Faculty of Humanities

Identifying and Incorporating Community Coastal Values in Coastal Hazard Risk Management and Adaptation Planning: A Case Study of the South West of Western Australia

Craig Perry

0000-0002-0124-5611

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Declaration

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.

Human Ethics (For projects involving human participants/tissue, etc) The research

presented and reported in this thesis was conducted in accordance with the National

Health and Medical Research Council National Statement on Ethical Conduct in

Human Research (2007) – updated March 2014. The proposed research study

received human research ethics approval from the Curtin University Human

Research Ethics Committee (EC00262), Approval Number # HRE2018-0039

Signature: ………………………………………….

Date: 04/04/2022

Acknowledgement of Country

We acknowledge that Curtin University works across hundreds of traditional lands and custodial groups in Australia, and with First Nations people around the globe. We wish to pay our deepest respects to their ancestors and members of their communities, past, present, and to their emerging leaders. Our passion and commitment to work with all Australians and peoples from across the world, including our First Nations peoples are at the core of the work we do, reflective of our institutions' values and commitment to our role as leaders in the Reconciliation space in Australia.

Abstract

Coastal cities and towns around the world, including those in the south west of Western Australia, are impacted by coastal hazards such as erosion and inundation. It is widely acknowledged that climate change will lead to an increase in the extent and occurrence of these coastal hazards. To identify and mitigate these hazards and associated risks, coastal decision makers such as local governments, are required to undertake coastal hazard risk management and adaptation planning. A key component of this process is the consideration of social, cultural, economic and environmental values over a 100 year planning timeframe. However, historically, it has often been the case that short-term economic values are given priority. This has generally resulted in the construction of hard engineered structures to protect physical assets, which often leads to the loss of and/or damage to other assets that are highly valued by the community, such as foreshore reserves and sandy beaches. If decision makers are to develop and deliver sustainable policies and outcomes, it is imperative that technical information supports, and is supported by, clear understanding of how the community interprets and values the coast.

In response to this need, a community focussed research project was designed and applied through cases studies in the south west of Western Australia to understand what communities currently value on the coast and how these values could be affected by the impacts of climate change, explicitly coastal erosion and inundation. The research also explored how specific collaborative learning practices can enhance understanding and knowledge uptake of coastal climate change in the community and to demonstrate how community values of the coast can be incorporated into coastal hazard risk management and adaptation planning.

This research adopted a methodological approach that included qualitative and quantitative methods that were applicable, valid and credible for the applied research. The research

resulted in the generation of substantive knowledge in relation to community coastal values including values typologies that incorporated physical values and assets and sustainability aspects and collaborative learning. The values based approaches can be incorporated into risk based frameworks that are predominantly utilised by coastal decision makers to encourage transformative governance approaches that support collaborative learning.

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1   Introduction

The coast is highly significant to the lives of many. Coastal decision makers must plan for sustainability and the management of coastal hazards, specifically erosion and inundation. These hazards will be exacerbated by the impacts of climate change such as sea level rise and changing weather conditions. The importance of the coast is exemplified in a statement from California Coastal Commission Executive Director Jack Ainsworth in March 2017 in response to a study of beaches in Southern Californian by the US Geological Survey Vitousek et al. (2017).

> *The prospect of losing so many of our beaches in Southern California to sea-level rise is frankly unacceptable. The beaches are our public parks and economic heart and soul of our coastal communities. We must do everything we can to ensure that as much of the iconic California coast is preserved for future generations (United States Geological Survey Coastal and Marine Hazards and Resources Program, 2017 , para. 8).*

The same could be said of Australian beaches. They are the heart and soul of many coastal communities and are emblematic of our lifestyle, with more than 85 per cent of the population living within 50 kilometres of the coastline (Bishop-Taylor et al., 2018).

The United Nations' Intergovernmental Panel on Climate Change (IPCC) sixth assessment report (AR6) concludes that it is indisputable that anthropogenic emissions have warmed the earth, resulting in significant changes to the oceans, ice sheets, global sea levels and extreme weather events. The impacts of climate change will continue to worsen as warming continues, which is anticipated to reach 1.5°C by the early 2030's. Globally, mean sea levels have risen about 20cm since 1901, which AR6 notes was faster in the 20th century than other period in the last three millennia. This rate has increased from an average rate of 1.87mm per year in

the period 1971 – 2006 to 3.69mm per year from 2006 – 2018. Emissions scenarios project that sea levels will continue to rise, based on the period 1995 – 2014, under scenario Shared Socioeconomic Pathway (SSP) 5-8.5, sea levels will rise by 0.63 – 1.01m by the year 2100 (IPCC, 2021). Although, this is the worst-case scenario, monitoring of recent sea level suggests that levels are tracking to match or exceed this scenario (Slater et al., 2020).

Thermal expansion of seawater, mass loss from glaciers and ice sheets and land water storage changes are the primary reasons for historic sea level rise. The report states that it is virtually certain that sea level rise will continue into the future, with melting of ice sheets, which has recently and will continue to be an increasing cause for sea level rise, and thermal expansion being likely to virtually certain to be enduring contributors to sea level rise (IPCC, 2021).

At the regional scale, in the past decades, relative sea levels have increased at a higher rate in Australia than the global average and in many areas with sandy shores, coastlines have retreated. The report states that relative sea level is projected to continue to rise into the future, which will cause increasing coastal erosion and inundation in coastal areas of sandy shorelines; with heavy rainfall and river flooding projected to increase in some areas. If no action is taken to significantly reduce emissions and no adaptation measures are implemented, this could result in sandy coastlines receding by 50m by 2100. In some coastal areas in Australia such as the north west of Western Australia (WA), recession of more than 200m could be experienced (IPCC, 2021). Although, it should be noted that some research suggests that increasing sea levels may not necessarily result in ersoion of sandy coastlines in Australia (Cooper et al., 2020; Short, 2022).

