Public Administration Research and Theory*, 18, 4, pp.543-571.
- ARCHIBUGI, F. & NIJKAMP, P. (eds.). 1989. *Economy and Ecology: Towards Sustainable Development*, Kluwer Academic Publishers: Dordrecht, Boston.
- ARGYROUS, G. (2009). *Evidence for Policy and Decision-Making: A Practical Guide*, UNSW Press: Sydney, NSW.
- ARMITAGE, D. R. (2009). Adaptive co-management for social-ecological complexity, *Frontiers in ecology and the environment*, 7, 2, pp. 95-102.
- ARMITAGE, D. R. & PLUMMER, R. (eds.). 2010. *Adaptive Capacity and Environmental Governance*, Heidelberg Springer: Berlin, Germany.

- ARTD 2010. *Local Government Needs in Responding to Climate Change in New South Wales, Australia*. NSW Office of Environment and Heritage and Local Government, Sydney, NSW. Available from: <http://www.lgsa-plus.net.au/ClimateChangeActionPack>. [http://www.lgsa-plus.net.au/resources/documents/Local Government Needs in Responding to Climate Change in NSW December 2010.pdf](http://www.lgsa-plus.net.au/resources/documents/Local_Government_Needs_in_Responding_to_Climate_Change_in_NSW_December_2010.pdf). [5/5/2014].
- ASDAL, K. (2003). The Problematic Nature of Nature: The Post - Constructivist Challenge to Environmental History, *History and Theory*, 42, 4, pp.60-74.
- AUSTRALIA BUREAU OF STATISTICS 2011. Geraldton Population. Available from: <http://abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/53503Population/People12004-2008?opendocument&tabname=Summary&prodno=53503&issue=2004-2008&num=&view=>. [21/11/2011].
- AUSTRALIAN GOVERNMENT (1992). *Australia's National Strategy for Ecologically Sustainable Development*, Ecologically Sustainable Development Steering Committee: Canberra, ACT.
- AUSTRALIAN GOVERNMENT 1999. *Environment Protection and Biodiversity Conservation Act (EPBC Act)*, Department of the Environment, Australian Government.
- AUSTRALIAN GOVERNMENT 2006. *Climate Change Impacts & Risk Management: A Guide for Business and Government*. Department of Environment and Heritage, Canberra, ACT. <https://www.environment.gov.au/climate-change/adaptation/publications/climate-change-impact-risk-management>. [20 April 2011].
- AVEN, T. (2011). On risk governance deficits, *Safety Science*, 49, 6, pp.912-919.
- AVOLIO, B., WALUMBWA, F. & WEBER, T. (2009). Leadership: Current Theories, Research, and Future Directions, *Annual Review of Psychology*, 60, pp.421-449.
- BACHE, I. & FLINDERS, M. (2005). *Multi-level Governance* Oxford University Press: Oxford, UK.
- BACKSTRAND, K., KHAN, J. & KRONSELL, A. (2010). *Environmental Politics and Deliberative Democracy: Examining the Promise of New Modes of Governance*, Edward Elgar Publishing Limited: Cheltenham: Vic.
- BAKER & MCKENZIE 2011. *Local Councils Risk of Liability in the Face of Climate Change - Resolving uncertainties*. Australian Local Government Association, Sydney, NSW.
- BALLINGER, R., PICKAVER, A., LYMBERY, G. & FERRERIA, M. (2010). An evaluation of the implementation of the European ICZM principles, *Ocean & Coastal Management*, 53, 12, pp.738-749.
- BANKS, G. (2009a). *Challenges of evidence-based policy-making*, Australian Public Service Commission: Canberra.
- BANKS, G. (2009b). Evidence-based policy-making: What is it? How do we get it?, *Public Administration Today*, 20, (Policy Theory and Practice special issue), pp.1-27.
- BAPNA, M. & MCGRAY, H. 2008, Financing Adaptation: Opportunities for Innovation and Experimentation. In: LAEL BRAINARD, ABIGAIL JONES & PURVIS, N. (eds.) *Climate Change and Global Poverty: A Billion Lives in the Balance?*, Brookings Institution Press: Washington, D.C.
- BARTON, J. R., KRELLENBERG, K. & HARRIS, J. M. (2015). Collaborative governance and the challenges of participatory climate change adaptation planning in Santiago de Chile, *Climate and Development*, 7, 2, pp.175-184.
- BASKERVILLE, R. L. & WOOD-HARPER, A. T. (1996). A critical perspective on action research as a method for information systems research, *Journal of Information Technology*, 11, 3, pp.235-246.

- BAUER, A. & STEURER, R. (2014). Multi-level governance of climate change adaptation through regional partnerships in Canada and England, *Geoforum*, 51, pp.121-129.
- BECKWITH ENVIRONMENTAL PLANNING 2010. *Geraldton-Greenough Coastal Communities Study*. Northern Agricultural Catchments Council, Perth, WA. Available from: <http://www.nacc.com.au/getdoc/16fd25f0-4577-4983-85e6-832e7b545289/Coastal-Communities-Study--Report-Final.aspx>. [22/4/2011].
- BEDER, S. (1996). The nature of sustainable development, *Metascience*, 10, pp.112-114.
- BELIAEFF, B. & PELLETIER, D. (2011). A general framework for indicator design and use with application to the assessment of coastal water quality and marine protected area management, *Ocean & Coastal Management*, 5, 1, pp.84-92.
- BELL, S. & HINDMOOR, A. (2009). *Rethinking governance: the centrality of the state in modern society*, Cambridge University Press: Victoria, Australia.
- BENTRUP, G. (2001). Evaluation of a Collaborative Model: A Case Study Analysis of Watershed Planning in the Intermountain West, *Environmental Management*, 27, 5, pp.739-748.
- BERGMAN, J. Z., RENTSCH, J. R., SMALL, E. E., DAVENPORT, S. W. & BERGMAN, S. M. (2012). The shared leadership process in decision-making teams, *The Journal of Social Psychology*, 152, 1, pp.17-42.
- BERKES, F., BERKES, M. K. & FAST, H. (2007). Collaborative integrated management in Canada's north: The role of local and traditional knowledge and community-based monitoring, *Coastal Management*, 35, 1, pp.143-162.
- BERKHOUT, F., HERTIN, J. & GANN, D. (2006). Learning to Adapt: Organisational Adaptation to Climate Change Impacts, *Climatic Change*, 78, 1, pp.135-156.
- BERNSTEIN, S. (2004). Legitimacy in global environmental governance, *International Law and International Relations*, 1, 1-2, pp.139-166.
- BERRANG-FORD, L., FORD, J. D. & PATERSON, J. (2011). Are we adapting to climate change?, *Global Environmental Change*, 21, 1, pp.25-33.
- BICKNELL, C. 2010. *Sea Level Change in western Australia. Application to Coastal Planning*. Department of Transport and Infrastructure, Western Australian Government, Perth, WA.
- BIESBROEK, G., SWART, R. & VAN DER KNAAP, W. (2009). The mitigation-adaptation dichotomy and the role of spatial planning, *Habitat Int*, 33, 3, pp.230 - 237.
- BIESBROEK, G. R., TERMEER, K., KABAT, P. & KLOSTERMANN, J. E. M. 2009. Institutional governance barriers for the development and implementation of climate adaptation strategies, *Working paper for the International Human Dimensions Programme (IHDP) conference "Earth System Governance: People, Places, and the Planet"*, Amsterdam, The Netherlands, pp.1-14.
- BLASS, F. R. & FERRIS, G. R. (2007). Leader reputation: The role of mentoring, political skill, contextual learning, and adaptation, *Human Resource Management*, 46, 1, pp.5-19.
- BONYHADY, T., MACINTOSH, A. & MCDONALD, J. (2010). *Adaptation to climate change: law and policy*, The Federation Press: Annandale, NSW.
- BORGATTI, S. P. & CROSS, R. (2003). A Relational View of Information Seeking and Learning in Social Networks., *Management Science*, 49, 4, pp.432-445.
- BORGSTRÖM, S., ELMQVIST, T., ANGELSTAM, P. & ALFSEN-NORODOM, C. (2006). Scale Mismatches in Management of Urban Landscapes, *Ecology and Society*, 11, 2, p.16.
- BORRÁ, S. (2011). Policy learning and organizational capacities in innovation policies, *Science and Public Policy*, 38, 9, pp.725-734.

- BOVAIRD, T. (2007). Beyond Engagement and Participation: User and Community Coproduction of Public Services, *Public Administration Review*, 67, 5, pp/846-860.
- BREWER, G. D. (1973). *Politicians, Bureaucrats, and the Consultant. A critique of urban problem solving*, Basic Books: New York.
- BRINKERHOFF, J. M. (2002). Assessing and improving partnership relationships and outcomes: a proposed framework, *Evaluation and Program Planning*, 25, 3, pp.215-231.
- BRITTON, R., DAHM, J., ROUSE, H., HUME, T., BELL, R. & BLACKETT, P. 2011. *Coastal Adaptation to Climate Change: Pathways to Change*. NZ. Available from: https://www.niwa.co.nz/sites/niwa.co.nz/files/pathways_to_change_nov2011.pdf. [13 June 2014].
- BROWN, K., FURNEAUX, C. & GUDMUNDSSON, A. (2012). Infrastructure transitions towards sustainability: a complex adaptive systems perspective, *International Journal of Sustainable Development*, 15, 1, pp.54-71.
- BRUCE, T. 2008. Submission to the Inquiry into Climate and Environmental Impacts on Coastal Communities, *Public submission* [Online], p.23. <http://www.aph.gov.au/House/committee/ccwea/coastalzone/subs.htm>. [13/5/2008]
- BRUNNER, R. D. & LYNCH, A. H. (2010). *Adaptive Governance and Climate Change*, American Meteorological Society: Boston.
- BRUNNER, R. D., STEELMAN, T. A., COE-JUELL, L., CROMELY, C. M., EDWARDS, C. M. & TUCKER, D. W. (2005). *Adaptive Governance: Integrating Science, Policy, and Decision-making*, Columbia University Press: New York, Chichester, West Sussex.
- BULKELEY, H. & BETSILL, M. (2005). Rethinking sustainable cities: Multilevel governance and the 'urban' politics of climate change., *Environmental Politics*, 14, 1, pp.42 - 63.
- BULKELEY, H. & KERN, K. (2006). Local Government and the Governing of Climate Change in Germany and the UK, *Urban Studies*, 43, 12, pp.2237-2259.
- BURCH, S. (2010). Transforming barriers into enablers of action on climate change: Insights from three municipal case studies in British Columbia, Canada, *Global Environmental Change*, 20, 2, pp.287-297.
- BURKE, G. R., 2012. *Making viability sustainable*, PhD, School of Humanities, Curtin University Sustainability Policy Institute, Curtin University.
- BURTON, I. 2009, In: AGRAWALA, S. & FANKHAUSER, S. (eds.) *Reviewed In: Economic aspects of adaptation to climate change: Costs, benefits and policy instruments*, pp.98-99.
- BUSENBERG, G. J. (2001). Learning in organizations and public policy, *Journal of Public Policy*, 21, 2, pp.173-189.
- CANDEL, J. J. L. & BIESBROEK, R. (2016). Toward a processual understanding of policy integration, *Policy Sciences*, 49, 3, pp.211-231.
- CARLEY, J. T., BLACKA, M. J., TIMMS, W. A., ANDERSEN, M. S., MARIANI, A., RAYNER, D. S., MCARTHUR, J. & COX, R. J. 2008. *Coastal Processes, Coastal Hazards, Climate Change and Adaptive Responses for Preparation of a Coastal Management Strategy for Clarence City, Tasmania*. The University of New South Wales School of Civil and Environmental Engineering Water research laboratory, Manly Vale, NSW.
- CARR, A. & WILKINSON, R. (2005). Beyond participation: Boundary organizations as a new space for farmers and scientists to interact, *Society & natural resources*, 18, 3, pp.255-265.
- CARTER, R. M., PARRY, M. L., NISHIOKA, S. & HARASAWA, H. 1994. *Technical Guidelines for Assessing Climate Change Impacts and Adaptations*. Working

Group II, Intergovernmental Panel for Climate Change. University College London and Centre for Global Environmental Research, London and Tsukuba, Geneva.

- CARTER, T. R., M.L. PARRY, S. NISHIOKA, H. HARAWASA 1992. *Preliminary Guidelines for Assessing Impacts of Climate Change: Prepared by the IPCC Working Group II*. Environmental Change Unit, Oxford, UK, and Centre for Global Environmental Research, Tsukuba, Japan.
- CASH, D., CLARK, W., ALCOCK, F., DICKSON, N., ECKLEY, N. & JÄGER, J. (2002). Salience, credibility, legitimacy and boundaries: Linking research, assessment and decision making, *KSG Working Papers Series RWP02-046*, pp.1-24.
- CASH, D. W., ADGER, W. N., BERKES, F., GARDEN, P., LEBEL, L., OLSSON, P., PRITCHARD, L. & YOUNG, O. 2006. Scale and cross-scale dynamics: governance and information in a multi-level world, *Ecology and Society* [Online], 11, 2, p. 8. Available from: URL: <http://www.ecologyandsociety.org/vol11/iss2/art8/>. [10 March 2012]
- CASH, D. W., BORCK, J. C. & PATT, A. G. (2006). Countering the Loading-Dock Approach to Linking Science and Decision Making: Comparative Analysis of El Nino/Southern Oscillation (ENSO) Forecasting Systems, *Science Technology Human Values*, 31, 4, pp.465-494.
- CASH, D. W., CLARK, W. C., ALCOCK, F., DICKSON, N. M., ECKLEY, N., GUSTON, D. H., JAGER, J. & MITCHELL, R. B. (2003). Knowledge systems for sustainable development, *Proceedings of the National Academy of Sciences*, 100, 14, pp.8086 - 8091.
- CASTAÑOS, H. & LOMNITZ, C. (2009). Ortwin Renn, Risk Governance: Coping with Uncertainty in a Complex World, *Natural Hazards*, 48, 2, pp.313-314.
- CASTREJÓN, M. & CHARLES, A. (2013). Improving fisheries co-management through ecosystem-based spatial management: The Galapagos Marine Reserve, *Marine Policy*, 38, pp.235-245.
- CAVAYE, J. M. 2004. Governance and Community Engagement. The Australian Experience In: LOVAN, W. R., SHAFFER, R. & MURRAY, M. (eds.) *Participatory Governance: Planning, Conflict Mediation and Public Decision Making in Civil Society*, pp.85-102, Ashgate Pub Ltd: Aldershot, UK.
- CHAFFIN, B., GOSNELL, H. & COSENS, B. (2014). A decade of adaptive governance scholarship: synthesis and future directions, *Ecology and Society*, 19, 3, p.56.
- CHAPMAN, J. K. 2009. Translating research into practice: working to build adaptive institutions for sustainable tourism in Western Australia's Ningaloo Region, *See Change: tourism & hospitality in a dynamic world*, Fremantle, WA,
- CHECKLAND, P. (1985). From optimizing to learning: A development of System Thinking for the 1990s, *Operational Research Society*, 36, 9, pp.757-767.
- CHOUDHURY, E. & AHMED, S. (2002). The shifting meaning of governance: public accountability of third sector organizations in an emergent global regime, *International Journal of Public Administration*, 25, 4, pp.561-588.
- CHRISTENSEN, N. L., BARTUSKA, A. M., BROWN, J. H., CARPENTER, S., D'ANTONIO, C., FRANCIS, R., FRANKLIN, J. F., MACMAHON, J. A., NOSS, R. F., PARSONS, D. J., PETERSON, C. H., TURNER, M. G. & WOODMANSEE, R. G. (1996). The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management, *Ecological Applications*, 6, 3, pp.665-691.
- CHRISTOPHER, S., WATTS, V., MCCORMICK, A. K. H. G. & YOUNG, S. (2008). Building and maintaining trust in a community-based participatory research partnership, *American Journal of Public Health*, 98, 8, pp.1398-1406.
- CHRISTOPLOS, I., MITCHELL, J. & LILJELUND, A. 2001. Re - framing Risk: The Changing Context of Disaster Mitigation and Preparedness, *Disasters*

[Online], 25, 3, pp.185-198. Available from:
<http://onlinelibrary.wiley.com/doi/10.1111/1467-7717.00171/abstract>. [17
October 2012]