1.1   The importance of values in coastal planning

The planning and management of coastal processes, and associated socioeconomic issues are underpinned by complicated interactions of science and politics. Climate change has added a further level of uncertainty and complexity to the challenge of coastal sustainability and its relationship with community values. This thesis included research of conceptual frameworks and policy relating to values and coastal planning. This project included the development of a new analytical framework that was designed and applied to address the identified theoretical and practical limitations and differences. The framework also acknowledged the disparate definitions and typologies of 'values' adopted in literature that has been highlighted as an issue, and operationalized these for the purpose of identifying what coastal elements, features and uses need to be protected and/or enhanced. For example, the importance of tacit values has been noted by Anthony et al. (2009) and Couzin (2008), however these classifications do not include the natural environmental and built assets to which the community assigns values. This is very important from the point of view of coastal planning requirements. Other typologies such as the Millennium Ecosystem Assessment (2005) recognize the values (direct use, indirect use and option) of ecosystem services, but not the built assets that also provide values (uses and benefits) to the community. The framework for this project also recognized that, as noted by Morrissey and Oliver-Smith (2013) and Tschakert et al. (2017), 'value' in and of itself does not exist without individuals or society, whether they be past, present or future. This is a common attribute in all typologies of values.

The requirement to identify and quantify coastal values, is recognised in various policy documents such as State Planning Policy 2.6 - Coastal planning (SPP2.6) (Western Australian Planning Commission, 2013) as being integral to coastal hazard risk management and adaptation planning. Furthermore, in WA, where this research is situated, government policy

advises that coastal planning decisions and resources should only be used to preserve values and community assets that provide value and benefit to the public; and government resources should only be used to protect private assets and values that provide public benefit (Western Australian Planning Commission, 2014).

This thesis contends that comprehensive and innovative approaches that better engage and involve the community to identify and integrate 'non-economic' values into decision-making are required. If it is not, then there is a risk that coastal decision-makers will strive to preserve and maintain coastal features and assets that do not represent what a particular community genuinely values. Indeed, research (Adger et al., 2009; Tschakert et al., 2017) highlights the significance of determining what is valued by the community so that it can be maintained.

1.2   Significance of this research

This research is significant for a number of reasons that relate to: theory, methodology, substantive knowledge, policy and practice. The theoretical literature notes that social, cultural and environmental values have not been adequately addressed in coastal planning and management (Leslie & McLeod, 2007; McGuire, 2013; O' Brien & Wolf, 2010) and governance instruments in Australia often prioritise the physical hazards and economic values and as such are not appropriately addressing all values that are deemed of importance by communities in the coastal zone (Elrick-Barr & Smith, 2021). Literature also indicates that community consultation is not actively involving stakeholders and the community in the decision making process (Kenchington et al., 2012; Preston et al., 2011; Smith et al., 2016) and collaborative learning approaches should be adopted (Kenchington et al., 2012). I suggest that the results and approach, including the development and implementation of an analytical framework, complement existing theory and practice in this field.

The methodological approach adopted qualitative and quantitative methods such as beach user surveys and participatory workshops that were applicable, valid and credible for the applied research. The thesis generated substantive knowledge in relation to community coastal values including values typologies that incorporated physical values and assets and sustainability aspects and collaborative learning.

It has been noted in policy and practice (Damara WA, 2016b; GHD Pty Ltd, 2016) that the community as a key stakeholder has not been effectively engaged and involved in coastal hazard risk management and adaptation planning. Traditional approaches to planning and managing the coast, including those utilized in WA, have been for the most part engineering-based, with expectations that technical solutions can be found to well-understood problems such as coastal erosion threatening assets.These expectations have in fact rarely been met (Pranzini, 2018). Institutional frameworks need to consider often competing values in areas at current risk or projected to be at risk in the future. I suggest that in WA, there is an inherent need to re-frame risk and vulnerability to take a more sustainable, holistic and integrated approach including consideration of all coastal values. This has occurred to some extent in NSW and Victoria with the introduction of new coastal legislation (Harvey & Clarke, 2019).

Furthermore, as SPP2.6 and its guidelines exist in a larger context of rapid change, an approach was needed 'on the ground' that is adaptive, exploratory and learning-oriented that reflects the communities values, concerns and priorities. This study also examined the communities, stakeholders and policy makers understanding of hazard and risk and how collaborative learning can be utilised so that these elements are considered in the decision-making process.

1.3   Benefits of this research

Research and application of the case studies in this research suggests that values based approaches that incorporate collaborative learning enhance understanding and knowledge uptake of coastal climate change in the community are beneficial (Stocker et al., 2012). The outcomes of this research, which resulted in the creation of new knowledge were relatively consistent across the case study sites. This indicates that there is validity in the methodology, and the outcomes could be cautiously generalised to theory.

1.4   Situating the research

The Peron-Naturaliste Partnership (PNP) is an incorporated collaboration of nine local governments between Cape Peron and Cape Naturaliste in the southwest of WA, being: Bunbury; Busselton; Capel; Dardanup; Harvey; Mandurah; Murray; Rockingham; and Waroona. The coastal areas of the PNP region include several cities and towns that have been identified as vulnerable to the impacts of climate change (Australian Department of Climate Change, 2009; Damara WA, 2012). Recognizing the vulnerability and associated risks, the local government authorities took a proactive role and formed the PNP alliance to take a regional and integrated planning and management approach to address coastal climate change.