- CHURCH, J. A., HUNTER, J. R., MCINNES, K. L. & WHITE, N. J. (2006). Sea-level rise around the Australian coastline and the changing frequency of extreme sea-level events, *Australian Meteorological Magazine*, 55, 4, pp.253 - 260.
- CLARKE, B., STOCKER, L., COFFEY, B., LEITH, P., HARVEY, N., BAXTER, T., BRUEKERS, G., DANESE GALANO, C., GOOD, M., HOFMEESTER, C., MARTINS DE FREITAS, D., MUMFORD, T., NURSEY-BRAY, M., KRIWOKEN, L., SHAW, J., SHAW, J., SMITH, T., THOMSEN, D. & WOOD, D. (2013). Enhancing the Knowledge-Governance Interface: Coasts, Climate and Collaboration, *Ocean & Coastal Management*.
- COAG 2013. *Climate Change Adaptation: National Adaptation Priorities and Roles and Responsibilities*. Council of Australian Governments, Canberra, ACT.
- COASTAL PROTECTION BOARD (2012). *Coastal Protection Board Policy Document (revised May 2012)*, Coast Protection Board: Keswick, South Australia.
- COASTAL ZONE MANAGEMENT PTY LTD 2008. *Vulnerability of the Cottesloe Foreshore to the Potential Impacts of Climate Change*. Town of Cottesloe, Claremont, WA.
- COASTAL ZONE MANAGEMENT PTY LTD 2009. *Mandurah Coastal Zone Climate Change Risk Assessment and Adaptation Plan: Risk Assessment Methods*. City of Mandurah, Claremont, Perth.
- CONNICK, S. & INNES, J. E. (2003). Outcomes of Collaborative Water Policy Making: Applying Complexity Thinking to Evaluation *Journal of Environmental Planning and Management*, 46, 2, pp.177 - 197.
- CONSIDINE, M. 2005. Partnerships and Collaborative Advantage: Some Reflections on new forms of Network Governance, *Governments and Communities in Partnership*, Centre for Public Policy, University of Melbourne, Melbourne, Vic, p.26.
- CONSIDINE, M. 2006. The Power of Partnership: States and Solidarities in the Global Era, *Governments and Communities in Partnership*, Centre for Public Policy, University of Melbourne, p.28.
- CONSIDINE, M. & HART, A. 2006. Designing Local Governance Partnerships Issues and Dynamics in Two Australian Cases, *Governments and Communities in Partnership conference*, Centre for Public Policy, University of Melbourne, Melbourne, Vic., p.36s.
- COOPER, J. A. G. & MCKENNA, J. (2008). Social justice in coastal erosion management: The temporal and spatial dimensions, *Geoforum*, 39, 1, pp.294-306.
- COOPER, J. A. G. & PILKEY, O. H. (2004). Sea-level rise and shoreline retreat: time to abandon the Bruun Rule, *Global and Planetary Change*, 43, 3-4, pp.157 - 171.
- CORFEE-MORLOT, J., COCHRAN, I., HALLEGATTE, S. & TEASDALE, P.-J. (2010). Multilevel risk governance and urban adaptation policy, *Climatic Change*, 104, 1, pp.169-197.
- COSTANZA, R. (ed.) 1992. *Ecological Economics: The Science and Management of Sustainability*, Columbia University Press: New York.
- COSTANZA, R., ANDRADE, F., ANTUNES, P., VAN DEN BELT, M., BOERSMA, D., BOESCH, D. F., CATARINO, F., HANNA, S., LIMBURG, K., LOW, B., MOLITOR, M., PEREIRA, J. G., RAYNER, S., SANTOS, R., WILSON, J. & YOUNG, M. (1998). Principles for sustainable governance of the oceans, *Science*, 281, 5374, pp.198-199.
- COSTANZA, R., WAINGER, L., FOLKE, C. & MALER, K.-G. (1993). Modeling complex ecological economic systems, *Bioscience*, 43, 8, pp.545-555.

- COWELL, P. & BARRY, S. 2011. *Coastal recession risk in the Busselton-Rockingham coastal cell due to climate change*. Geoscience Australia, Sydney, NSW.
- CRAMER, J. L. (1974). Administrative Leadership, *Improving College and University Teaching*, 22, 2, pp.91-93.
- CROSBY, B. C. & BRYSON, J. M. (2010). Integrative leadership and the creation and maintenance of cross-sector collaborations, *The Leadership Quarterly*, 21, 2, pp.211-230.
- CROWDER, L. B., OSHERENKO, G., YOUNG, O. R., AIRAMÉ, S., NORSE, E. A., BARON, N., DAY, J. C., DOUVERE, F., EHLER, C. N., HALPERN, B. S., LANGDON, S. J., MCLEOD, K. L., OGDEN, J. C., PEACH, R. E., ROSENBERG, A. A. & WILSON, J. A. (2006). Sustainability. Resolving mismatches in U.S. ocean governance, *Science (New York, N.Y.)*, 313, 5787, pp.617-618.
- CUMMING, G. S., CUMMING, D. H. M. & REDMAN, C. L. (2006). Scale mismatch in social-ecological systems: causes, consequences, and solutions, *Ecology and Society*, 11, 1, p.14.
- DĄBROWSKI, M., BACHTLER, J. & BAFOIL, F. (2014). Challenges of multi-level governance and partnership: drawing lessons from European Union cohesion policy, *European Urban and Regional Studies*, 21, 4, pp.355-363.
- DAMARA WA PTY LTD 2010. *Dongara to Cape Burney Western Australia: coastal geomorphology*. Department of Planning, Perth, WA.
- DAMARA WA PTY LTD 2012. *Coastal Hazard Mapping for Economic Analysis of Climate Change Adaptation in the Peron-Naturaliste Region*. Peron Naturaliste Partnership, Perth, WA.
- DANESE GALANO, C. 2012. *Coastal Governance Workshop Report*. Northern Agricultural Catchments Council, Geraldton, WA.
- DANIELL, K., MÁÑEZ COSTA, M., FERRAND, N., KINGSBOROUGH, A., COAD, P. & RIBAROVA, I. (2011). Aiding multi-level decision-making processes for climate change mitigation and adaptation, *Regional Environmental Change*, 11, 2, pp.243-258.
- DANIELS, S. E. & WALKER, G. B. (1996). Collaborative learning: Improving public deliberation in ecosystem-based management, *Environmental Impact Assessment Review*, 16, 2, pp.71-102.
- DAVIDSON, J. & LOCKWOOD, M. (2008). Partnerships as Instruments of Good Regional Governance: Innovation for Sustainability in Tasmania?, *Regional Studies*, 42, 5, pp.641-656.
- DAVIDSON, J., LOCKWOOD, M., GRIFFITH, R., CURTIS, A. & STRATFORD, E. 2008. *Status and good practice in Australian NRM governance*. Land and Water Australia Project UTA16. Hobart, Tasmania.
- DAVIES, J. L. (1974). The coastal sediment compartment, *Australian Geographical Studies*, 12pp.139-151.
- DAVOS, C. A. (1998). Sustaining co-operation for coastal sustainability, *Journal of Environmental Management*, 52, 4, pp.379-387.
- DE GROOT, R. S., ALKEMADE, R., BRAAT, L., HEIN, L. & WILLEMEN, L. (2010). Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making, *Ecological Complexity*, 7, 3, pp.260-272.
- DE LOË, R. C., ARMITAGE, D., PLUMMER, R., DAVIDSON, S. & MORARU, L. 2009. *From Government to Governance: A State-of-the-Art Review of Environmental Governance. Final Report*. Alberta Environment Environmental Stewardship Environmental Relation, Guelph, ON.
- DE MARCHI, B. & RAVETZ, J. R. (1999). Risk management and governance: a post-normal science approach, *Futures*, 31, 7, pp.743-757.

- DE VRIES, B. J. M. & PETERSEN, A. C. (2009). Conceptualizing sustainable development: An assessment methodology connecting values, knowledge, worldviews and scenarios, *Ecological Economics*, 68, 4, pp.1006-1019.
- DEPARTMENT OF CLIMATE CHANGE 2009. *Climate Change Risks to Australia's Coast: a First Pass National Assessment*. Department of Climate Change, Australian Government, Canberra, ACT.
- DEPARTMENT OF CLIMATE CHANGE AND ENERGY EFFICIENCY 2007. *National Climate Change Adaptation Framework*. Department of Climate Change and Energy Efficiency, Australian Government, Canberra, ACT.
- DEPARTMENT OF CLIMATE CHANGE AND ENERGY EFFICIENCY 2010. *Developing a National Coastal Adaptation Agenda. A Report on the National Climate Change Forum*. Department of Climate Change and Energy Efficiency, Australian Government, Canberra, ACT.
- DEPARTMENT OF CLIMATE CHANGE AND ENERGY EFFICIENCY 2011. *Climate Change Risks to Coastal Buildings and Infrastructure: A supplement to the first pass national assessment* Department of climate Change and Energy Efficiency, Australian Government, Canberra, ACT.
- DEPARTMENT OF ENVIRONMENT AND CONSERVATION 2012. *Adapting to our changing climate*. Government of Western Australia, Perth, WA.
<https://www.der.wa.gov.au/your-environment/climate-change>. [12 February 2013].
- DEPARTMENT OF ENVIRONMENT AND WATER RESOURCES 2007. *Climate Change Impacts and Risk Management: A Guide to Business and Government*. Australian Greenhouse Office, Canberra, ACT.
- DEPARTMENT OF TRANSPORT 2007. *Coastal Protection Policy for Western Australia*. Western Australia Department of Transport, Government of Western Australia, Perth, WA.
- DESSAI, S., HULME, M., LEMPert, R. J. & PIELKE, R. J., 2009. Do We Need Better Predictions to Adapt to a Changing Climate? *Eos, Transactions American Geophysical Union*, 90, Issue, pp.111-112, Number, Available from: http://sciencepolicy.colorado.edu/admin/publication_files/resource-2720-2009.08.pdf. [2 May 2013]
- DIETZ, T., OSTROM, E. & STERN, P. C. (2003). The struggle to govern the commons, *Science*, 302, 5652, pp.1907-1912.
- DINAS-COAST CONSORTIUM. 2006, DIVA 1.5.5, UNITED NATIONS, Potsdam, Germany.
<http://www4.unfccc.int/sites/NWP/pages/item.aspx?ListItemId=22905&ListUrl=/sites/nwp/Lists/MainDB>
- DOVERS, S. (2000). *Environmental history and policy: still settling Australia*, Oxford University Press: Melbourne, Vic.
- DOVERS, S. (2005). *Environment and sustainability policy: creation, implementation, evaluation*, Federation Press: Annandale, NSW.
- DOVERS, S. R. & HANDMER, J. W. (1992). Uncertainty, sustainability and change, *Global Environmental Change*, 2, 4, pp.262-276.
- DOVERS, S. R., HANDMER, J. W. & NORTON, T. W. (2001). *Ecology, uncertainty and policy: managing ecosystems for sustainability*, Prentice Hall/Pearson Education: Harlow, England.
- DPIPWE 2008a. *Background report: Coastal flooding – Review of the use of Exceedance Statistics in Tasmania*. Department of Primary Industries and Water, Hobart, Tasmania.
- DPIPWE 2008b. *Climate Change and Coastal Asset Vulnerability: An audit of Tasmania's coastal assets potentially vulnerable to flooding and sea-level rise*. Department of Primary Industries and Water, Hobart, Tasmania.

- DPIPWE 2008c. *Sea-level extremes in Tasmania: Summary and Practical Guide for Planners and Managers*. Department of Primary Industries and Water, Hobart, Tasmania
- DPIPWE 2009. *Tasmanian Coastal Risk Management Plan: Templates and Guidelines* [Online], Tasmanian Government,.
<http://dPIPWE.tas.gov.au/conservation/climate-change/climate-change-and-coastal-vulnerability/coastal-risk-management-plan-template>.
- DRYZEK, J. S. (1997). *The politics of the earth: Environmental discourses*, Oxford University Press: Oxford, UK.
- DUIT, A. & GALAZ, V. (2008). Governance and Complexity—Emerging Issues for Governance Theory, *Governance*, 21, 3, pp.311-335.
- DUIT, A., GALAZ, V., ECKERBERG, K. & EBBESSON, J. (2010). Governance, complexity, and resilience, *Global Environmental Change*, 20, 3, pp.363-368.
- DUXBURY, J. & DICKINSON, S. (2007). Principles for sustainable governance of the coastal zone: In the context of coastal disasters, *Ecological Economics*, 63, pp.319-330.
- DWYER, J. (1989). The politics of participation, *Community Health Studies*, XIII, 1, pp.59-65.
- EAKIN, H. C. & PATT, A. (2011). Are adaptation studies effective, and what can enhance their practical impact?, *Wiley Interdisciplinary Reviews: Climate Change*, 2, 2, pp.141-153.
- EASTERLING W.E., HURD, B. H. & SMITH, J. B. 2004. *Coping with Global Climate Change: The Role of Adaptation in the United States: Report*. Pew Center on Global Climate Change Arlington, Virginia. Available from:
<http://www.c2es.org/docUploads/Adaptation.pdf>. [24 July 2013].
- EBURN, M. & HANDMER, J. (2012). Legal issues and information on natural hazards, *17 Local Government Law Journal* 19, 17, 1, pp.19-26.
- EEA, Practical Applications of the Precautionary Principle. Scientific Committee meeting and report, 20 May 1999, Copenhagen, Denmark.
- EGGENBERGER, M. & PARTIDÁRIO, M. R. (2000). Development of a framework to assist the integration of environmental, social and economic issues in spatial planning, *Impact Assessment and Project Appraisal*, 18, 3, pp.201-207.
- ELBAKIDZE, M., ANGELSTAM, P., SANDSTRÖM, C. & AXELSSON, R. 2010. Multi-Stakeholder Collaboration in Russian and Swedish Model Forest Initiatives: Adaptive Governance Toward Sustainable Forest Management?, *Ecology and Society* [Online], 15, 2, p.14. Available from:
<http://www.ecologyandsociety.org/vol15/iss2/art14/>.
- ELIOT, I., NUTT, C., GOZZARD, B., HIGGINS, M., BUCKLEY, E. & BOWYER, J. 2011. *Coastal Compartments of Western Australia: A Physical Framework for Marine & Coastal Planning* Department of Environment and Conservation, Perth, WA.
- EMERSON, K. & GERLAK, A. (2014). Adaptation in Collaborative Governance Regimes, *Environmental Management*, 54, 4, pp.768-781.
- EMERSON, K., NABATCHI, T. & BALOGH, S. (2012). An Integrative Framework for Collaborative Governance, *Journal of Public Administration Research and Theory*, 22, 1, pp.1-29.
- ENGLAND, P. 2007. Climate Change: What Are Local Governments Liable for?, *Urban Research Program* [Online], 6, pp.1-24. Available from:
<http://apo.org.au/node/4674>. [21/5/2010]
- ENGLAND, P. 2008. *Climate change law for planners, developers, local government and greenies: A quick stock take and some ideas for the future*. Brisbane, QLD. Available from: <http://coastaladaptationresources.org/PDF-files/1195-England-Climate-change-law-2008.pdf>. [12 May 2012].

- ESBJÖRN-HARGENS, S. (2010a). An Ontology of Climate Change: Integral Pluralism and the Enactment of Environmental Phenomena, *Journal of Integral Theory and Practice*, 5, 1, pp.183-201.
- ESBJÖRN-HARGENS, S. 2010b, An Overview of Integral Theory. In: ESBJÖRN-HARGENS, S. (ed.) *Integral Theory in Action: Applied, Theoretical, and Constructive Perspectives on the Aqal Model*, State University of New York Press (SUNY Press): New York.
- FIELDMAN, G. (2011). Neoliberalism, the production of vulnerability and the hobbled state: Systemic barriers to climate adaptation, *Climate and Development*, 3, 2, 159-174.
- FLEMING, A., VANCLAY, F., HILLER, C. & WILSON, S. (2014). Challenging dominant discourses of climate change, *An Interdisciplinary, International Journal Devoted to the Description, Causes and Implications of Climatic Change*, 127, 3, 407-418.
- FOLKE, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses, *Global Environmental Change*, 16, 3, pp.253-267.
- FOLKE, C., CARPENTER, S., ELMQVIST, T., GUNDERSON, L., HOLLING, C. S. & WALKER, B. (2002). Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations, *Ambio*, 31, 5, pp.437-440.
- FOLKE, C., HAHN, T., OLSSON, P. & NORBERG, J. (2005). Adaptive governance of social-ecological systems, *Annual Reviews of Environment and Resources*, 30pp.441-473.
- FOLKE, C., PRITCHARD, L., BERKES, F., COLDING, J. & SVEDIN, U. 1998. The problem of fit between ecosystems and institutions. IHDP Working Paper Number 2., *International Human Dimensions Programme on Global Environmental Change (IHDP)*, Bonn, Germany.,
- FOLKE, C., PRITCHARD, L., BERKES, F., COLDING, J. & SVEDIN, U. (2007). The problem of fit between ecosystems and institutions: Ten years later, *Ecology and Society*, 12, 1, p.30.
- FOLKE, C. & ROCKSTRÖM, J. (2009). Turbulent times, *Global Environmental Change*, 19, 1, pp.1 - 3.
- FORD, J., BERRANG-FORD, L. & PATERSON, J. (2011). A systematic review of observed climate change adaptation in developed nations, *An Interdisciplinary, International Journal Devoted to the Description, Causes and Implications of Climatic Change*, 106, 2, pp.327-336.
- FORD, J. & KING, D. (2015). A framework for examining adaptation readiness, *Mitigation and Adaptation Strategies for Global Change*, 20, 4, pp.505-526.
- FOXON, T., REED, M. & STRINGER, L. (2009). Governing long-term social-ecological change: What can the adaptive management and transition management approaches learn from each other?, *Environmental Policy and Governance*, 19, 1, pp.3-20.
- FRITZE, J., WILLIAMSON, L. & WISEMAN, J. 2009. *Community Engagement and Climate Change: Benefits, Challenges and Strategies. Report for Department of Planning and Community Development*. Victorian Government, Melbourne, Victoria.
http://www.vcross.org.au/documents/VCOSS_docs/Climate_Change/CCCE_Final_Report_Jan_31_2009.pdf.
- FUERTH, S. L. (2009). Foresight and anticipatory governance, *Foresight*, 11, 4, pp.14-32.
- FUNTOWICZ, S. & RAVETZ, J., R. (1994a). Emergent complex systems, *Futures*, 26, 6, pp.568-582.
- FUNTOWICZ, S. O. & RAVETZ, J. R. 1991, A New Scientific Methodology for Global Environmental Issues. In: COSTANZA, R. (ed.) *Ecological Economics: the Science and Management of Sustainability*, pp.137-152, Columbia University Press.: New York.

- FUNTOWICZ, S. O. & RAVETZ, J. R. (1994b). Uncertainty, complexity and post-normal science, *Environmental Toxicology and Chemistry*, 13, 12, pp.1881-1885.
- FÜSSEL, H. & KLEIN, R. J. T. (2006). Climate Change Vulnerability Assessments: An Evolution of Conceptual Thinking, *Climatic Change*, 75, 3, pp.301-329.
- FÜSSEL, H. M. (2007a). Adaptation planning for climate change: concepts, assessment approaches, and key lessons, *Sustainability and Science*, 2pp.265-275.
- FÜSSEL, H. M. (2007b). Vulnerability: A generally applicable conceptual framework for climate change research, *Global Environmental Change*, 17, 2, pp.155-167.
- GALLAGHER, A. (2010). The coastal sustainability standard: A management systems approach to ICZM, *Ocean & Coastal Management*, 53, 7, pp.336-349.
- GERGEN, K. (2009). *Relational Being: Beyond Self and Community*, Oxford University Press: New York.
- GIDLEY, J. M. (2016). Understanding the Breadth of Futures Studies through a Dialogue with Climate Change, *World Future Review*, 8, 1, pp.24-38.
- GILMOUR, P., COFFEY, B. & O'TOOLE, K. (2015). Trust and knowledge exchange in coastal settings, *Australian Journal of Maritime & Ocean Affairs*, 7, 1, pp.66-74.
- GIORDANO, T. (2012). Adaptive planning for climate resilient long-lived infrastructures, *Utilities Policy*, 23, pp.80-89.
- GLAVOVIC, B., KELLY, M., KAY, R. & TRAVERS, A. (2014). Climate Change and the Coast: Building Resilient Communities [online], CRC Press, Boca Raton, FL.
- GLEESON, B. & LOW, N. (2000). 'Unfinished Business': Neoliberal Planning Reform in Australia, *Urban Policy and Research*, 18, 1, pp.7-28.
- GODSCHALK, D. (2004). Land Use Planning Challenges: Coping with Conflicts in Visions of Sustainable Development and Livable Communities, *Journal of the American Planning Association*, 70, 1, pp.5-13.
- GOFFMAN, E. (2006). Book Review Perspectives: Jan-Peter VoB, Dierk Bauknecht & Rene Kemp (Eds) 'Reflexive Governance for Sustainable Development', *Sustainability: Science, Practice and Policy*, 3, 2, pp.70-71.
- GORDON, A. D. 2015. Coastal Hazard Lines – Last Century 's Thinking, *Australasian Coasts & Ports Conference 2015*, Auckland, NZ, p.7.
- GOVERNMENT OF WESTERN AUSTRALIA 2005. *Planning and Development Act*, Government of Western Australia.
- GRANBERG, M. & GLOVER, L. (2014). Adaptation and Maladaptation in Australian National Climate Change Policy, *Journal of Environmental Policy & Planning*, 16, 2, pp.147-159.
- GRANT, B., BALDWIN, C., LIESKE, S. N. & MARTIN, K. (2015). Using participatory visual methods for information exchange about climate risk in canal estate communities, *Australian Journal of Maritime & Ocean Affairs*, 7, 1, pp.23-37.
- GRAY, P. C. R. & WIEDEMANN, P. M. (1999). Risk management and sustainable development: mutual lessons from approaches to the use of indicators, *Journal of Risk Research*, 2, 3, pp.201-218.
- GUNDER, M. (2006). Sustainability - Planning's saving grace or road to perdition?, *Journal of Planning Education and Research*, 26, 2, pp.208-221.
- GUNDER, M. (2010). Planning as the ideology of (neoliberal) space, *Planning Theory*, 9, 4, pp.298-314.
- GUNDERSON, L. & LIGHT, S. S. (2006). Adaptive management and adaptive governance in the everglades ecosystem, *Policy Science*, 39, 4, pp.323-334.

- GUNDERSON, L. H. & HOLLING, C. S. (2002). *Panarchy: understanding transformations in human and natural systems* Island Press: Washington, DC
- GURRAN, N. (2008). The Turning Tide: Amenity Migration in Coastal Australia, *International Planning Studies*, 13, 4, pp.391 - 414.
- GURRAN, N., HAMIN, E. & NORMAN, B. 2008. *Planning for climate change: leading practice principles and models for sea change communities in coastal Australia*. The University of Sydney, Sydney, NSW.
- GURRAN, N., SQUIRES, C. & BLAKELY, E. 2005. *Meeting the Sea Change Challenge: Best Practice Models of Local and Regional Planning for Sea Change Communities*. National Sea Change Taskforce, Sydney, NSW.
- GUSFIELD, J. R. (1981). *The culture of public problems: drinking-driving and the symbolic order*, University of Chicago Press: Chicago.
- GUSTON, D. H. (2001). Boundary organisations in environmental policy and science: An introduction, *Science, Technology and Human Values*, 26, 4, pp.399-408.
- HAAS, P. (2004). When does power listen to truth? A constructivist approach to the policy process, *Journal of European Public Policy*, 11, 4, pp.569-592.
- HAASNOOT, M., KWAKKEL, J. H., WALKER, W. E. & TER MAAT, J. (2013). Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world, *Global Environmental Change*, 23, 2, pp.485-498.
- HAHN, T., OLSSON, P., FOLKE, C. & JOHANSSON, K. (2006). Trust-building, knowledge generation and organizational innovations: The role of a bridging organization for adaptive comanagement of a wetland landscape around Kristianstad, Sweden, *Human Ecology*, 34, 4, pp.573–592.
- HAJER, M. A. & WAGENAAR, H. (2003). *Deliberative policy analysis: understanding governance in the network society*, Cambridge University Press: Cambridge, UK; New York, USA.
- HALLEGATTE, S., GREEN, C., NICHOLLS, R. J. & CORFEE-MORLOT, J. (2013). Future flood losses in major coastal cities, *Nature Climate Change*, 3, 9, pp.802-806.
- HAMIN, E. M. & GURRAN, N. (2009). Urban form and climate change: Balancing adaptation and mitigation in the U.S. and Australia, *Habitat International*, 33, 3, pp.238-245.
- HARGROVES, K. & SMITH, M. H. (2006). *The natural advantage of nations: business opportunities, innovation and governance in the 21st century* Earthscan: London, UK.
- HARRIS, G. 2007, Complexity and complex systems: The characteristics of complex adaptive systems and networks, and an introduction to emergence and emergent properties *Seeking sustainability in an age of complexity*, 2, 19, Cambridge University Press, 2007: Cambridge, UK.
- HARTZ-KARP, J. & STOCKER, L. 2013, Deliberative democracy, a collaborative action oriented learning process for a more sustainable future. In: SHULTZ, L. & KAJNER, T. (eds.) *Engaged Scholarship; The Politics of Engagement and Disengagement*, pp.121-137, Sense Publishers: Boston.
- HARVEY, N., CLOUSTON, B. & CARVALHO, P. (1999). Improving coastal vulnerability assessment methodologies for integrated coastal management: an approach from South Australia, *Australian Geographic Study*, 37, pp.50-69.
- HARVEY, N. & WOODROFFE, C. (2008). Australian approaches to coastal vulnerability assessment, *Sustainability Science*, 3, pp.67-87.
- HASCIC, I., JOHNSTONE, N. & KALAMOVA, M. (2009). Environmental Policy Flexibility, Search and Innovation, *Finance a Uver*, 59, 5, pp.426-441.

- HEAD, B. 2010, Evidence-based policy: Principles and requirements *In*: BANKS, G. (ed.) *Strengthening Evidence-based Policy in the Australian Federation*, 2, Productivity Commission: Canberra, ACT. Available from: <http://www.cebma.info/wp-content/uploads/Head-Evidence-based-policy.pdf>.
- HEDLUND-DE WITT, A. (2012). Exploring worldviews and their relationships to sustainable lifestyles: Towards a new conceptual and methodological approach, *Ecological Economics*, 84, pp.74-83.
- HEMER, M. A., MCINNES, K., CHURCH, J. A., O'GRADY, J. & HUNTER, J. R. 2008. *Variability and Trends in the Australian Wave Climate and Consequent Coastal Vulnerability*. Final Report for Department of Climate Change and Energy Efficiency. Marine and Atmospheric Research Centre for Australian Weather and Climate Research (CSIRO), <http://www.environment.gov.au/climate-change>. [3 April 2011].
- HENDRIKS, C. M. & GRIN, J. (2007). Contextualising reflexive governance: The politics of Dutch transformations to sustainability, *Journal of Environmental Policy and Planning*, 9, 3, pp.333-350.
- HIMMELMAN, A. T. (2001). On Coalitions and the Transformation of Power Relations: Collaborative Betterment and Collaborative Empowerment, *American Journal of Community Psychology*, 29, 2, pp.277-284.
- HIMMELMAN, A. T. 2002. Collaboration for a change: Definitions, decision-making roles, and collaboration process guide, p.28. Available from: https://depts.washington.edu/ccph/pdf_files/4achange.pdf.
- HINKEL, J. & KLEIN, R. J. T. (2009). Integrating knowledge to assess coastal vulnerability to sea-level rise: The development of the DIVA tool, *Global Environmental Change*, 19, 3, pp.384-395.
- HOFMEESTER, C., BISHOP, B., STOCKER, L. & SYME, G. (2012). Social cultural influences on current and future coastal governance, *Futures*, 44, 8, pp.719-729.
- HOLLING, C. S. (1978). *Adaptive Environmental Assessment and Management*, John Wiley and Sons: Chichester, UK.
- HOOZEMANS, F. M. J., MARCHAND, M. & PENNEKAMP, H. A. 1993. *Sea level rise, a global vulnerability assessment, Vulnerability Assessments for Population, Coastal Wetlands and Rice Production on a Global Scale*. Deltares (WL), The Netherlands.
- HOPPE, R. 2010, Lost in translation? Boundary work in making climate change governable. *In*: DRIESSEN, P. P. J. & LEROY, P. (eds.) *From climate change to social change: perspectives on science-policy interaction*, 6, pp.109 - 130, International Books: Twente, The Netherlands.
- HOPPE, T., VAN DEN BERG, M. & COENEN, F. (2014). Reflections on the uptake of climate change policies by local governments: facing the challenges of mitigation and adaptation, *Energy, Sustainability and Society*, 4, 1, pp.1-16.
- HRSCCCWEA 2009. *Managing our coastal zone in a changing climate The time to act is now*. The Parliament of the Commonwealth of Australia, Canberra, ACT.
- HUFTY, M. 2011, Investigating policy processes: The Governance Analytical Frame-work (GAF). *In*: WIESMANN, U. M. & HURNI, H. (eds.) *Research for sustainable development: foundations, experiences, and perspectives* pp.403-424, Geographica Bernensia. Available from: <https://ssrn.com/abstract=2019005>. [7 May 2012].
- HULME, M. (2011). Reducing the Future to Climate: A Story of Climate Determinism and Reductionism, *Osiris*, 26, 1, pp.245-266.
- HURLIMANN, A. C. & MARCH, A. P. (2012). The role of spatial planning in adapting to climate change, *Wiley Interdisciplinary Reviews: Climate Change*, 3, 5, pp.477-488.

- HYDEN, G. 1999, Governance and the Reconstitution of Political Order. In: RICHARD, J. (ed.) *State, Conflict, and Democracy in Africa*, pp.179-185, Lynne Rienner: Boulder, CO.
- IACONO, J., BROWN, A. & HOLTHAM, C. (2009). Research Methods – a Case Example of Participant Observation, *The Electronic Journal of Business Research Methods*, 7, 1, pp.39-46.
- IEG–WORLD BANK (2007). *Sourcebook for Evaluating Global and Regional Partnership Programs. Indicative Principles and Standards*, IEG–World Bank: Washington, D.C.
- IISD 2006. *Designing policies in a world of uncertainty, change, and surprise. Adaptive policy-making for agriculture and water resources in the face of climate change*. International Institute for Sustainable Development, Ottawa, Canada. Available from: https://www.iisd.org/pdf/2006/climate_designing_policies.pdf. [21 June 2012].
- ILES, A. T. (1996). Adaptive management: making environmental law and policy more dynamic, experimentalist and learning, *Environmental and Planning Law Journal*, 13, 4, pp.288-308.
- INNES, E. J. & BOOHER, E. D. 2003, Collaborative policymaking: governance through dialogue In: HAJER, M. & WAGENAAR, H. (eds.) *Deliberative Policy Analysis Understanding Governance in the Network Society Report*, pp.33-59, Cambridge University Press,; Cambridge, UK.
- IPCC 1990. *Strategies for Adaptation to Sea Level Rise*. Report of the Coastal Zone Management Subgroup of the UNEP/IVM Handbook Intergovernmental Panel on Climate Change for the Intergovernmental Panel on Climate Change, The Hague, Netherlands
- IPCC 1992. *A common methodology for assessing vulnerability to sea level rise*. Report of the Coastal Zone Management Subgroup of IPCC Working Group III for the Intergovernmental Panel on Climate Change, The Hague, Netherlands Available from: the National Institute for Coastal and Marine Management/RIKZ.
- IPCC (ed.) 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Cambridge University Press: Cambridge, UK.
- IPCC (ed.) 2009. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change*, Cambridge University Press: Cambridge, UK.
- IPCC (2014). *5th Assessment Report: Climate Change 2014: Mitigation of Climate Change*, Cambridge University Press: Cambridge, UK.
- IRGC 2009. *Risk Governance Deficits An analysis and illustration of the most common deficits in risk governance*. International Risk Governance Council, Geneva, Switzerland. Available from: https://www.irgc.org/IMG/pdf/IRGC_rgd_web_final.pdf. [26 May 2012].
- JACOBS, K., GARFIN, G. & LENART, M. (2005). More than just talk: Connecting science & decision making, *Environment*, 47, 9, pp.6 - 20.
- JAMIESON, D. (2010). Climate Change, Responsibility, and Justice, *Science and Engineering Ethics*, 16, 3, pp.431-445.
- JASANOFF, S. (2002). Citizens at risk: cultures of modernity in the US and EU, *Science as Culture*, 11, 3, pp.363-380.
- JONES, A. 2005, Potential coastal erosion of the Swan Coastal Plain due to long term sea level rise. In: JONES, A., MIDDELMANN, M. & CORBY, N. (eds.) *Natural hazard risk assessment for Perth, WA, Cities Project Perth Report*, 7, Department of Industry, Tourism and Resources: Canberra, ACT.
- JONES, A. 2009. *Pro-Poor Governance of Global Adaptation Funds: A Discussion Paper*. CARE, Germanwatch and Bread for the World, Available from: <https://germanwatch.org/klima/ad-dis09.pdf>. [13 October 2012].