Local governments are required to make informed coastal planning and management decisions that need to consider often competing values and interets in areas at current risk or projected to be at risk from coastal hazards in the future. To effectively address these hazards and risks, coastal planning in WA, SPP2.6 requires that a risk management approach be adopted (Western Australian Planning Commission, 2013). Should coastal assets be considered as potentially vulnerable to coastal hazards, coastal managers such as local governments are required to develop Coastal Hazard Risk Management and Adaptation Plans

(CHRMAP). A fundamental component of SPP2.6 is consultation with the community throughout the CHRMAP process, which includes the identification and assessment of community values.

It has been recognised in studies in the south west of WA (ACIL Tasman, 2012; Damara WA, 2012, 2016a) that the community as a key stakeholder, arguably the key stakeholder, has not been effectively engaged in coastal hazard risk management and adaptation planning. Acknowledging this gap, the author of this study who is employed by the PNP, and Dr Laura Stocker, Associate Professor at Curtin University, jointly designed and delivered a community focused coastal climate change study: Involving Communities in Developing Coastal Risk Management Frameworks in Western Australia. Funding for the research project was from the Western Australian Planning Commission (WAPC), Coastal Management Plan Assistance Program and the PNP.

1.5   Introduction to case study sites

This project was undertaken at the 'beach-scale', in key coastal sites in the Cities of Bunbury Rockingham, and Busselton, namely Bunbury Back Beach, Waikiki Beach and Old Dunsborough Foreshore (Figure 1.5.1). These sties were selected in consultation with the local governments and have been identified in previous coastal hazard mapping and studies (ACIL Tasman, 2012; Damara WA, 2012) as being subject to coastal hazards, which are projected to increase into the future. The extent of these projected hazards can be seen in Figure 1.5.1.1, Figure 1.5.2.1 and Figure 1.5.3.1. The case study sites are relatively diverse and include land uses from residential to regional open space with varied services, facilities and access. .
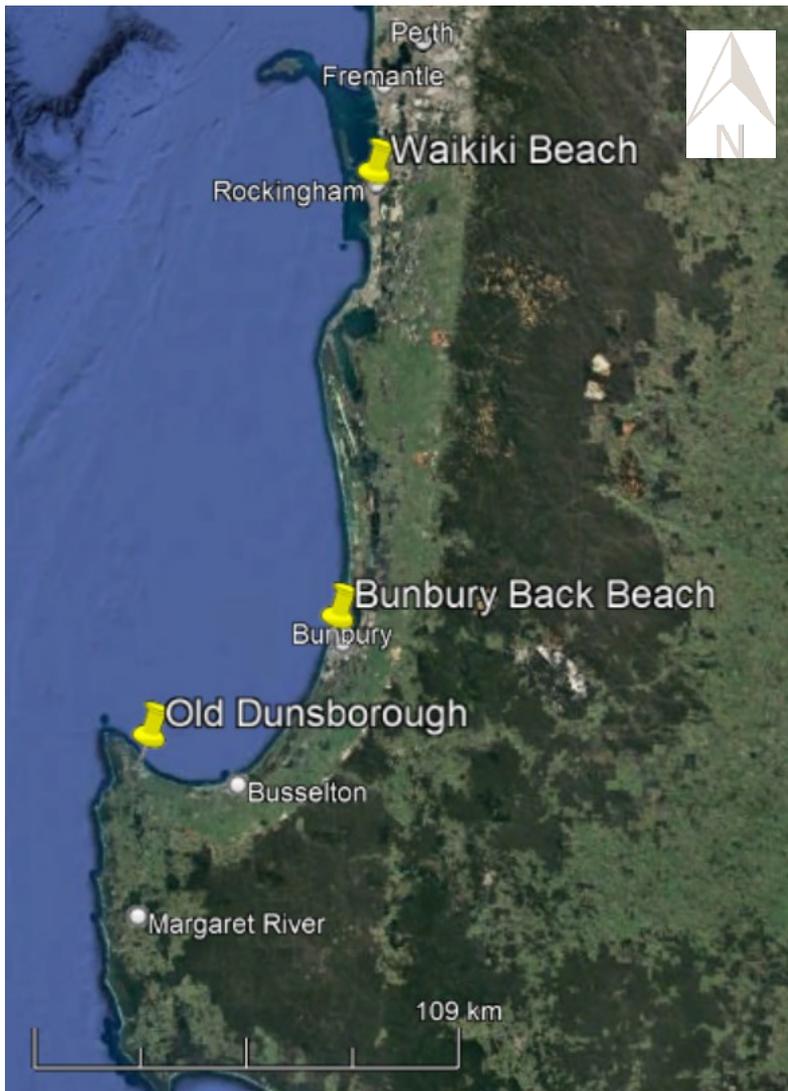
Figure 1.5.1.   Case study site locations.

1.5.1   City of Bunbury - Bunbury Back Beach

In 2018, the City of Bunbury had a population of approximately 33,000. Thirty percent of dwellings are within a five minute walk (300m) of the coastline and/or waterways and all dwellings are within five kilometres of the coastline and/or waterways (City of Bunbury, 2018). The case study area is from Wyalup-Rocky Point to Pendal Street and includes: ablutions; showers; access stairs; car parks; surf club; café; grassed foreshore area; and residential and commercial buildings. Significant coastal management has been undertaken, including construction of a seawall.

Figure 1.5.1.1   Bunbury Back Beach from Wyalup-Rocky Point to Pendal Street, Bunbury. Red line is 0.9m sea level rise scenario in 2100 [high scenario] (Damara WA, 2012).