- JONES, M. (2001a). The rise of the regional state in economic governance: 'partnerships for prosperity' or new scales of state power?, *Environment and Planning A*, 33, 7, pp.1185-1211.
- JONES, R. N. (2001b). An Environmental Risk Assessment/Management Framework for Climate Change Impact Assessments, *Natural Hazards*, 23, 2, pp.197-230.
- JONES, R. N. & PRESTON, B. L. (2011). Adaptation and risk management, *Wiley Interdisciplinary Reviews: Climate Change*, 2, 2, 296-308.
- JORDAN, A. (2008). The governance of sustainable development: taking stock and looking forwards, *Environment and Planning C: Government and Policy*, 26, 1, pp.17 - 33.
- JORGENSEN, D. L. (1989). *Participant observation: a methodology for human studies* London: SAGE: Newbury Park, Calif. London.
- JORGENSEN, D. L. 2015, Participant Observation. In: ROBERT A.S., BUCHMANN, M. C. & KOSSLYN, S. M. (eds.) *Emerging Trends in the Social and Behavioral Sciences: An Interdisciplinary, Searchable, and Linkable Resource*, 1, pp.1-15, Wiley Online Library.
- JUDE, S., JONES, A., ANDREWS, J. & BATEMAN, I. (2006). Visualisation for participatory coastal zone management: A case study of the Norfolk Coast, England, *Journal of Coastal Research*, 22, 6, pp.1527-1538.
- KALLIS, G., KIPARSKY, M. & NORGAARD, R. (2009). Collaborative governance and adaptive management: Lessons from California's CALFED Water Program, *Environmental Science and Policy*, 12, 6, pp.631-643.
- KAMPHUIS, J. W. (2010). *Introduction to coastal engineering and management*, World Scientific: Singapore and London.
- KARPOUZOGLOU, T. D., DEWULF, A. R. P. J. & CLARK, J. (2016). Advancing adaptive governance of social-ecological systems through theoretical multiplicity, *Environmental Science & Policy*, 57, pp.1-9.
- KARRASCH, L., KLENKE, T. & WOLTJER, J. (2014). Linking the ecosystem services approach to social preferences and needs in integrated coastal land use management – A planning approach, *Land Use Policy*, 38, pp.522-532.
- KASTENHOFER, K. (2011). Risk Assessment of Emerging Technologies and Post-Normal Science, *Science, Technology & Human Values*, 36, 3, pp.307-333.
- KATO, S. & AHERN, J. (2008). 'Learning by doing': adaptive planning as a strategy to address uncertainty in planning, *Journal of Environmental Planning and Management*, 51, 4, pp.543-559.
- KAY, R., ELIOT, I. & KLEM, G. 1992. *Analysis of the IPCC Sea-level Rise Vulnerability Assessment Methodology using Geographe Bay, SW Western Australia as a Case Study*. Department of Sports Arts the Environment and Territories, Coastal Risk Management, Norwich, U.K.
- KAY, R. & HAY, J. E. 1993, A decision support approach to coastal vulnerability and resilience assessment: a tool for integrated coastal zone management. In: McLean R, Mimura N (eds) *Vulnerability assessment to sea-level rise and coastal zone management, Proc IPCC Eastern Hemisphere Workshop*, Tokyo.
- KAY, R. C., ELIOT, I., CATON, B., MORVELL, G. & WATERMAN, P. (1996). A review of the intergovernmental panel on climate change's common methodology for assessing the vulnerability of coastal areas to sea - level rise, *Coastal Management*, 24, 2, pp.165-188.
- KEARNEY, J., BERKES, F., CHARLES, A. E. & WIBER, M. (2007). The role of participatory governance and community-based management in integrated coastal and ocean management in Canada, *Coastal Management*, 35, 1, pp.79-104.
- KEMP, R. & LOORBACH, D. 2006, Transition management: a reflexive governance approach. In: BAUKNECHT, D. & KEMP, R. (eds.) *Reflexive Governance*

- For Sustainable Development*, 5, pp.103-131, Cheltenham: Edward Elgar Publishing Limited: The Netherlands
- KEMP, R., PARTO, S. & GIBSON, R. (2005). Governance for sustainable development: Moving from theory to practice, *International Journal of Sustainable Development*, 8, 1-2, pp.12-30.
- KEMP, R., ROTMANS, J. & LOORBACH, D. (2007). Assessing the Dutch Energy Transition Policy: How Does it Deal with Dilemmas of Managing Transitions?, *Journal of Environmental Policy & Planning*, 9, 3-4, pp.315-331.
- KENCHINGTON, R., STOCKER, L. & WOOD, D. 2012a, Lessons from regional approaches to coastal management in Australia: a synthesis. In: KENCHINGTON, R., STOCKER, L. & WOOD, D. (eds.) *Sustainable Coastal Management and Climate Adaptation*, pp.193-209, CSIRO Publishing. Available from: <http://books.google.com.au/books?id=1FVLjkyw73IC>. [4 April 2013].
- KENCHINGTON, R., STOCKER, L. & WOOD, D. (2012b). *Sustainable Coastal Management and Climate Adaptation*, CSIRO Publishing: Collingwood, Victoria.
- KESKITALO, E. C. H. (2010). *Developing Adaptation Policy and Practice in Europe: Multi-level Governance of Climate Change*, Springer: Dordrecht: Netherlands.
- KINGBOROUGH CITY COUNCIL 2015. *Interim Town Planning Scheme 2015*, Kingborough City Council, Hobart, Tasmania. Available: <http://www.iplan.tas.gov.au/pages/plan/book.aspx?exhibit=kinips>.
- KINSELA, M. & HANSLOW, A., Coastal Erosion Risk Assessment in New South Wales – Limitations and Potential Future Directions. NSW Coastal Conference, 2013, Shoal Bay, NSW.
- KJER, A. M. (2004). *Governance*, Polity Press: Malden, MA.
- KLEIN, R. J. T., MARION, J. S., GOOSEN, H. & HULSBERGEN, C. H. (1998). Resilience and Vulnerability: Coastal Dynamics or Dutch Dikes?, *The Geographical Journal*, 164, 3, pp.259-268.
- KLEIN, R. J. T., NICHOLLS, R. J. & MIMURA, N. (1999). Coastal Adaptation to Climate Change: Can the IPCC Technical Guidelines be applied?, *Mitigation and Adaptation Strategies for Global Change*, 4, 3-4, pp.239-252.
- KLEIN, R. J. T., NICHOLLS, R. J. & THOMALLA, F. (2003). Resilience to natural hazards: How useful is this concept?, *Global Environmental Change Part B: Environmental Hazards*, 5, 1-2, pp.35-45.
- KOETZ, T., FARRELL, K. N. & BRIDGEWATER, P. (2012). Building better science-policy interfaces for international environmental governance: assessing potential within the Intergovernmental Platform for Biodiversity and Ecosystem Services, *International Environmental Agreements: Politics, Law and Economics*, 12, 1, pp.1-21.
- KOUZES, J. M. & POSNER, B. Z. (2002). *The Leadership Challenge, 3rd Edition*, Jossey-Bass: San Francisco.
- KUHN, T. S. (1962). *The Structure of Scientific Revolutions*, University of Chicago Press: Chicago, IL.
- KUNSELER, E.-M., TUINSTRAN, W., VASILEIADOU, E. & PETERSEN, A. C. (2015). The reflective futures practitioner: Balancing salience, credibility and legitimacy in generating foresight knowledge with stakeholders, *Futures*, 66, pp.1-12.
- LACEY, M. J., HUNTER, J. R. & MOUNT, R. E. 2012. *Coastal Inundation Mapping for Tasmania – Stage 2*. Report to the Department of Premier and Cabinet by the Blue Wren Group, School of Geography and Environmental Studies, University of Tasmania and the Antarctic Climate and Ecosystems Cooperative Research Centre, Hobart, Tasmania. Available from:

- [http://www.dpac.tas.gov.au/_data/assets/pdf_file/0003/222924/Coastal Inundation Mapping - Stage 2.pdf](http://www.dpac.tas.gov.au/_data/assets/pdf_file/0003/222924/Coastal_Inundation_Mapping_-_Stage_2.pdf) [15 May 2013].
- LAFFERTY, W. M. (2004). *Governance for Sustainable Development: The Challenge of Adapting Form to Function*, Edward Elgar Publishing Limited: Cheltenham, Vic.
- LANGFORD, J. 2002, Managing Public-Private Partnerships in Canada. In: EDWARDS, M. & LANGFORD, J. (eds.) *New Players, Partners and Processes; A Public Sector without Boundaries*, pp.68-84, National Institute for Governance, Canberra: Canberra, ACT.
- LAWRENCE, P., BENNETT, J. & BARCHIESI, D. 2004. Adaptive management framework to support regional resource planning, *Citeseer* [Online], pp.1-6. Available from: <http://citeseerx.ist.psu.edu/viewdoc/summary;jsessionid=814BF4D1432E156251AE90A992B34943?doi=10.1.1.501.6990>. [14/2/2015]
- LAZAROW, N., SOUTER, R., FEARON, R. & DOVERS, S. 2006. *Coastal management in Australia: Key institutional and governance issues for coastal natural resource management and planning*. CRC for Coastal Zone, Estuary and Waterway Management. Supported by: Australian National University and the National Sea Change Taskforce, Indooroopilly, QLD.
- LEE, K. N. (1993a). *Compass and gyroscope integrating science and politics for the Environment*, Island Press: Washington D.C., USA.
- LEE, K. N. (1993b). Greed, Scale Mismatch, and Learning, *Ecological Applications*, 3, 4, pp.560-564.
- LEI, Y., LIU, C., ZHANG, L., WAN, J., LI, D., YUE, Q. & GUO, Y. (2015). Adaptive governance to typhoon disasters for coastal sustainability: A case study in Guangdong, China, *Environmental Science and Policy*, 54pp.281-286.
- LEITH, P., COFFEY, B., HAWARD, M., O'TOOLE, K. & ALLEN, S. 2012, Improving science uptake in coastal zone management: principles for science engagement and their application in South East Tasmania. In: KENCHINGTON, R., STOCKER, L. & WOOD, D. (eds.) *Sustainable coastal management and climate adaptation: Lessons from regional Australia*, pp.135—154, CSIRO Publishing: Collingwood, Victoria.
- LESSARD, G. (1998). An adaptive approach to planning and decision-making, *Landscape and Urban Planning*, 40, 1–3, pp.81-87.
- LEVIN, S. A. (1998). Ecosystems and the biosphere as complex adaptive systems, *Ecosystems*, 1, 5, pp.431-436.
- LEVIN, S. A. (2002). Complex adaptive systems: Exploring the known, the unknown and the unknowable, *Bulletin of the American Mathematical Society*, 40, 1, pp.3-19.
- LICHTENSTEIN, B. B., UHL-BIEN, M., MARION, R., SEERS, A., ORTON, J. D. & SCHREIBER, C. (2006). Complexity leadership theory: An interactive perspective on leading in complex adaptive systems, *Emergence: Complexity and Organization*, 8, 4, pp.2-12.
- LIEBRECHT, T. & HOWES, M. 2006. Collaboration: a solution to inter-jurisdictional strife?, *Governments and Communities in Partnership*, Melbourne, Vic, p.20.
- LINCOLN, Y. S. & GUBA, E. G. (1986). But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation, *New Directions for Program Evaluation*, 1986, 30, pp.73-84.
- LOCAL GOVERNMENT IN NEW ZEALAND 2016. *Local government in New Zealand: local councils* [Online]. http://www.localcouncils.govt.nz/lqip.nsf/wpg_url/Resources-Glossary-Index-UnitaryAuthority. [22/01/2016].
- LOCKWOOD, M., DAVIDSON, J., CURTIS, A., STRATFORD, E. & GRIFFITH, R. (2009). Multi-level Environmental Governance: Lessons from Australian natural resource management, *Australian Geographer*, 40, 2, pp.169 - 186.

- LOORBACH, D. (2007). Governance for sustainability, *Sustainability: Science, Practice, & Policy*, 3, 2, pp.1-4.
- LOORBACH, D. & ROTMANS, J. 2006, Managing Transitions for Sustainable Development. In: OLSTHOORN, X. & WIECZOREK, A. J. (eds.) *Understanding Industrial Transformation*, 9, pp.187 - 206, Springer Netherlands.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.502.4299&rep=rep1&type=pdf>.
- LOORBACH, D. & ROTMANS, J. (2010). The practice of transition management: Examples and lessons from four distinct cases, *Futures*, 42, 3, pp.237-246.
- LOORBACH, D. & VAN RAAK, R. 2005. Governance in Complexity: A multi-level policy-framework based on complex systems thinking, *Lof der Verwarring*, Rotterdam, pp.1-9.
- LORENZONI, I., JORDAN, A., TURNER, R. K., HULME, M. & O'RIORDAN, T. (2000). A co-evolutionary approach to climate change impact assessment: Part I. Integrating socio-economic and climate change scenarios, *Global Environmental Change*, 10, 1, pp.57 - 68.
- LORENZONI, I., PIDGEON, N. F. & O'CONNOR, R. E. (2005). Dangerous Climate Change: The Role for Risk Research, *Risk Analysis*, 25, 6, pp.1387-1398.
- LOWNDES, V. & SKELCHER, C. (1998). The Dynamics of Multi - organizational Partnerships: an Analysis of Changing Modes of Governance, *Public Administration*, 76, 2, pp.313-333.
- MACINTOSH, A. (2013). Coastal climate hazards and urban planning: how planning responses can lead to maladaptation, *Mitigation and Adaptation Strategies for Global Change*, 18, 7, pp.1035-1055.
- MACINTOSH, A., FOERSTER, A. & MCDONALD, J. 2013. *Limp, leap or learn? Developing legal frameworks for climate change adaptation planning in Australia*. National Climate Change Adaptation Research Facility, Gold Coast, QLD.
- MAIBACH, E. & PRIEST, S. H. (2009). No more "business as usual": Addressing climate change through constructive engagement, *Science Communication*, 30, 3, pp.299-304.
- MANZO, L. C. & PERKINS, D. D. (2006). Finding common ground: The importance of place attachment to community participation and planning, *Journal of Planning Literature*, 20, 4, pp.335-350.
- MARRE, J.-B., 2014. *Quantifying economic values of coastal and marine ecosystem services and assessing their use in decision-making: applications in New Caledonia and Australia*, PhD, Queensland University of Technology.
- MARSHALL, C. & ROSSMAN, G. B. (1989). *Designing qualitative research*, Sage: Newbury Park, CA.
- MARSHALL, N., DOLLERY, B. & WITHERBY, A. (2003). Regional Organisations of Councils (ROCS): the emergence of network governance in metropolitan and rural Australia?, *Australasian Journal of Regional Studies*, 9, 2, pp.169-188.
- MATLAND, R. (1995). Synthesizing the implementation literature: The ambiguity-conflict model of policy implementation, *Journal of Public Administration Research and Theory*, 5, 2, pp.145-174.
- MAZURKIEWICZ, P. 2005, Corporate self-regulation and multi-stakeholder dialogue. In: CROCI, E. (ed.) *The handbook of environmental voluntary agreements*, 31-45, Springer: Dordrecht, Netherlands.
- MCCALL, M. K. 2004. Can Participatory-GIS Strengthen Local-level Spatial Planning? Suggestions for Better Practice, *GISDECO 2004*, Skudai, Johor, Malaysia, pp.1-19.
- MCCLELLAND, A. 2002, Partnerships and Collaboration: Propositions from Experience. In: EDWARDS, M. & LANGFORD, J. (eds.) *New Players*,

- Partners and Processes; A Public Sector without Boundaries*, National Institute for Governance, Canberra: Canberra, ACT.
- MCCLURE, L. & BAKER, D., Doing Adaptation Differently? Does Neoliberalism Influence Adaptation Planning in Queensland? State of Australian Cities Conference, 2013, Sydney, NSW.
- MCFADDEN, L. (2007). Governing coastal spaces: The case of disappearing science in integrated coastal zone management, *Coastal Management*, 35, 4, pp.429 - 443.
- MCGREGOR, S. (2003). Government transparency: the citizen perspective and experience with food and health products policy, *International Journal of Consumer Studies*, 27, 2, pp.168-175.
- MEASHAM, T. & LOCKIE, S. (2012). *Risk and Social Theory in Environmental Management*, CSIRO Publishing: Collingwood, Vic.
- MEASHAM, T., PRESTON, B., SMITH, T., BROOKE, C., GORDDARD, R., WITHYCOMBE, G. & MORRISON, C. (2011). Adapting to climate change through local municipal planning: barriers and challenges, *Mitigation and Adaptation Strategies for Global Change*, 16, 8, pp.889-909.
- MEIJER, A. (2012). Co-production in an Information Age: Individual and Community Engagement Supported by New Media, *Official journal of the International Society for Third-Sector Research*, 23, 4, pp.1156-1172.
- MEIJERINK, S. & STILLER, S. (2013). What kind of leadership do we need for climate adaptation? A framework for analyzing leadership objectives, functions and tasks in climate change adaptation, *Environment and Planning C: Government and Policy*, 31, 2, pp.240-256.
- MEIJERS, E. & STEAD, D. 2004. Policy integration: what does it mean and how can it be achieved, *Berlin Conference on the Human Dimensions of Global Environmental Change: Greening of Policies – Interlinkages and Policy Integration*, Berlin, Germany, pp.1-15.
- MELKONYAN, T. A. (2011). The effect of communicating ambiguous risk information on choice, *Journal of Agricultural and Resource Economics*, 36, 2, pp.292-312.
- MERKEL, A. (1998). The role of science in sustainable development, *Science*, 281, 5375, pp.336-337.
- MERRIAM, B. S. (1998). *Qualitative research and case study applications in education*, Jossey-Bass Publishers: San Francisco.
- MERRIAM, S. B. (1988). *Case study research in education: a qualitative approach*, Jossey-Bass Publishers: San Francisco, Cal.
- METCALF, L. & BENN, S. (2013). Leadership for Sustainability: An Evolution of Leadership Ability, *Journal of Business Ethics*, 112, 3, pp.369-384.
- MIDDLE, G. J., 2010. *Environmental policy making in highly contested contexts : the success of adaptive-collaborative approaches* Thesis (Ph.D.) Curtin University of Technology.
- MIMURA, N., PULWARTY, R. S., DUC, D. M., ELSHINNAWY, I., REDSTEER, M. H., HUANG, H. Q., NKEM, J. N. & RODRIGUEZ, R. A. 2014, Adaptation planning and implementation. In: FIELD, C. B., BARROS, V. R., DOKKEN, D. J., MACH, K. J., MASTRANDREA, M. D., BILIR, T. E., CHATTERJEE, M., EBI, K. L., ESTRADA, Y. O., GENOVA, R. C., GIRMA, B., KISSEL, E. S., LEVY, A. N., MACCRACKEN, S., MASTRANDREA, P. R. & WHITE, L. L. (eds.) *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, 869-898, Cambridge University Press: Cambridge, UK.
- MIRFENDERESK, H. & CORKILL, D. (2009). The need for adaptive strategic planning: Sustainable management of risks associated with climate change,

- International Journal of Climate Change Strategies and Management*, 1, 2, pp.146-159.
- MORSE, J. M. (1999). Qualitative generalizability, *Qualitative Health Research*, 9, 1, pp.5-6.
- MOSER, S. C. & EKSTROM, J. A. (2010). A framework to diagnose barriers to climate change adaptation, *PNAS*, 107, 51, pp.22026-22031.
- MP ROGERS 2016. *Point Moore Inundation & Coastal Processes Study*. City of Greater Geraldton, Perth, WA.
- MUKHEIBIR, P., GERO, A. & HERRIMAN, J. 2012. *Cross-Scale Barriers to Climate Change Adaptation in Local Government, Australia – Workshop Three Report*. NCCARF, Sydney, NSW.
- MUMFORD, T. & HARVEY, N. (2014). Champions as Influencers of Science Uptake into Australian Coastal Zone Policy, *Coastal Management*, 42, 6, pp.495-511.
- MUNARETTO, S., SICILIANO, G. & TURVANI, M. E. (2014). Integrating adaptive governance and participatory multicriteria methods: a framework for climate adaptation governance, *Ecology and Society*, 19, 2, pp.1-13.
- MUNASINGHE, M. 2003. Analysing the nexus of sustainable development and climate change: An overview, *Organization for Economic Cooperation and Development, Development and Climate Change Project*, Paris, p.59.
- NCCARF 2012. NCCARF research portfolio fact sheets. National Climate Change Adaptation Research Facility. Available: <http://www.nccarf.edu.au/publications/research-portfolio-factsheets>.
- NCCARF 2016. *CoastAdapt* [Online]. <https://coastadapt.com.au/>.
- NCCOE (2012). *Coastal Engineering Guidelines for Working with the Australian Coast in an Ecologically Sustainable Way*, National Committee on Coastal & Ocean Engineering. Engineers Australia: QID.
- NELSON, D. R., ADGER, W. N. & BROWN, K. (2007). Adaptation to environmental change: Contributions of a resilience framework, *Annual Review of Environment and Resources*, 32, 1, pp.395–419.
- NELSON, R., HOWDEN, M. & STAFFORD SMITH, M. (2008). Using adaptive governance to rethink the way science supports Australian drought policy, *Environmental Science & Policy*, 11, 7, pp.588-601.
- NICHOLLS, R. J. (2011). Planning for the Impacts of Sea Level Rise, *Oceanography*, 24, 2, pp.144-157.
- NICHOLSON-COLE, S. & O'RIORDAN, T. 2009, Adaptive governance for a changing coastline: Science, policy and publics in search of a sustainable future. In: ADGER, N., LORENZONI, I. & O'BRIEN, K. (eds.) *Adapting to Climate Change: Thresholds, Values, Governance*, 23, pp.368-383, Cambridge University Press: New York.
- NILSSON, M. (2005). Learning, frames, and environmental policy integration: the case of Swedish energy policy, *Environment and Planning C: Government and Policy*, 23, 2, pp.207-226.
- NOLLKAEMPER, A. & JACOBS, D. (2013). Shared Responsibility in International Law: A Conceptual Framework, *Michigan Journal of International Law*, 34, 2, pp.359-438.
- NORMAN, B. (2009). Principles for an intergovernmental agreement for coastal planning and climate change in Australia, *Habitat International*, 33, 3, pp.293-299.
- NURSEY-BRAY, M. (2010). Local governance for local governments: A framework for addressing climate change, *Commonwealth Journal of Local Governance*, 0, 7, pp.168-186.
- NURSEY-BRAY, M. (2015). Learning and local government in coastal South Australia: towards a community of practice framework for adapting to global change, *Regional Environmental Change*, 15, 4, pp.733-746.

- NURSEY-BRAY, M. & HARVEY, N. 2013, The role of learning processes in bridging the science-policy divide in the coastal zone. *In: E. MOKSNESS, E., DAHL & J. STØTTRUP (ed.) Global Challenges in Integrated Coastal Zone Management*, pp.218-227, Wiley-Blackwell.
- NUTLEY, S., DAVIES, H. & WALTER, I. (2003). Evidence-Based Policy and Practice: Cross-Sector Lessons from the United Kingdom, *Social Policy Journal of New Zealand*, 20pp.29-48.
- O'BRIEN, K., ERIKSEN, S., NYGAARD, L. & SCHJOLDEN, A. (2007). Why different interpretations of vulnerability matter in climate change discourses, *Climate Policy*, 7, 1, pp.73-88.
- O'BRIEN, K. L. & WOLF, J. (2010). A values-based approach to vulnerability and adaptation to climate change, *Wiley Interdisciplinary Reviews: Climate Change*, 1, 2, pp.232-242.
- O'DWYER, L. 2004. *A critical review of evidence-based policy making, AHURI Final Report No. 58*. Australian Housing and Urban Research Institute Limited, Melbourne, VIC.
- O'FLYNN, J. & WANNA, J. (2008). *A new era of public policy in Australia?*, ANU E Press: Canberra, ACT.
- O'MAHONY, S. & BECHKY, B. A. (2008). Boundary Organizations: Enabling Collaboration among Unexpected Allies, *Administrative Science Quarterly*, 53, 3, pp.422-459.
- O'TOOLE, K. & COFFEY, B. (2013). Exploring the Knowledge Dynamics Associated with Coastal Adaptation Planning, *Coastal Management*, 41, 6, pp.561-575.
- O'BRIEN, K. & HOCHACHKA, G. (2010). Integral adaptation to climate change, *Journal of Integral Theory and Practice*, 5, 1, pp.89-102.
- OECD 2010. *Integrating climate change adaptation into development co-operation; policy guidance*. Organisation for Economic Co-Operation and Development, Portland. Available from: <https://www.oecd.org/dac/43652123.pdf>.
- OECD & THE WORLD BANK (2014). *Making Innovation Policy Work: Learning from Experimentation*, OECD Publishing: Paris, France.
- OLSSON, P., FOLKE, C. & BERKES, F. (2004). Adaptive comanagement for building resilience in social-ecological systems, *Environmental Management*, 34, 1, pp.75-90.
- OLSSON, P., GUNDERSON, L. H., CARPENTER, S. R., RYAN, P., LEBEL, L., FOLKE, C. & HOLLING, C. S. (2006). Shooting the rapids: Navigating transitions to adaptive governance of social-ecological systems, *Ecology and Society*, 11, 1, pp.75-90.
- ORR, S. K. (2013). *Environmental Policymaking and Stakeholder Collaboration : Theory and Practice*, Taylor and Francis: Hoboken, New Jersey.
- OSTROM, E. (2009). A General Framework for Analyzing Sustainability of Social-Ecological Systems, *Science*, 325, 5939, pp.419-422.
- PARKER, R. L. (2007). Networked governance or just networks? Local governance of the knowledge economy in Limerick (Ireland) and Karlskrona (Sweden), *Political Studies*, 55, 1, pp.113-132.
- PARLIAMENT OF WESTERN AUSTRALIA 1993. *Regional Development Commissions Act* Western Australia.
- PATT, A., KLEIN, R. J. T. & DE LA VEGA-LEINERT, A. (2005). Taking the uncertainty in climate change vulnerability assessment seriously, *Geoscience*, 337, 4, pp.411-424.
- PATT, A. G. & SCHRÖTER, D. (2008). Perceptions of climate risk in Mozambique: Implications for the success of adaptation strategies, *Global Environmental Change*, 18, 3, pp.458-467.
- PATTIARATCHI, C. 2009. Climate change impacts on coastal systems in Western Australia, *A Changing Climate: Western Australia in Focus*, Perth, Western Australia, pp.22-23.

- PATTON M. Q. (2011). *Developmental evaluation: Applying complexity concepts to enhance innovation and use*, Guilford: New York, USA.
- PATTON, M. Q. (1990). *Qualitative evaluation and research methods*, Sage: Newbury Park, CA.
- PELLIZZONI, L. (2004). Responsibility and Environmental Governance, *Environmental Politics*, 13, 3, pp.541-565.
- PER, L. & RYKKJA, H. L. 2014. Governance for complexity – how to organize for the handling of «wicked issues»? , *Policy & Politics Conference “The challenges of leadership and collaboration in the 21st Century”*, Bristol, p.30.
- PETERS, B. G. & PIERRE, J. (1998). Governance without government? Rethinking public administration, *Journal of Public Administration Research and Theory*, 8, 2, pp.223-243.
- PETERS, B. G. & PIERRE, J. (2006). *Governing complex societies: trajectories and scenarios* [online], Palgrave Macmillan, Houndmills, Basingstoke, Hampshire, New York.
- PETERSEN, K. L. & TJALVE, V. S. (2013). (Neo) Republican Security Governance? US Homeland Security and the Politics of “Shared Responsibility”, *International Political Sociology*, 7, 1, pp.1-18.
- PIELKE, R. A. J. (2007). *The honest broker: making sense of science in policy and politics*, Cambridge University Press: Cambridge, UK.
- PINKSE, J. & KOLK, A. (2012). Addressing the Climate Change - Sustainable Development Nexus: The Role of Multistakeholder Partnerships, *Business and Society*, 51, 1, pp.176-210.
- PITT&SHERRY 2012. *Tasmanian Coastal Adaptation Decision Pathways Project: Inundation Control Works for the Lauderdale Area*. Local Government Association of Tasmania, Hobart, Tasmania.
- PONCELET, C. E. (2001). “A Kiss Here and a Kiss There”: Conflict and Collaboration in Environmental Partnerships, *Environmental Management*, 27, 1, pp.13-25.
- POPA, F., GUILLERMIN, M. & DEDEURWAERDERE, T. (2015). A pragmatist approach to transdisciplinarity in sustainability research: From complex systems theory to reflexive science, *Futures*, 65, pp.45-56.
- PREECE, I. (2013). Clarence's adaptation journey, *Ocean & Coastal Management*, 86pp.119-123.
- PRESTON, B., BEVERIDGE, B., WITHYCOMBE, G., MORRISON, C., , SMITH, T. F., BROOKE, C., GORDDARD, R., MEASHAM, T. G., ABBS, D. & MCINNES, K. 2007. Integrated approach to regional climate change adaptation strategies: project methodology, results and key lessons learnt, *New South Wales Coastal Conference*, Yamba, NSW, p.11.
- PRESTON, B., BROOKE, C., MEASHAM, T., SMITH, T. & GORDDARD, R. (2008). Igniting change in local government: lessons learned from a bushfire vulnerability assessment., *Mitigation and Adaptation Strategies for Global Change*, 14, 3, pp.251-283.
- PRESTON, B., DANESE, C. & YUEN, E. 2011. Embedding Climate Change Risk Assessment within a Governance Context, *Earth System Governance: crossing boundaries and building bridges*, Colorado, US, p. 22.
- PRESTON, B., YUEN, E. & WESTAWAY, R. (2011). Putting vulnerability to climate change on the map: a review of approaches, benefits, and risks, *Sustainability Science*, 6, 2, pp.177-202.
- PRESTON, B. L. & KAY, R. C. 2010, Managing climate risk in human settlements. In: JUBB, I., HOLPER, P. & CAI, W. (eds.) *Managing Climate Change: Papers from the Greenhouse 2009*, pp.185-195, CSIRO: Collingwood, Victoria.
- PRESTON, B. L., STAFFORD-SMITH, M. & FLAGSHIP, C. A. 2009. *Framing vulnerability and adaptive capacity assessment: Discussion paper*. CSIRO

- Climate Adaptation National Research Flagship, Canberra, ACT. Available: <https://publications.csiro.au/rpr/download?pid=procite:adb84f2f-6855-4daa-95de-8b7d1d7603b3&dsid=DS1>.
- PRESTON, B. L., WESTAWAY, R. M. & YUEN, E. J. (2011). Climate adaptation planning in practice: an evaluation of adaptation plans from three developed nations, *Mitigation and Adaptation Strategies for Global Change*, 16, 4, pp.407-438.
- PRODUCTIVITY COMMISSION 2010a. *Barriers to Effective Climate Change Adaptation. Final Inquiry Report, No.59*, Canberra, ACT. <http://www.pc.gov.au/inquiries/completed/climate-change-adaptation/report/climate-change-adaptation.pdf>.
- PRODUCTIVITY COMMISSION 2010b. *Strengthening Evidence Based Policy in the Australian Federation: Volume 1 Proceedings* Canberra.
- PROVAN, K. G. & KENIS, P. (2007). Modes of network governance: Structure, management, and effectiveness, *Journal of Public Administration Research and Theory*, 18, 2, pp.229-252.
- PRUTSCH, A., GROTHMANN, T., MCCALLUM, S., SCHAUSER, I. & SWART, R. (eds.). 2014. *Climate Change Adaptation Manual: Lessons learned from European and other industrialised countries*, Routledge: Abingdon, Oxton.
- RAMMEL, C. & VAN DEN BERGH, J. C. J. M. (2003). Evolutionary policies for sustainable development: adaptive flexibility and risk minimising, *Ecological Economics*, 47, 2, pp.121-133.
- RANDALL, A., CAPON, T., SANDERSON, T., MERRETT, D. & HERTZLER, G. 2012. *Choosing a decision-making framework to manage uncertainty in climate adaptation decision-making: a practitioner's handbook. Report for the National Climate Change Adaptation Research Facility*. Griffith University. Available from: <https://www.nccarf.edu.au/publications/Handbook-decision-making-framework-climate-adaptation>.
- REDCLIFT, M. (1992). The meaning of sustainable development, *Geoforum*, 23, 3, pp.395-403.
- REED, M. S., EVELY, A. C., CUNDILL, G., FAZEY, I., GLASS, J., LAING, A., NEWIG, J., PARRISH, B., PRELL, C., RAYMOND, C. & STRINGER, L. C. 2010. What is Social Learning?, *Ecology of Society* [Online], 15, 4, p.542. Available from: <http://www.ecologyandsociety.org/volXX/issYY/artZZ/>.
- RENN, O. (2006). Participatory processes for designing environmental policies, *Land Use Policy*, 23, 1, pp.34-43.
- RENN, O. & KLINKE, A. (2013). A Framework of Adaptive Risk Governance for Urban Planning, *Sustainability*, 5, 5, pp.2036-2059.
- RENN, O., KLINKE, A. & ASSELT, M. (2011). Coping with Complexity, Uncertainty and Ambiguity in Risk Governance: A Synthesis, *Ambio*, 40, 2, pp.231-246.
- RENN, O. & SCHWEIZER, P. J. (2009). Inclusive risk governance: concepts and application to environmental policy making, *Environmental Policy and Governance*, 19, 3, pp.174-185.
- RESOURCE PLANNING AND DEVELOPMENT COMMISSION 2003. *Guide to the Resource Management and Planning System*, RESOURCE PLANNING AND DEVELOPMENT COMMISSION, Hobart, Tasmania.
- RICHARDSON, B. J. 2002, Regulation for Ecological Modernisation. In: ORTS, W. E. (ed.) *Environmental Regulation through Financial Organisations: Comparative Perspectives on the Industrialised Nations*, p.407, Kluwer Law: The Hague, The Netherlands.
- RICHARDSON, B. J. & WOOD, S. (2006). *Environmental law for sustainability: a reader*, Hart Publishing: Portland, Or.
- RICHARDSON, K., STEFFEN, W., SCHELLNHUBER, H. J., ALCAMO, J., BARKER, T., KAMMEN, D., LEEMANS, R., LIVERMAN, D., MONASINGHE, M., OSMAN-ELASHA, B., STERN, N. & WAEVER, O. 2009. *Synthesis*