1.5.2   *City of Rockingham - Waikiki Beach*

In 2019, the City of Rockingham had a population of approximately 136,000, which is

expected to increase to about 240,000 by 2036 (City of Rockingham, 2020). Waikiki beach is

one of the major beaches along Rockingham's 37 km stretch of coastline. The case study area

is from Donald Drive to Short Street and includes: ablutions; showers; access ramp; car park;

basketball court; playground; BBQ's; picnic shelters; grassed foreshore area; a memorial; and

residential and commercial buildings. It has been identified by the WA Government as a

coastal vulnerability hotspot (Stul et al., 2019), and has already required significant

management including construction of a buried seawall and sand nourishment.

Figure 1.5.2.1 **Waikiki Beach - from Donald Drive to Short Street, Waikiki. Blue line is 0.9m sea level rise scenario in 2100 [high] (Damara WA, 2012).**

1.5.3 *City of Busselton - Old Dunsborough Foreshore*

In 2021, the City of Busselton had a population of approximately 40,000, which is expected to

grow to around 60,000 by 2031 (City of Busselton, 2021). The study area is from Curtis Bay

in Meelup Regional Park to Beach Road and includes: ablutions; showers; boat ramp; car

parks; grassed foreshore area; conservation reserve; and residential buildings.
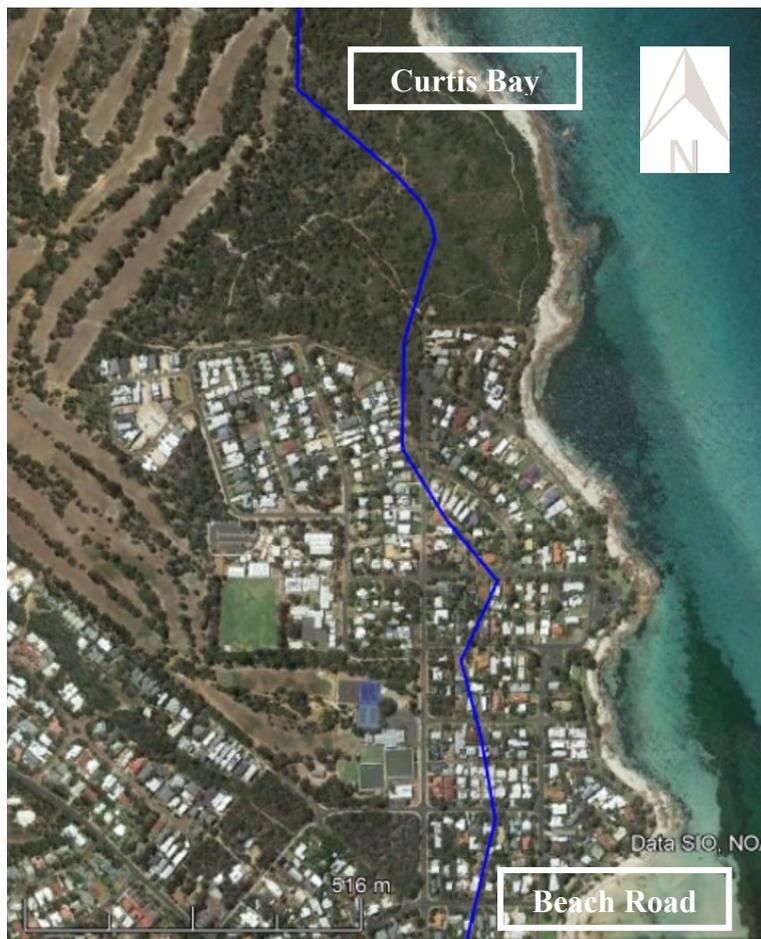
Figure 1.5.3.1   Old Dunsborough Foreshore from Curtis Bay in Meelup Regional Park to Beach Road, Old Dunsborough. Blue line is 0.9m sea level rise scenario in 2100 [high] (Damara WA, 2012).

1.6   Research objective and questions

The primary research objective for this action research is to explore how an understanding of community values can improve coastal adaptation to climate change and sustainability.

Research questions were developed to assist in achieving the research objective.

1. How does the community use and value the coast and how would the values be affected by climate change?

2. How can collaborative learning practices enhance understanding and knowledge uptake of coastal climate change in the community?

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3. How can community values be better incorporated into coastal hazard risk management and adaptation planning?

4. How can coastal hazard risk management and planning better address sustainability?

1.7 Research design and methods

The research project investigated and implemented best practice engagement methods that vary in terms of levels of community participation (Arnstein, 1969; International Association for Public Participation, 2015; Stocker et al., 2012), including public information sessions, community surveys, and scenario planning workshops with collaborative learning objectives to provide a robust approach to gather accurate and reliable community data. The public information sessions were held at the three case study areas to introduce the research project and raise awareness of coastal values, hazards, and risks with the community and stakeholders. These sessions included a Welcome to Country by Traditional Owners, preceded by presentations from the: PNP; relevant local government; WAPC; Department of Transport; and the South West Catchment Council. These presentations provided an overview of: the research; state and local government policy settings; coastal processes, hazards and risks; and approaches to coastal management and adaptation. This phase of the study is not discussed further in this thesis as the aims of this stage do not directly relate to the research objective and questions of this thesis.

Information Sessions → Beach User Surveys → Deliberative Workshops

Figure 1.7.1 Research Project Key Stages

A preliminary review of the literature was used to help formulate the beach user surveys and develop the scenario planning workshop exercises. In addition to academic literature on coastal values and collaborative learning, the review included an examination of social and environmental values assessments undertaken in the PNP region and further afield. The literature pointed to the need to improve our practical understanding of how community values can improve adaptation planning processes. Approaches can include both qualitative and quantitative methods, including participatory approaches. Furthermore, the literature indicated that collaborative learning is an important process in increasing the level of understanding of the community and, thereby, its meaningful contribution to decision-making.