- Report from Climate Change: Global Risks, Challenges and Decisions.* University of Copenhagen, Copenhagen. Available: <https://www.pik-potsdam.de/news/press-releases/files/synthesis-report-web.pdf>.
- RIGBY, J. (2005). *Sea Level Rise and Coastal Settlements: An Analysis of Adaptive Decision Making Within Integrated Coastal Zone Management. Report to the Tasmanian Government on the findings of an Honours study within the University of Tasmania*, Antarctic Climate & Ecosystems CRC School of Government: Hobart, Tasmania.
- RISSIK, D. & REIS, N. 2013. *The Climate Change Adaptation Good Practice project* [Online], National Climate Change Adaptation Research Facility. Available from: <https://www.nccarf.edu.au/localgov/map>.
- RIST, L., CAMPBELL, B. M. & FROST, P. (2013). Adaptive management; where are we now?, *Environmental Conservation*, 40, pp.5-18.
- RIST, L., FELTON, A., SAMUELSSON, L., SANDSTRÖM, C. & ROSVALL, O. (2013). A New Paradigm for Adaptive Management, *Ecology and Society*, 18, 4, p.63.
- ROBB, A., STOCKER, L., PAYNE, M. & MIDDLE, G. (2017). Planning for coastal erosion and inundation in Western Australia: Practices and perceptions from the local level, *Environmental and Planning Law Journal*, 34, 77, pp.77-96.
- ROBINSON, J. (2004). Squaring the circle? Some thoughts on the idea of sustainable development, *Ecological Economics*, 48, 4, pp.369-384.
- ROBOTTOM, I. (2012). Constructivism in environmental education: beyond conceptual change theory, *Australian Journal of Environmental Education*, 20, 2, pp.93-101.
- ROLLASON, V., HAINES, P. 2012. Outcomes from the application of ISO 31000:2009 risk management principles to coastal zone management, *21st NSW Coastal Conference* Kiama, NSW, pp.1-15.
- ROSS, A. & DOVERS, S. (2008). Making the harder yards: Environmental policy integration in Australia, *The Australian Journal of Public Administration*, 67, 3, pp.245 - 260.
- ROTMANS, J., KEMP, R. & VAN ASSELT, M. (2001). More evolution than revolution: Transition management in public policy, *Foresight*, 3, 1, pp.1-17.
- ROTMANS, J. & LOORBACH, D. (2009). Complexity and Transition Management, *Journal of Industrial Ecology*, 13, 2, pp.184-196.
- SABATIER, P. (1980). The implementation of public policy: a framework of analysis, *Policy Studies Journal*, 8, 4, pp.538-560.
- SABATIER, P. A. (1991). Toward Better Theories of the Policy Process, *Political Science and Politics*, 24, 2, pp.147-156.
- SAINT - MARTIN, D. (1998). The New Managerialism and the Policy Influence of Consultants in Government: An Historical-Institutionalist Analysis of Britain, Canada and France, *Governance*, 11, 3, pp.319-356.
- SALORANTA, T. M. (2001). Post-normal science and the global climate change issue, *Climatic Change*, 50, 4, pp.395 - 404.
- SANDRI, S. (2009). *Reflexivity in economics: an experimental examination on the self-referentiality of economic theories*, Springer: Heidelberg and London.
- SANO, M., BAUM, S., BUSSEY, M., CARTER, R. W. B., CRICK, F., GOLSHANI, A., CHOY, D. L., RICHARDS, R., ROIKO, A. & SERRAO-NEUMANN, S. (2012). Adapting Coasts to Climatic Futures. An Australian Perspective, *Coastal Engineering Proceedings*, 1, 33, pp.1-12.
- SARKISSIAN, W., PERLGUT, D. & WALSH, K. (1994). *Community participation in practice*, Institute for Science and Technology Policy, Murdoch University: Perth, WA.
- SAYCE, K., SHUMAN, C., CONNOR, D., REISEWITZ, A., POPE, E., MILLER-HENSON, M., PONCELET, E., MONIÉ, D. & OWENS, B. (2013). Beyond

- traditional stakeholder engagement: Public participation roles in California's statewide marine protected area planning process, *Ocean & Coastal Management*, 74, pp.57-66.
- SCALLY, J. & WESCOTT, G. (2011). Perceptions of Climate Change and Adaptation Responses in a Local Community: the Barwon Estuary Complex, Victoria, *Australian Geographer*, 42, 4, pp.387-401.
- SCHERMERHORN, J. R., JR. (1975). Determinants of interorganizational cooperation, *Academy of Management Journal (Pre-1986)*, 18, 4, pp.846-856.
- SCHILLING, J. (2009). From Ineffectiveness to Destruction: A Qualitative Study on the Meaning of Negative Leadership, *Leadership*, 5, 1, pp.102-128.
- SCHIPPERS, M. C., HARTOG, D. D. N., KOOPMAN, P. L. & KNIPPENBERG, V. D. (2008). The role of transformational leadership in enhancing team reflexivity, *Human Relations*, 61, 11, pp.1593-1616.
- SCHMIDT-THOME, P. & KLEIN, J. (2013). *Climate change adaptation in practice : from strategy development to implementation / edited by Philipp Schmidt-Thome, Johannes Klein*, John Wiley & Sons Inc.: Chichester, West Sussex, UK
- SCHÖN, D. A. (1994). *Frame reflection: toward the resolution of intractable policy controversies* BasicBooks: New York.
- SCHULTZ, L., FOLKE, C., ÖSTERBLOM, H. & OLSSON, P. (2015). Adaptive governance, ecosystem management, and natural capital, *Proceedings of the National Academy of Sciences of the United States of America*, 112, 24, 7369-7374.
- SCHUSLER, T. M., DECKER, D. J. & PFEFFER, M. J. (2003). Social Learning for Collaborative Natural Resource Management, *An International Journal*, 16, 4, pp.309-326.
- SCHWANDT, T. A. 2000, Three epistemological stances for qualitative inquiry: Interpretivism, hermeneutics, and social constructionism. In: DENZIN, N. K. & LINCOLN, Y. S. (eds.) *Handbook of Qualitative Research*, 7, pp.189-213, Sage Publications, Inc.: Thousand Oaks, California.
- SCHWANDT, T. A. 2003, Three Epistemological Stances for Qualitative Inquiry: Interpretivism, Hermeneutics, and Social Constructionism. In: K. DENZIN, Y. S. L. (ed.) *The Landscape of Qualitative Research: Theories and Issues*, 7, pp.253-291, Sage. Thousand Oaks.
- SERRAO-NEUMANN, S., CRICK, F., HARMAN, B., SANO, M., SAHIN, O., VAN STADEN, R., SCHUCH, G., BAUM, S. & LOW CHOY, D. (2014). Improving cross-sectoral climate change adaptation for coastal settlements: insights from South East Queensland, Australia, *Regional Environmental Change*, 14, 2, pp.489-500.
- SERRAO-NEUMANN, S., HARMAN, B., LEITCH, A. & LOW CHOY, D. (2015). Public engagement and climate adaptation: insights from three local governments in Australia, *Journal of Environmental Planning and Management*, 58, 7, pp.1196-1216.
- SGS ECONOMICS & PLANNING 2007. *Socioeconomic Assessment and Response for Climate Change Impacts on Clarence Foreshores, Interim Report*. Clarence City Council Hobart, Tasmania. Available from: http://coastaladaptationresources.org/PDF-files/1252-03-Socio-economic_report_Part_1_July_07.pdf.
- SGS ECONOMICS & PLANNING 2012a. *Models for Funding and Decision Making for Coastal Adaptation Pathways*. Local Government Association of Tasmania, Hobart, Tasmania. Available from: http://www.ccc.tas.gov.au/webdata/resources/files/04-20120159_TCAP_Funding_and_Decision_Making_Coastal_Adaptation_120617.pdf.

- SGS ECONOMICS & PLANNING 2012b. *Tasmanian Coastal Adaptation Pathways Project Lauderdale Scenario Planning Summary*. Clarence City Council, Available from: http://www.ccc.tas.gov.au/webdata/resources/files/Attwater_-_Lauderdale_Scenario_Planning_Summary_Final_120308.pdf.
- SGS ECONOMICS & PLANNING & WATER RESEARCH LABORATORY 2009. *Climate change impacts on Clarence Coastal Areas: Final Report*. Clarence City Council, Hobart, Tasmania. Available from: <http://www.ccc.tas.gov.au/webdata/resources/files/CCICCA-Final-Report-A415375.pdf>.
- SHANI, A. B. & PASMORE, W. A. 1985, Organizational Inquiry: towards a new model of the action research process. In: WARRICK, D. D. (ed.) *Contemporary Organization Development: current thinking and applications* Scott, Foresman and Co: Glenview, Illinois.
- SHARP, E., DALEY, D. & LYNCH, M. (2011). Understanding local adoption and implementation of climate change mitigation policy, *Urban Affairs review*, 47, 3, pp.433 - 457.
- SHARPLES, C. 2004. *Indicative Mapping of Tasmanian Coastal Vulnerability to Climate Change and Sea-Level Rise: Explanatory Report, First Edition*. Department of Primary Industries & Water, Hobart, Tasmania.
- SHARPLES, C. 2006. *Indicative Mapping of Tasmanian Coastal Vulnerability to Climate Change and Sea-Level Rise: Explanatory Report (Second Edition)* Hobart, Tasmania. Available at: <http://dppwe.tas.gov.au/conservation/climate-change/climate-change-and-coastal-vulnerability/indicative-mapping-of-tasmanian-coastal-vulnerability>. [12/9/2011].
- SHARPLES, C., MOUNT, R., PEDERSEN, T., LACEY, M., NEWTON, J., JASKIERNIAK, D. & WALLACE, L. 2009. *Australian Coastal Geomorphic and Stability Mapping Project, Smartline*. School of Geography & Environmental Studies (Spatial Sciences) University of Tasmania, Hobart, Tasmania.
- SHARPLES, C., WALFORD, H. & ROBERTS, L. 2013. *Coastal erosion susceptibility zone mapping for hazard band definition in Tasmania*. Department of Premier and Cabinet, Hobart, Tasmania. Available from: http://www.dpac.tas.gov.au/_data/assets/pdf_file/0004/222925/Coastal_Erosion_Susceptibility_Zone_Mapping.pdf [23/9/2014].
- SHAW, J., DANESE, C. & STOCKER, L. (2013). Spanning the boundary between climate science and coastal communities: Opportunities and challenges, *Ocean & Coastal Management*, 86, pp.80-87.
- SHOVE, E. & WALKER, G. (2007). Caution! Transition ahead: Politics, practice and sustainable transition management, *Environment and Planning C: Government & Policy*, 39, 4, pp.763-770.
- SLIFE, B. (2004). Taking practice seriously: Towards a relational ontology, *Journal of Theoretical and Philosophical Psychology*, 24, 2, pp.158-178.
- SMEC AUSTRALIA 2006. *Local Government Land Use Planning & Risk Mitigation: National Research Paper*. Australian Local Government Association (ALGA), Victoria, Australia. Available from: http://alga.asn.au/site/misc/alga/downloads/emergency_mgm/LGLUP.pdf. [12/4/2012].
- SMEC AUSTRALIA 2007. *Climate Change Adaptation Actions for Local Government* Australian Greenhouse Office Department of the Environment and Water Resources. Department of Climate Change and Energy Efficiency, Canberra, ACT.
- SMIT, B. & WANDEL, J. (2006). Adaptation, adaptive capacity and vulnerability, *Global Environmental Change*, 16, 3, pp.282-292.

- SMITH, C. L., GILDEN, J. & STEEL, B. S. (1998). Sailing the shoals of adaptive management: the case of salmon in the Pacific Northwest, *Environmental Management*, 22, pp.671-681.
- SMITH, J. & LENHART, S. S. (1996). Climate change adaptation policy options, *Climate Research*, 6, pp.193-201.
- SMITH, T., BROOKE, C., MEASHAM, T., PRESTON, B., GORDDARD, R., WITHYCOMBE, G., BEVERIDGE, B. & MORRISON, C. 2008a. *Case Studies of Adaptive Capacity: Systems Approach to Regional Climate Change Adaptation Strategies*. Sydney Coastal Councils, Sydney, NSW. Available from:
<http://www.sydneycostalouncils.com.au/sites/default/files/systapproachphasethreereport.pdf>. [22/12/2012].
- SMITH, T., LEITCH, A. & THOMSEN, D. 2016. Community Engagement CoastAdapt Information Manual 9. National Climate Change Adaptation Research Facility: Gold Coast, QLD. Available from:
https://coastadapt.com.au/sites/default/files/information-manual/IM09_community_engagement.pdf [15/9/2016].
- SMITH, T. & SMITH, D. 2006, Institutional adaptive learning for coastal management. In: LAZAROW, N., FEARON, R., SOUTER, R. & DOVERS, S. (eds.) *Coastal management in Australia: key institutional governance issues for coastal natural resource management and planning*, 101-106, Cooperative Research Centre for Coastal Zone Estuary and Waterway Management: Indooroopilly, QLD. Available from:
http://www.ozcoasts.gov.au/pdf/CRC/Coastal_Management_in_Australia.pdf . [21/11/2011].
- SMITH, T. B. (1973). The policy implementation process, *Policy Sciences*, 4, 2, pp.197-209.
- SMITH, T. F., CARTER, R. W., THOMSEN, D. C., MAYES, G., NURSEY-BRAY, M., WHISSON, G., JONES, R., DOVERS, S. & O'TOOLE, K. (2009). Enhancing science impact in the coastal zone through adaptive learning, *Journal of Coastal Research*, SI, 56, 2, pp.1306-1310.
- SMITH, T. F. & LAZAROW, N. S. (2006). Social learning and the adaptive management framework, *Journal of Coastal Research*, SI 39 (Proceedings of the 8th International Coastal Symposium), pp.952 - 954.
- SMITH, T. F., PRESTON, B., GORDDARD, R., BROOKE, C., MEASHAM, G. T., WITHYCOMBE, G., BEVERIDGE, B. & MORRISON, C. 2008b. *Regional Workshops Synthesis Report: Sydney Coastal Councils' Vulnerability to Climate Change*. Prepared for the Sydney Coastal Councils Group, Available from:
<http://www.sydneycostalouncils.com.au/sites/default/files/systapproachphasetworeport.pdf>.
- SONDEIJKER, S., GEURTS, J., ROTMANS, J. & TUKKER, A. (2006). Imagining sustainability: the added value of transition scenarios in transition management, *Foresight-The journal of future studies, strategic thinking and policy*, 8, 5, pp.15-30.
- SØRENSEN, E. & TORFING, J. (2005). The Democratic Anchorage of Governance Networks, *Scandinavian Political Studies*, 28, 3, pp.195-218.
- SOUTH EAST COUNCILS CLIMATE CHANGE ALLIANCE 2016. *South East Councils Climate Change Alliance Home Page* [Online], South East Councils Climate Change Alliance. Available from: <http://www.seccca.org.au/>. [7 April 2016].
- SPRADLEY, J. P. (1980). *Participant observation*, Holt, Rinehart and Winston: New York.

- SQUIRES, H. & RENN, O. (2011). Can Participatory Modelling Support Social Learning in Marine Fisheries? Reflections from the Invest in Fish South West Project, *Environmental Policy and Governance*, 21, 6, pp.403-416.
- STANDARDS AUSTRALIA 2004. Risk Management: AS/NZS 4360:2004 Standards Australia: Available from: <http://www.riskmanagement.com.au/> [21 September 2014].
- STANDARDS AUSTRALIA 2009. Risk Management-Principles and Guidelines: AS/NZS ISO 31000:2009. Standards Australia From: <http://www.riskmanagement.com.au/> [15 September 2014].
- STEAD, D. 2010, Integrated Transport Policy: a Conceptual Analysis. In: GIVONI, M. & BANISTER, D. (eds.) *Integrated transport: from policy to practice* pp.15-30, Routledge: London, New York.
- STEAD, D. & MEIJERS, E. (2009). Spatial Planning and Policy Integration: Concepts, Facilitators and Inhibitors, *Planning Theory & Practice*, 10, 3, pp.317-332.
- STEELE, W. & RUMING, K. J. (2012). Flexibility versus Certainty: Unsettling the Land-use Planning Shibboleth in Australia, *Planning Practice & Research*, 27, 2, pp.155-176.
- STOCKER, L., BRUEKERS, G., DANESE, C., HOFMEESTER, C., SHAW, J., PETROVA, S., WOOD, D., ROSIER, J., BALDWIN, C. & POKRANT, B. 2013. *CSIRO Coastal Cluster: Governance Theme 1 Report*. CSIRO, Canberra, ACT.
- STOCKER, L. & BURKE, G., Overlay mapping—a methodology for place-based sustainability education. In: WOOLTORTON, S. & MARINOVA, D., eds. *Sharing wisdom for our future: Environmental education in actions*. Conference of the Australian Association of Environmental Education, 2006, Perth, WA, Institute for Sustainability and Technology Policy, Murdoch University.
- STOCKER, L. & BURKE, G., Teaching sustainability with overaly mapping and Google Earth. *Proceedings of the 18th Annual Teaching and Learning Forum*. 29 January 2009 2009, Perth, WA, Curtin University of Technology, CUSP. Available from: <http://otl.curtin.edu.au/tlf/tlf2009/refereed/stocker.html>. [25 August 2013].
- STOCKER, L., BURKE, G., KENNEDY, D. & WOOD, D. (2012a). Sustainability and climate adaptation: Using Google Earth to engage stakeholders, *Ecological Economics*, 80, pp.15-24.
- STOCKER, L., KENCHINGTON, R., KENNEDY, D. & STEVEN, A. 2012b, Introduction to Australian coasts and human influences. In: KENCHINGTON, R., STOCKER, L. & WOOD, D. (eds.) *Sustainable Coastal Management and Climate Adaptation*, pp.1-27, CSIRO Publishing: Collingwood, Victoria. Available from: <http://books.google.com.au/books?id=1FVLjkyw73IC>.
- STOCKER, L. & KENNEDY, D. (2009). Cultural Models of the Coast in Australia: Toward Sustainability, *Coastal Management*, 37, 5, pp.387 - 404.
- STOCKER, L., KENNEDY, D., KENCHINGTON, R. & MERRICK, K. 2012c, Sustainable Coastal Management? . In: KENCHINGTON, R., STOCKER, L. & WOOD, D. (eds.) *Sustainable Coastal Management and Climate Adaptation*, pp.29-50, CSIRO Publishing: Collingwood, Victoria. Available from: <http://books.google.com.au/books?id=1FVLjkyw73IC>.
- STOCKER, L., KENNEDY, D., KENCHINGTON, R. A. & MERRICK, K. 2012d, Sustainable coastal management? . In: KENCHINGTON, R. A., STOCKER, L. & WOOD., D. (eds.) *Sustainable Coastal Management and Climate Adaptation: Global Lessons from Regional Approaches in Australia* 4, pp.29-55, CSIRO Publishing: Collingwood, Vic.
- STOCKER, L., KENNEDY, D., METCALF, S., DAMBACHER, J., MIDDLE, G. & WOOD, D., Modelling coastal governance in the south west of Western

- Australia: complexity, collaboration and climate adaptation. *19th International Congress on Modelling and Simulation, Modelling and Simulation Society of Australia and New Zealand*. 12—16 December 2011, 2011, Perth, Western Australia, pp. 2996-3001.
- STOJANOVIC, T., BALLINGER, R. C. & LALWANI, C. S. (2004). Successful integrated coastal management: measuring it with research and contributing to wise practice, *Ocean & Coastal Management*, 47, 5-6, pp.273-298.
- STOJANOVIC, T. A. & BALLINGER, R. C. (2009). Integrated Coastal Management: A comparative analysis of four UK initiatives, *Applied Geography*, 29, 1, pp.49-62.
- STOJANOVIC, T. I. M. & BARKER, N. (2008). Improving governance through local Coastal Partnerships in the UK, *Geographical Journal*, 174, 4, pp.344-360.
- STRANGERT, P. (1977). Adaptive planning and uncertainty resolution, *Futures*, 9, 1, pp.32-44.
- SULLIVAN, H. & SKELCHER, C. (2002). Working Across Boundaries, *Health and Social Care in the Community*, 11, 2, 81-188.
- SWANSON, D., BARG, S., TYLER, S., VENEMA, H., TOMAR, S., BHADWAL, S., NAIR, S., ROY, D. & DREXHAGE, J. (2010). Seven tools for creating adaptive policies, *Technological Forecasting and Social Change*, 77, 6, pp.924-939.
- SWANSON, D. & BHADWAL, S. (2009). *Creating adaptive policies: a guide for policymaking in an uncertain world*, SAGE: Los Angeles, Ottawa.
- SWIHART, D. & HESS, R. G. 2014, Introduction: The concept behind shared governance. *Shared Governance, Third Edition: A Practical Approach to Transforming Interprofessional Healthcare*, pp.1-14, HCPro: Danvers, MA
- SYDNEY COASTAL COUNCILS 2011. *Sydney Coastal Councils Group* [Online], Sydney Coastal Councils,. Available from: <http://www.sydneycoastalcouncils.com.au/>. [7 April 2016].
- TASAN-KOK, T. (2008). Changing Interpretations of 'Flexibility' in the Planning Literature: From Opportunism to Creativity?, *International Planning Studies*, 13, 3, pp.183-195.
- TASMANIAN PLANNING COMMISSION 2009. *State of the Environment Report: Tasmania*, TASMANIAN PLANNING COMMISSION, Hobart, Tasmania.
- TASMANIAN PLANNING COMMISSION 2010. *Cradle Coast Regional Land Use Strategy 2010-2030*, DEPARTMENT OF PREMIER AND CABINET, Hobart, Tasmania.
- TASMANIAN PLANNING COMMISSION 2013a. *Regional Land Use Strategy of Northern Tasmania*, DEPARTMENT OF PREMIER AND CABINET, Hobart, Tasmania.
- TASMANIAN PLANNING COMMISSION 2013b. *Southern Tasmania Regional Land Use Strategy 2010–2035*, DEPARTMENT OF PREMIER AND CABINET, Hobart, Tasmania.
- TASMANIAN PLANNING COMMISSION 2016. *Mitigating Natural Hazards through Land Use Planning and Building Control Coastal Hazards in Tasmania Summary Report Consultation (DRAFT)*, DEPARTMENT OF PREMIER AND CABINET, Hobart, Tasmania.
- TASMANIAN STATE COASTAL POLICY 1996.
- TAYLOR, A. C., Sustainable urban water management champions: What do we know about them. *Proceedings of the Rainwater and Urban Design 2007 Conference, incorporating the 13th International Rainwater Catchment Systems Conference & the 5th International Water Sensitive Urban Design Conference*. 13th International Rainwater Catchment Systems Conference, 2007, Sydney, NSW, pp.21-23.
- TETT, L. (2005). Partnerships, community groups and social inclusion, *Studies in Continuing Education*, 27, 1, pp.1-15.

- THOM, B. 2010. Coastal Adaptation in Australia - some challenges, *Coastal Forum*, Adelaide, SA, p.6.
- THOM, B. (2012). Climate change, coastal hazards and the public trust doctrine, *Macquarie Journal of International and Comparative Environmental Law*, 8, 2, pp.21-41.
- THOMAS, J. W. & GRINDLE, M. S. (1990). After the decision: Implementing policy reforms in developing countries, *World Development*, 18, 8, pp.1163-1181.
- THOMSEN, D., SMITH, T. & KEYS, N. (2012). Adaptation or Manipulation? Unpacking Climate Change Response Strategies, *Ecology and Society*, 17, 3, p.20.
- TOMPKINS, E. L. (2005). Planning for climate change in small islands: Insights from national hurricane preparedness in the Cayman Islands, *Global Environmental Change*, 15, 2, pp.139-149.
- TOMPKINS, E. L., FEW, R. & BROWN, K. (2008). Scenario-based stakeholder engagement: Incorporating stakeholders preferences into coastal planning for climate change, *Journal of Environmental Management*, 88, 4, pp.1580-1592.
- TOMPKINS, L. E. & ADGER, W. N. (2005). Defining response capacity to enhance climate change policy, *Environmental Science & Policy*, 8, 6, pp.562-571.
- TORRESAN, S., CRITTO, A., DALLA VALLE, M., HARVEY, N. & MARCOMINI, A. (2008). Assessing coastal vulnerability to climate change: comparing segmentation at global and regional scales, *Sustain Science*, 3pp.45-65.
- TRÜCK, S., BRADFORD, W., HENDERSON-SELLERS, A., MATHEW, S., SCOTT, J., STREET, M. & TAPLIN, R. 2010, Assessing climate change adaptation options for local government. In: YOU, Y. & HENDERSON-SELLERS, A. (eds.) *Climate alert: Climate change monitoring and strategy*, pp.362-399, Sydney University Press: Sydney, NSW.
- TURNER, R. K., VAN DEN BERGH, J. C. J. M. & BROUWER, R. G. 2003, 'Introduction'. In: TURNER, R. K., VAN DEN BERGH, J. C. J. M. & BROUWER, R. G. (eds.) *Managing wetlands. An ecological economics approach*, pp.1-16, Edward Elgar: Cheltenham, Northampton
- TURNPENNY, J., JONES, M. & LORENZONI, I. (2011). Where Now for Post-Normal Science?: A Critical Review of its Development, Definitions, and Uses, *Science, Technology & Human Values*, 36, 3, pp.287-306.
- TWYFORDS, V. (ed.) 2012. *The Power of Co; The Smart Leaders' Guide to Collaborative Governance* Twyfords Consulting: Wollongong, NSW.
- UHL-BIEN, M., MARION, R. & MCKELVEY, B. (2007). Complexity leadership theory: Shifting leadership from the industrial age to the knowledge era, *The Leadership Quarterly*, 18, 4, pp.298-318.
- UITTENBROEK, C., JANSSEN-JANSEN, L. & RUNHAAR, H. (2013). Mainstreaming climate adaptation into urban planning: overcoming barriers, seizing opportunities and evaluating the results in two Dutch case studies, *Reg Environ Change*, 13, 2, pp.399 - 411.
- UITTENBROEK, C. J., JANSSEN-JANSEN, L. B., SPIT, T. J. M., SALET, W. G. M. & RUNHAAR, H. A. C. (2014). Political commitment in organising municipal responses to climate adaptation: the dedicated approach versus the mainstreaming approach, *Environmental Politics*, 23, 6, pp.1043-1063.
- UNCED 1992. *Agenda 21 - Programme of action for sustainable development*. United Nations Conference on Environment and Development, United Nations Dept. Public Information, New York.
- UNITED NATIONS (1992). *The Global Partnership for Environment and Development: A Guide to Agenda 21*, United Nations Pubns, Post Rio ed edition: Geneva, Switzerland.
- UNITED NATIONS 2015. *Policy integration in government in pursuit of the sustainable development goals* Department of Economic and Social Affairs

- Division for Public Administration and Development Management New York. Available from: <http://www.un.org/esa/socdev/csocd/2016/egmreport-policyintegrationjan2015.pdf>. [22 december 2015].
- UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE. United Nations Framework Convention on Climate Change (UNFCCC), 1992, UNFCCC, New York.
- URBANO, F. P. (2015). *Risk Governance: The Articulation of Hazard, Politics and Ecology*, Springer Netherlands: Dordrecht, The Netherlands.
- URWIN, K. & JORDAN, A. (2008). Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance, *Global Environmental Change*, 18, pp.180-191.
- VAN ASSELT, M. B. A. & RENN, O. (2011). Risk governance, *Journal of Risk Research*, 14, 4, pp.431-449.
- VAN DE KERKHOF, M. & WIECZOREK, A. (2005). Learning and stakeholder participation in transition processes towards sustainability: Methodological considerations, *Technological Forecasting & Social Change*, 72, 6, pp.733-747.
- VAN DE MEENE, S. J., BROWN, R. R. & FARRELLY, M. A. (2011). Towards understanding governance for sustainable urban water management, *Global Environmental Change*, 21, 3, pp.1117-1127.
- VAN DER BRUGGE, R. & VAN RAAK, R. (2007). Facing the adaptive management challenge: Insights from transition management, *Ecology and Society*, 12, 2, p.33.
- VAN MIERLO, B., ARKESTEIJN, M. & LEEUWIS, C. (2010). Enhancing the Reflexivity of System Innovation Projects with System Analyses, *American Journal of Evaluation*, 31, 2, pp.143-161.
- VAN NIEUWAAL, K., DRIESSEN, P., SPIT, T. & TERMEER, K. (2009). A state of the art of governance literature on adaptation to climate change: Towards a research agenda, *Earth and Environmental Science*, 6, 36, p. 362019
- VICKERY, D. & DANESE GALANO, C., Assessing coastal vulnerability and value at risk: lessons learnt from a local government perspective. *In: Coasts and Ports 2013: 21st Australasian Coastal and Ocean Engineering Conference and the 14th Australasian Port and Harbour Conference*. Australasian Port and Harbour Conference Coasts and Ports 2013, 2013, Sydney, NSW, Engineers Australia:p. 809-814. Available from: <http://search.informit.com.au/documentSummary;dn=831088972578709;res=IELENG>
- VOGEL, C., MOSER, S. C., KASPERSON, R. E. & DABELKO, G. D. (2007). Linking vulnerability, adaptation, and resilience science to practice: Pathways, players, and partnerships, *Global Environmental Change*, 17, 3-4, pp.349-364.
- VOICE, M., HARVEY, N. & WALSH, K. 2006. *Vulnerability to Climate Change of Australia's Coastal Zone: Analysis of gaps in methods, data and system thresholds*. Australian Greenhouse Office, Canberra, ACT
- VON WINTERFELDT, D. (2013). Bridging the gap between science and decision making, *Proceedings of the National Academy of Sciences of the United States of America*, 110, 3, p.14055.
- VOS, J. & BORNEMANN, B. (2011). The politics of reflexive governance: challenges for designing adaptive management and transition management, *Ecology and Society*, 16, 2, p.1.
- VOS, J.-P., BAUKNECHT, D. & KEMP, R. (2006). *Reflexive Governance for Sustainable Development*, Edward Elgar Publishing: Cheltenham, Glos and Northampton, MA.
- VOS, J.-P. & KEMP, R. 2006, Sustainability and reflexive governance. *In: VOS, J.-P. & KEMP, R. (eds.) Reflexive Governance for Sustainable Development*

- Introduction, pp.3 - 28, Edward Elgar Publishing Ltd.: Cheltenham, Glos and Northampton, MA.
- VOS, J.-P., SMITH, A. & GRIN, J. (2009). Designing long-term policy: Rethinking transition management, *Policy Science*, 42, 4, pp.275 - 302.
- WACHINGER, G., RENN, O., BEGG, C. & KUHLLICKE, C. (2013). The Risk Perception Paradox—Implications for Governance and Communication of Natural Hazards, *Risk Analysis*, 33, 6, pp.1049-1065.
- WAINWRIGHT, D. J., RANASINGHE, R., CALLAGHAN, D. P., WOODROFFE, C. D., COWELL, P. J. & ROGERS, K. (2014). An argument for probabilistic coastal hazard assessment: Retrospective examination of practice in New South Wales, Australia, *Ocean and Coastal Management*, 95pp.147-155.
- WALKER, B., HOLLING, C. S., CARPENTER, S. R. & KINZIG, A. (2004). Resilience, Adaptability and Transformability in Social–ecological Systems, *Ecology of Society*, 9, 2, pp.5-14.
- WALKER, W. E., RAHMAN, S. A. & CAVE, J. (2001). Adaptive policies, policy analysis, and policy-making, *European Journal of Operational Research*, 128, 2, pp.282-289.
- WALTERS, C., GUNDERSON, L. & HOLLING, C. S. (1992). Experimental Policies for Water Management in the Everglades, *Ecological Applications*, 2, 2, pp.189-202.
- WALTERS, C. J. (1986). *Adaptive Management of Renewable Resources*, Macmillan: New York.
- WANNA, J. (1991). Community power debates: themes, issues and remaining dilemmas, *Urban Policy and Research*, 9, 4, pp.193-208.
- WANNA, J. 2008, Collaborative government: meanings, dimensions, drivers and outcomes In: WANNA, J. (ed.) *Collaborative Governance: A new era of public policy in Australia?*, 1, 3-13, ANU E Press. Available from: <http://press.anu.edu.au/publications/series/australia-and-new-zealand-school-government-anzsog/collaborative-governance>. [4 July 2014].
- WARBER, A. 2008. Public values and public interest: counterbalancing economic individualism. American Library Association dba CHOICE: Middletown, Ohio.
- WARE, D. 2016. Financial and funding mechanisms for adaptation to climate change, CoastAdapt, National Climate Change Adaptation Research Facility, Gold Coast, Available from: <https://coastadapt.com.au/resources-adaptation-including-innovative-financing-mechanisms>. [12 September 2016].
- WCED 1990, Towards sustainable development. *Our common future: Report of the World Commission on Environment and Development* 2, 87-110, World Commission on Environmental Development Available from: <http://www.un-documents.net/ocf-02.htm>. [4 April 2014].
- WEBER, E. P. & KHADEMIAN, A. M. (2008). Wicked Problems, Knowledge Challenges, and Collaborative Capacity Builders in Network Settings, *Public Administration Review*, 68, 2, pp.334-349.
- WESCOTT, G. (2004). The Theory and Practice of Coastal Area Planning: Linking Strategic Planning to Local Communities, *Coastal Management*, 32, 1, pp.95-100.
- WESCOTT, G. (2009). Stimulating Vertical Integration in Coastal Management in a Federated Nation: The Case of Australian Coastal Policy Reform, *Coastal Management*, 37, 6, pp.501-513.
- WESTERN AUSTRALIA PLANNING COMMISSION 2014. *Coastal hazard risk management and adaptation planning guidelines*, Perth, WA.
- WESTERN AUSTRALIAN PLANNING COMMISSION 2003. *State Planning Policy No. 2.6 State Coastal Planning Policy*, Perth, WA.
- WESTERN AUSTRALIAN PLANNING COMMISSION 2013a. *State Coastal Planning Policy Guidelines*, Perth, WA.