1.8 Thesis structure

The review of the literature (chapter two) explores values in coastal adaptation planning and management. The purpose of the review was to: develop an understanding of coastal values; explore approaches to social learning; investigate coastal hazard and risk management/planning and concepts of risks/coastal hazard; approaches to incorporate values into decision making such as asset and values based tools; and explore development of values based frameworks and relationship to sustainability.

The third chapter explores the approaches and processes adopted to identify community coastal values such as surveys and presents the case study survey method and results. The survey sought to identify how the community use and value the coast and how this would be affected by climate change.

Building upon the learnings and results from the survey, chapter four investigates how participatory workshops can support social learning and presents the case study workshop

method and results. The workshops also produced spatial data that was not derived from the surveys.

Risk based approaches and values based frameworks are discussed in chapter five, drawing on the findings of the case studies. The chapter includes: an evaluation of the current policy framework in WA as it relates to community values and participation; and the rationale for incorporating community values into coastal hazard risk management and adaptation planning.

The concluding chapter summarises: the research findings; knowledge gained from application of the case studies; theoretical and practical implications of this research; and potential future applications.

2 Situating values in coastal adaptation planning and management

2.1 Introduction

Coastal governance is a complex and challenging space, characterised by difficulties in engaging effectively with climate science and its implications, and a broader failure to capture the diverse voices, interests, values, and discourses of coastal users (Clarke et al., 2013). Furthermore, it has been identified in literature that there has been a focus on the vulnerability of the built environment but that social, cultural and environmental values have not been adequately addressed (Aurora Environmental, 2015; Leslie & McLeod, 2007; McGuire, 2013; O' Brien & Wolf, 2010). Thus there is an evident requirement, in the context of coastal risk management and adaptation planning, to identify how the community values the coast (Middle & Scherini, 2013) and how the community views the potential impacts resulting from climate change on these values (Barnett et al., 2011; Western Australian Planning Commission, 2013). This literature review presents an overview of the key elements of this problematic: coastal hazard risk management and adaptation planning as it relates to incorporation of community values; various approaches to collaborative learning; sense of place; and our understanding of the term 'values'. It then presents a new values based framework for use in this thesis.

This chapter illustrates the need to build upon existing values typologies to incorporate the types of assets that characterise coastal environments, and to emphasise sustainability. Recent research indicates that the majority of institutional instruments adopted around Australia are not effectively mitigating the impacts of climate change on coastal values (Elrick-Barr & Smith, 2021). Traditional approaches to planning and managing the coast have been for the most part engineering-based, with expectations that technical solutions can be found to well-understood problems such as coastal erosion threatening assets. These expectations have in

fact rarely been met (Pranzini, 2018). Coastal hazard and adaptation planning governance frameworks tend to prioritise built assets and therefore include a bias towards economic rather than social, cultural and environmental values. Institutional frameworks need to consider often competing values in areas at current risk or projected to be at risk in the future.

Furthermore, acknowledgement of the impacts of climate change on the sustainability of coastal communities, such as loss of beach access, tend to be side lined in favour of the direct physical impacts such as rising temperature (Elrick-Barr & Smith, 2021). This is often referred to as 'outcome' based vulnerability assessment (O'Brien et al., 2007); it does not consider the complex relationships between the economic, social, environment and governance aspects. It is suggested that 'outcome' based vulnerability assessment appears to be the preferred approach adopted by many governance institutions (Elrick-Barr & Smith, 2021).

For these reasons there is an urgent need to re-frame risk and vulnerability to take a more sustainable, holistic and integrated approach including consideration of all coastal values. This has occurred to some extent in NSW and Victoria with the introduction of new coastal legislation (Harvey & Clarke, 2019) but there has been little progress in WA where it has been noted in several cases (Damara WA, 2016b; GHD Pty Ltd, 2016) that the community as a key stakeholder has not been effectively engaged in coastal hazard risk management and adaptation planning. Values based approaches that incorporate collaborative learning practices and enhance understanding and knowledge uptake of coastal climate change in the community are needed.

The imperative for community participation in climate change assessment is enshrined internationally in the 1992 United Nations Framework Convention on Climate Change (UNFCCC) (UN, 1992) and is part of the Third Assessment Report of the Intergovernmental

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Panel on Climate Change (IPCC) (Collins & Ison, 2009). Indeed, since 1992 participation has been consistently promoted as a complement to technical studies.

Coastal cities and towns around the world, including the south west of WA have been identified as being at significant risk from the impacts of climate change, which include sea-level rise, storm surges and changes in storm intensity (Allan et al., 2021; McInnes et al., 2015).

To support local governments and other decision makers to better plan for and manage climate change, risk-based approaches have been widely adopted by governments around the world including England (Kuklicke & Demeritt, 2016) and Australia (Australian Greenhouse Office, 2006) The Australian Government guidance; *Climate change impacts & risk management: a guide for business and government,* which follows the Australian and New Zealand Standard for Risk Management, AS/NZ 4360: 2004, supports decision makers in the risk management process to identify hazards and risks, and develop adaptation actions (Kennedy et al., 2010).

To address coastal climate change hazards and risks, instruments and guidance specific to the coast have been developed to assist with planning and management for coastal climate change impacts. In WA, the WA Coastal Strategy provides the framework for coastal planning and management and establishes the vision, goals and objectives for coastal zone management. The primary coastal planning instrument SPP2.6, recommends that a risk management methodology be adopted to address current and future coastal hazards and risks (Western Australian Planning Commission, 2013). This policy is not dissimilar to legislation, policies and plans adopted in other Australian States including NSW and Queensland, in that they have adopted risk management approaches based on AS/NZ 4360:2004.

Local governments, being the principal decision maker for coastal areas in all Australian States including WA (Harvey et al., 2012), are responsible for undertaking coastal hazard risk management and adaption planning. This, although not a statutory requirement in WA is being undertaken for a number of reasons including to: minimise potential damage to local government assets; reduce loss of natural public assets; minimise potential damage to private property; address potential liability issues; and minimise risk to corporate reputation (Robb et al., 2017). A further consideration for local governments is finding a balance between the benefits that urban development provides, including economic development and the social benefits gained from living close to the coast, versus the potential economic costs associated with damage to built assets from coastal hazards and/or the decision or requirement to protect private and public assets threatened by coastal hazards (Wainwright et al., 2014).

Coastal risk-based approaches such as SPP2.6 generally adhere to Standards Australian risk management processesapproaches. There are six common stages with standard risk processes:

- Establish the context

- Risk Identification – identify hazards, assets and values

- Risk Analysis – determine likelihood, consequences and level of risk. Also includes determining adaptive capacity and vulnerability.

- Risk Evaluation – determine tolerable risk, identify existing controls and assets requiring risk treatment.

- Risk Treatment – identify and evaluate risk treatment options.

- Implementation

It is recommended in SPP2.6 that stakeholder and community involvement and engagement is, to varying degrees, a component in all the above stages; however in practice this is often not undertaken with appropriate rigour or depth (Damara WA, 2016b; GHD Pty Ltd, 2016).

In regards to the relationship of SPP2.6 to 'values' and 'sustainability', the objectives of this policy include to "protect, conserve and enhance coastal zone values, particularly in areas of landscape, biodiversity and ecosystem integrity, indigenous and cultural significance"; and "ensure the identification of appropriate areas for the sustainable use of the coast for housing, tourism, recreation, ocean access, maritime industry, commercial and other activities." (Western Australian Planning Commission, 2013, p. 3). The policy also states that there should be opportunities available for the community to be engaged and to participate in planning for the coastal zone and that the often competing environmental, social, cultural and economic values need to be considered and balanced (Western Australian Planning Commission, 2020).

2.2 Coastal hazard and risk management and adaptation planning

As outlined in the introduction, Australian coastal planning and management is dominated by risk management approaches. The concept of risk is based upon the likelihood of an event(s) occurring and the subsequent potential magnitude of consequences and is generally defined by multiplication of these factors[1]. Due to this, risk assessments tend to give similar value to risks that are highly likely but have a low consequence and/or risks that have a low likelihood but have a high consequence (Kasperson et al., 1988). However, empirical studies of risk perception show that communities can have a more nuanced and comprehensive understanding of risk. Furthermore, other characteristics including a persons: awareness of

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[1] In the coastal context, consequence is a function of exposure, sensitivity and adaptive capacity.

hazards and potential impacts; perceived capacity to mitigate the risk; and free will, all influence a persons understanding of risk (Kasperson et al., 1988). As such, it is argued by Kasperson, Renn et al. (1998) that the technical concept of risk is of limited use in decision-making.Other limitations of the risk approach include: the potentially limited ability to address complex system dynamics of climate change; and the subjective nature of the process, in particular when determining likelihood and consequence in the risk analysis phase (Kennedy et al., 2010). For example, the consequences of loss of a sandy beach could vary considerably depending on whether one considers only economic assets and values or the other social and environmental assets and values (Ardeshiri et al., 2019). In fact, risk-based approaches often overlook non-economic values (Morrissey & Oliver-Smith, 2013) and focus primarily on physical assets. This is partly due to the nature of the methodology, which is often constrained by limited financial and time constraints. This generally results in maintenance and protection of physical built assets (Gurran et al., 2007; Pranzini, 2018) that are easily identified and assessed from an economic perspective (Ardeshiri et al., 2019), and a neglect of less tangible but, I argue, equally important values.

The theoretical relationship between risk, values and community participation in risk based approaches also needs to be considered. Community values and perceived risks must be the central component of any risk assessment. Quantitative modelling and assessments of hazards and risk often do not identify the lived reality of risk and the complexity and dynamism of evolving social-ecological systems (Kennedy et al., 2010). Enabling community members to actively participate in identifying values that underpin risk assessment and management is crucial to broadening and legitimising our understanding of risk.

Not only do the community need to be involved in the risk management process but they should be an active participant in the governance/decision-making process. These frameworks

that result in the production of shared knowledge (Kenchington et al., 2012) are discussed under numerous terms including: deliberative governance (Glavovic, 2014; Hobson and Niemeyer, 2011), co-management (Armitage et al., 2009; Plummer and Armitage, 2013), or collaborative adaptive management (Beratan, 2014; Fernández-Giménez et al., 2019). It is has been noted and observed in research and practice that these shared governance models can effectively address risk (Kenchington et al., 2012).

2.3   Approaches to collaborative learning

Local governments, being the closest level of government to the community, are regularly consulting with residents on a wide variety of matters. Some of these issues are 'wicked problems', which are complex, inconclusive and difficult problems to identify and solve (Head, 2022). Climate change adaptation is an example of such an issue and is an area where local governments are necessarily becoming closely involved (Smith et al., 2016). However 'consultation' activities are often undertaken with limited and ineffectual participation by relevant stakeholders and/or the general community (Preston et al., 2011; Smith et al., 2016). Furthermore, research suggests that in regard to coastal planning, the community are not always very well engaged on this issue (Kenchington et al., 2012). Therefore, there is a need to find alternative approaches to engage the community and have a focus on learning, in order to increase the level of understanding and involvement in the decision making process (Kenchington et al., 2012).This is supported by evidence, which suggests that decisions are more likely to be accepted when the community and stakeholders are involved in the decision-making processes (Reed et al., 2010).