- WESTERN AUSTRALIAN PLANNING COMMISSION 2013b. *State Planning Policy No. 2.6 State Coastal Planning Policy*, Perth, WA.
- WILSON, E. (2006). Adapting to climate change at the local level: The spatial planning response, *Local Environment*, 11, 6, pp.609-625.
- WISE, R. M., FAZEY, I., STAFFORD SMITH, M., PARK, S. E., EAKIN, H. C., ARCHER VAN GARDEREN, E. R. M. & CAMPBELL, B. (2014). Reconceptualising adaptation to climate change as part of pathways of change and response, *Global Environmental Change*, 28pp.325-336.
- WOLF, J., ALLICE, I. & BELL, T. (2013). Values, climate change, and implications for adaptation: Evidence from two communities in Labrador, Canada, *Global Environmental Change*, 23, 2, pp.548-562.
- WOLFE, C. (2010). *What is Posthumanism?*, University of Minnesota: Minneapolis.
- WOOD, D. & STOCKER, L. (2009). Coastal Adaptation to Climate Change: Towards Reflexive Governance, *The international journal of science in society*, 1, 3, p.14.
- WOOD, M. & MILLS, D. 2008. *A Turning of the Tide: Science for Decisions in the Kimberley-Browse Marine Region*. Western Australia Marine Science Institution, Perth, WA. Available from: [http://www.wamsi.org.au/sites/wamsi.org.au/files/A turning of the tide - science for decisions in the Kimberley-Browse marine region.pdf](http://www.wamsi.org.au/sites/wamsi.org.au/files/A%20turning%20of%20the%20tide%20-%20science%20for%20decisions%20in%20the%20Kimberley-Browse%20marine%20region.pdf). [12 June 2012].
- WOODROFFE, C. D., COWELL, P. J., CALLAGHAN, D. P., RANASINGHE, R., JONGEJAN, R., WAINWRIGHT, D. J., BARRY, S., ROGERS, K. & DOUGHERTY, A. J. 2012. *Approaches to risk assessment on Australian coasts: a model framework for assessing risk and adaptation to climate change on Australian coasts*. National Climate Change Adaptation Research Facility, Wollongong, NSW.
- WREFORD, A. & MORAN, D., Adapting to climate change: the costs and benefits of incremental and transformative changes. No 202589, 2015 Conference (59th) February 10-13, 2015 2015, Rotorua, New Zealand, Australian Agricultural and Resource Economics Society.
- WREN, L. S. 2002. *The Integration of Science and Policy in Canada's Public Service: Creating Common Purpose*. Prepared by CCMD Roundtable on Science and Public Policy, Toronto, Canada.
- WRIGHT, I. L. & CLEARLY, S., Reinvigorating planning and the planning system in Queensland - A neoliberal perspective Planning Institute of Australia Annual Conference, 4 October 2012 2012, Cairns, QLD.
- WRL 2012. *Investigation of Roches Beach Protection Works*. University of New South Wales, School of Civil and Environmental Engineering, New South Wales.
- YIN, R. K. (2009). *Case Study Research: Design and Methods*, Sage Publications Inc.: California
- YOUNG, O. R. (2010). Institutional dynamics: Resilience, vulnerability and adaptation in environmental and resource regimes, *Global Environmental Change*, 20, 3, 378-385.

Every reasonable effort has been made to acknowledge the owners of copyright material. I would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged.

APPENDIX A

Coastal Adaptation Planning: From Global to Local (background)

The precursors of the modern coastal adaptation planning studies were impact assessments commissioned by the Intergovernmental Panel of Climate Change (IPCC) in the early '90s in response to growing concerns regarding the impacts of global warming (particularly rising sea levels) on coastal communities (IPCC 1990, IPCC 1992). Based on global climate predictions, models and scenarios, the first IPCC assessments aimed to establish a database on global coastal vulnerability to sea level rise and to identify broad adaptation options to mitigate risk. They also aimed to develop a common methodology for any country that wished to assess national coastal vulnerability to sea level rise.

A few methodologies were developed in this attempt: the *Common Methodology (CM)* (IPCC 1992), the *IPCC Technical Guidelines* (Carter et al. 1994, Carter 1992) and the *United Nations Environment Program Handbook* (Klein et al. 1998). Funding to test these methodologies in various countries was provided by the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol through the Global Environment Facility Trust Fund (GEF), the Special Climate Change Fund (SCCF), the Least Developed Countries Trust Fund (LCDF), the Adaptation Fund, the National Adaptation Programs of Action (NAPAs) and by individual nation's adaptation initiatives. These methodologies were of broad scope, designed to be applicable to any natural and socioeconomic system potentially affected by sea level rise. They did not explicitly refer to a risk assessment framework but they were essentially consistent with a hazard-driven assessment approach (Jones and Preston 2011).

Under the commitments of the UN Framework Convention on Climate Change several countries, including Australia, agreed to test these methodologies. These tests revealed numerous methodological and operational limitations that emerged from the different case studies. In Australia the *CM*, tested at 9 sites, was considered not applicable and did not upgrade to a national level assessment. According to Klein, Nicholls and Mimura (1999) and Kay et al. (1996) the first methodologies were too simplistic and based on broad and incomplete national datasets. Furthermore, these early methodologies focused primarily on the assessment of climate risk rather than on the development of adaptation measures.

Hence, they were considered of little use for decision making.

The *Global Vulnerability Assessment* (GVA) developed by Hoozemans is probably the only source of global information on coastal vulnerability to sea level rise available to date (Hinkel and Klein 2009). More sophisticated methodologies such as the *Dynamic Interactive Vulnerability Assessment* (DIVA) (DINAS-COAST Consortium 2006), the *Synthesis and Upscaling of Sea-Level Rise Vulnerability Assessment* (SURVAS), the *Coastal Vulnerability Indices* (CVI), the *Shoreline Management Planning* (SMP) were developed to guide the analysis of climate change impacts on environmental, cultural and socio-economic systems at the regional level and support more detailed coastal management decisions (Torresan et al. 2008). However, these methodologies were never tested in Australia (Harvey and Woodroffe 2008).

Many scholars critiqued their accuracy for assessing a nation's coastal vulnerability and their usefulness in supporting the formulation of effective mitigation and adaptive policy responses, especially at the regional and local level (Füssel 2007b, Harvey, Clouston and Carvalho 1999, Harvey and Woodroffe 2008, Jones and Preston 2011, Kay et al. 1996).

These 'one size fit all' methodologies and assessments presented several limitations. First, these assessments were based on global climate scenarios hence not always accurate regionally or locally and not sufficiently precise at the scale useful for adaptation planning. Regional and local scale coastal data and modeling were not always available. Secondly, there was a lack of consideration of climatic and non-climatic stressors other than sea level rise and a lack of consideration of socio-economic systems and social vulnerability (Kay et al. 1996, Klein, Nicholls and Mimura 1999). Global assessments also failed to take into consideration the different governance and political contexts in which adaptation occurs or to be integrated with risk assessment and emergency management standards (Kay, Eliot and Klem 1992).

Alternative methodologies for assessing national coastal vulnerability specific to the Australian context were developed by Kay and Hay (1993) and Harvey, Clouston and Carvalho (1999) in the early '90s. These methodologies showed some improvement but there were still major hurdles to overcome such as gaps in national coastal datasets, inaccuracy of climate change models and lack of governments'

leadership in support of a national scale assessment. As a result these methodologies were tested in only a few states (e.g. South Australia) and never translated into a national coastal vulnerability assessment.

In 2009, following the recommendations from the National Climate Change Adaptation Framework (Department of Climate Change and Energy Efficiency 2007), the Australian Government completed the first National Coastal Vulnerability Assessment. The *Climate Change to Australia's Coast: a First Pass National Assessment* Report followed years of data collection and tailored research programs such as the *Smartline* GIS database (Sharples et al. 2009), the new national Digital Elevation Model database (DEM), the NCCOEE Engineering Guidelines (NCCOEE 2012) and the *Coastal Compartment Classification* (Eliot et al. 2011). The DCCEE report identifies, broadly, key risks associated with sea level rise and erosion to built infrastructure, with a particular focus on residential buildings and areas that require further detailed vulnerability and adaptation assessments. This report and the associated mapping have provided important baseline information for more detailed coastal hazards and adaptation mapping studies. A series of guidelines and tools were also produced by the Australian Government to guide coastal risk assessment processes such as the *Climate Change Impacts and Risk Management: A Guide for Business and Government* (Department of Environment and Water Resources 2007), the *Climate Change Adaptation Actions for Local Government* (Department of Environment and Water Resources 2007) and the *Australian and New Zealand Standard for Risk Management AS/NZS 39000:2009* (Standards Australia) and more recently the Australian Government funded *CoastADAPT* (NCCARF 2016).

At the state level, most of the information produced to date consists of coastal landform mapping and mapping of indicative risk of landform change. In Tasmania, the State Government commissioned a statewide vulnerability assessment (DPIPWE 2008b) that led to comprehensive mapping of coastal landforms, values and assets potentially at risk. In WA, the State Government commissioned the *Coastal Compartment Study Project* (Eliot et al. 2011), a series of coastal vulnerability studies covering most of the WA coast.

In Queensland, the government prepared coastal hazard area maps showing areas projected to be at risk up to the year 2100. In Victoria, the *Future Coasts Program* consists of a statewide assessment of the physical impacts of sea level rise and

storms, with a focus on the areas with the greatest potential for erosion and inundation. In NSW, the *Comprehensive Coastal Assessment* is an element of the NSW Government's *Coastal Protection Package* and includes a Comprehensive Coastal Assessment toolkit to help local councils, government agencies and other stakeholders undertake important strategic land use planning.

However, the increasing demand for more accurate information regarding climate risk has led to a proliferation of regional and local hazard risk assessment and adaptation planning frameworks. Assessments of different levels of complexity and completeness have been carried out through federal government funding initiatives (Integrated Assessment of Human Settlements Subprogram (2007), Local Adaptation Pathways Program (2008-2010), Coastal Adaptation Decision Pathways Program (CAP) (2011-2013) National Climate Change Adaptation Research Facility (2008-2013) and state government initiatives such as the State Emergency Service grants and various types of coastal protection and adaptation grants (Jones and Preston 2011, Preston and Kay 2010).

Compared to the first global climate risk assessments, the more recent local coastal hazard risk assessments and adaptation plans are developed using methodologies tailored to specific local government conditions and needs. They are also less 'data dependent' and more focused on the development, in consultation with community, of a suit of adaptation options that are sound and financially feasible.

The majority of these studies have been undertaken through partnerships arrangements typically between local councils, with some degree of involvement and support (financial and/or technical) from state and federal governments. Some may have a strong participation of non-state actors such as universities, natural resource management (NRM) groups and community groups.

Examples of collaborative regional studies are the Sydney Coastal Councils Group in NSW (Sydney Coastal Councils 2011), the South East Councils Climate Change Alliance in Victoria (South East Councils Climate Change Alliance 2016), the South East Queensland Climate Adaptation Research Initiative in Queensland (Sano et al. 2012) and the PNP in WA. The Marine and Coastal Community Network in Victoria is another example of multi agency network attempting to meet the collaboration/honest broker role that operated over 16 years (Scully and Wescott 2011). Such proliferation of partnership arrangements for coastal adaptation, both in Australia

and in the United Kingdom, suggests that stronger collaboration across jurisdictional boundaries and levels (Preston, Danese and Yuen 2011) has been viewed as necessary to achieve better integration in coastal management and planning (Stojanovic and Barker 2008).

In some states like WA collaborative initiatives are not formally recognised by government but are coordinated through formal arrangements. The degree of inclusion in the process of collaboration of non-government agencies such as NRM groups, the private sector and citizens varies from case to case. Central to the success of informal partnerships are key individuals who are typically the initiators of the partnership process and who help facilitate information flows, identify knowledge gaps, and develop expertise of significance relevant to coastal adaptation. These individuals may emerge from different organisations (government or non-government) and levels. In some instances these individuals are members of non-government organisations, hence freer from scrutiny or obligations of their agencies or constituencies and freer to think creatively about the resolution of resource problems.

APPENDIX B

Copyright Authorisation Forms

Permission to use Copyright Material

- for reproduction in a digital thesis -

Chiara Danese Galano
Curtin University Sustainability and Policy Institute
Curtin University

As sole copyright holder/licensor of the item described in the email below, I agree to grant a limited non-exclusive licence to reproduce the material for inclusion in Chiara Danese Galano's thesis as held online in Curtin University's institutional repository.

Author	<i>Sira Tecchiato</i>
Title	<i>Geraldton coastal compartments and erosion areas. Source: Tecchiato (2015)</i>
Licence period	<i>indefinite</i>
Conditions, if any	<i>[for the copyright owner to complete]</i>

To the best of my knowledge the work is original, and does not infringe copyright of any other party.

Signed: *Alexandra Stevens*

[copyright owner's signature]

Date: 23/08/2017

Permission to use Copyright Material

- for reproduction in a digital thesis -

Chiara Danese Galano
Curtin University Sustainability and Policy Institute
Curtin University

As sole copyright holder/licensor of the item described in the email below, I agree to grant a limited non-exclusive licence to reproduce the material for inclusion in Chiara Danese Galano's thesis as held online in Curtin University's institutional repository.

Author	<i>Peron Naturaliste Partnership</i>
Title	PNP region (map)
Licence period	<i>indefinite</i>
Conditions, if any	<i>[for the copyright owner to complete]</i>

To the best of my knowledge the work is original, and does not infringe copyright of any other party.

Signed:



[copyright owner's signature]

Date:

24/8/17

Permission to use Copyright Material

- for reproduction in a digital thesis -

Chiara Danese Galano
Curtin University Sustainability and Policy Institute
Curtin University

As sole copyright holder/licensor of the item described in the email below, I agree to grant a limited non-exclusive licence to reproduce the material for inclusion in Chiara Danese Galano's thesis as held online in Curtin University's institutional repository.

Author	<i>M P Rogers & Associates pl</i>
Title	Inundation risk at Pt. Moore for the year 2110 with 0.9 SLR
Licence period	<i>indefinite</i>
Conditions, if any	[for the copyright owner to complete] <i>NIL</i>

To the best of my knowledge the work is original, and does not infringe copyright of any other party.

Signed:

[copyright owner's signature]



Date: *23/8/17*