The literature on deep community engagement methods for adaptation (Hartz-Karp & Stocker, 2013) points to the need to improve our theoretical and practical understanding of how community values can be better integrated into the adaptation planning processes.

According to Collins and Ison (2009) community and stakeholder participation is a fundamental component in addressing climate change. In policy and academic circles, Sherry Arnstein's (1969) well known ladder representing increasing levels of participation and power was of seminal significance in 1969 but has been subject to critical analysis as our understanding of participation has deepened (Collins & Ison, 2009). The lower levels of the ladder relate to 'manipulation' with no community participation, through 'informing' and 'consulting' which are tokenistic forms of engagement, to 'citizen power' where citizens make final decisions over (for instance) resource allocation (Collins & Ison, 2009). Armsteins's Ladder has been utilised in the UK and elsewhere to inform the practice of community engagement, but it is argued that this simplistic, linear concept: assumes that the community (and other stakeholders) seek power as their ultimate objective of participation (Tritter & McCallum, 2006); does not reflect the complexities of wicked problems such as climate change that require varied forms of community engagement (Bishop & Davis, 2002); and does not adequately account for the varied roles and responsibilities of the parties involved in the engagement process, which are sometimes not easily defined in terms of their relationship to power and may evolve during the course of the process (Tritter & McCallum, 2006).

As suggested by Collins and Ison (2009) and others, Armstein's 1969 ladder does not adequately address the complex nature of climate change and sustainability when engaging the community in policy discourse. Despite the known limitations of this framework, however models based on the ladder concept have been adopted around the world (Kotus & Sowada, 2017), including in WA's coastal adaptation policy (SPP2.6) for community engagement. Such models suggest that some level of power can be chosen and conferred on communities/stakeholders by policy makers, according to various criteria. Such a relationship of power and decision-making is exemplified in WA's coastal policy whereby the power

resides with government as the holder and creator of knowledge. This thesis suggests that this governance model does not adequately support the identification of the community's social and cultural values, and that the policy needs to move from a position of conferred power to one that promotes collaborative learning and systems thinking. This change will require that public participation is a priority and is sufficiently resourced to create environments amenable to collaborative learning; and that public participation processes shift from informing and consultation to the sharing of ideas, worldviews and norms between all actors in genuine deliberation (Hartz-Karp, 2007). This is particularly important in the coastal environment, which has significant social, cultural, economic and environmental values for the community. It is imperative that these values are key considerations in coastal risk management and adaption planning. Coastal climate change is also a technical issue that requires an understanding of various complex physical sciences such as; coastal geomorphology, geology, meteorological, oceanographic and climatology processes, and ecosystem services. Collaborative learning that supports some community knowledge and understanding of these technical matters will encourage sustainable coastal planning and management (Hartz-Karp, 2007; Stocker & Burke, 2017).

Collaborative learning is more than 'learning', which has an educational focus on an individual (Collins & Ison, 2009; Tritter & McCallum, 2006); it is where mutual learning occurs through co-operative processes with multiple actors such as government officers, academics (scientists) and community members (van de Kerkhof & Wieczorek, 2005). Collaborative learning can be classified according to what is being learned. First or lower order learning results in new learnings or insights for a given policy context (van de Kerkhof & Wieczorek, 2005) ; and second or higher order learning develops new insights into the problem itself and the decision making context (Stocker et al., 2012; van de Kerkhof & Wieczorek, 2005).

In the context of coastal climate change adaptation, the shared creation of knowledge and understanding can build relational capital and result in behaviour change (van de Kerkhof & Wieczorek, 2005). Learning for sustainability involves first and second order thinking: it develops new insights into solutions to address policy problems (Hartz-Karp & Stocker, 2013; van de Kerkhof & Wieczorek, 2005) and it can lead to a shift in the way policy makers, scientists and stakeholders frame the issue (van de Kerkhof & Wieczorek, 2005). It has therefore proven to be an effective tool in the decision making process on matters such as climate change (Hartz-Karp & Stocker, 2013).

It has been observed that second order learning supports systems thinking (Cundill et al., 2012), which can lead to a transformation in societal values and norms, are needed to address the challenges of sustainability and climate change (Saviano et al., 2019). It is maintained by some commentators that government cannot plan or manage social change, which they argue is required to address issues of environmental change such as climate change (Berkhout et al., 2004). For example, the Netherlands Government 'Transition Management' approach, which is based on systems thinking with collaborative learning being a key component (van de Kerkhof & Wieczorek, 2005). Furthermore, this approach emphasises that the role of government is not simply to use its power to impose change, but to enable collaborative learning (van de Kerkhof & Wieczorek, 2005).

There are numerous participatory processes that enable collaborative learning, such as workshops that incorporate the principles of participation, equity and transparency (Stocker et al., 2012). Such participatory processes include values or participatory mapping, which is a useful tool for individuals to collaboratively identify areas of physical, mental and spiritual importance of 'place' (Pánek et al., 2020).

2.4   Place and sense of place

Place is a space with strong biophysical, social, spiritual (Vanclay et al., 2008) and economic (Moore, 1997) connections to a person. These connections can include previous experiences of a particular place or past events or present intentions (Moore, 1997). Sense of place is a connected term describing the relationships that individuals have with the economic, social, cultural and ecological aspects of life (Beatley, 1997). Place and sense of place are both individual and social constructs influenced by location, natural features and built assets, and the varied personal uses, experiences and feelings derived from these geographically explicit features and assets (Cole et al., 2015). Place and sense of place are particularly significant in regards to climate change because climate change impacts will vary by region and locale (IPCC, 2021). For example, variability in coastal processes or beach morphology will be unique at the local scale due to a combination of factors including: regional rate of sea level rise, climatic circulation patterns such as the El Nino Southern Oscillation (ENSO) (Wainwright et al., 2014), Indian Ocean Dipole, tidal regimes, geomorphology, sediment transport pathways, land use (natural or built) and proximity to high water mark etc. Further, how communities experience these impacts will vary according to their use of the coast. As such, the connections that people have to specific places that have special meaning, such as local beaches, could be negatively impacted or lost. As such, it is imperative that these relationships to place are considered, so that decision makers have a clear understanding of how the community interprets and values the coast.

Place and sense of place are, like values, difficult to define and defined in a multitude of ways (Moore, 1997; Vanclay et al., 2008), but they are at the core of our tacit values - our sense of identity and community values (Vanclay et al., 2008). It is problematic to determine metrics for place and sense of place. Previous research has quantified aesthetics as a proxy for place,

although more recent research has focused on qualitative representations of sense of place such as photo elicitation and participant observation (Andrews et al., 2018; Moore, 1997). Methodologies to research place and sense of place can include: surveys; nondirective interviews; photo elicitation, mapping, stories and textual analysis; and ethnographic approaches including participant observation (Moore, 1997). As with place and sense of place, sustainability is also a social construct about the relationships and intersection of the social, environmental, cultural and environmental realms (Moore, 1997).

2.5   Values in policy making

As outlined earlier, the current approaches favoured by policy makers to undertake coastal risk management and adaption planning particularly in WA are asset based approaches that generally produce quantitative results such as economic value of buildings and significantly under represent the broader values held by the community such as health and wellbeing. Moore (1997) noted that although quantitative results are most easily identified, measured and conveyed, qualitative findings can be a better reflection of the meaning and value of place.

On the other hand, values based approaches that have a focus on collaborative learning and sense of place can identify and consider values that have special meaning to the community. These approaches can incorporate surveys that can produce quantitative data, but should also provide opportunities for sharing qualitative experience, knowledge and perspectives (Stocker et al., 2016). Of course, data does have a crucial role in sustainability, and we need the sciences of environment and climate change to inform decisions. It is important to remember, though, that sustainability is about data in a world of values; not values in a world of data. Some processes include: place making; participatory/deliberative workshops; and values mapping (Smith et al., 2016).

Participatory or deliberative workshops that involve participants in the decision-making process can result in a shared understanding and production of knowledge. They can also empower minority groups by giving them a platform to share their thoughts and concerns (McCall, 2003; Stocker et al., 2012). Furthermore, research suggests that participatory workshops are an applicable approach to address climate change and sustainability as climate change impacts such as coastal erosion are felt at the local level (Stocker et al., 2012).

As an element of a deliberative workshop, Brown and Weber (2012) suggest that mapping landscape values is an effective tool to engage the community in decision making and to identify potential conflicts in land-use. It also raises awareness of climate change impacts and sustainability (Stocker et al., 2012) and, as noted earlier, engages with people's sense of place. Mapping has been adopted by many, including Powell (2010) and Stocker et al. (2012), as a tool to demonstrate the connections between community, place and lived experiences. Mapping can highlight how the local environment, cultural and historical connections can influence and define an individual's sense of place (Powell, 2010; Stocker et al., 2012). One successful method of participatory mapping has adopted Geographic Information system (GIS) utilising programs such as Google Earth to inform, involve, and engage the community in visualising places (Patterson, 2007; Stocker et al., 2012) This method has been used for participatory planning for sustainability and climate change. As a collaborative group, stakeholders, policy makers and scientists, identify areas of social, economic, ecological and cultural significance to co-produce knowledge (Stocker et al., 2012). This method has some advantages over traditional mapping techniques that do not employ GIS, such as: the immediacy of using existing hazard mapping and historical/geographical datasets; and being able to easily manipulate maps (McCall, 2003).

The thesis, is adding to previous research on values and sustainability, in that it explores the environmental, and economic aspects of sustainability, but with a focus on the social themes and the intersection of these relationships. Achieving sustainability, in this regard, requires co-production of knowledge and new ways of representing and negotiating perspectives (Stocker et al., 2012). Policy makers and scientists require a range of new or adapted theoretical concepts, research tools, and policy frameworks. In particular, values based sustainability research, and the subsequent formulation and implementation of policies and plans, requires participatory approaches. This values based research uses surveys and participatory mapping to identify participants lived values, and explores how the generation of scientific knowledge, especially climate science, by decision-makers can be improved to enhance sustainability.

2.6   Understanding coastal values

The significance of identifying and defining 'values' cannot be understated as values describe what is important in life (Adger et al., 2009) and what is valued should be preserved and protected (Tschakert et al., 2017). The term 'values' is used in many different ways and is often used quite informally (Dietz, 2013). However, 'values' is also a highly researched concept with a multitude of definitions that are related to various disciplines. For example, the term is expressed differently in anthropology, sociology, philosophy and ecology (Reser & Bentrupperbäumer, 2005). However, there are some common attributes, noted by Schwartz and Bilsky (1987) as: ''(a) concepts or beliefs, (b) about desirable end states or behaviours, (c) that transcend specific situations, (d) guide selection or evaluation of behaviour and events, and (e) are ordered by relative importance'' (p. 551). (Schwartz & Bilsky, 1987). A further common feature in the discourse is that the term 'values' is a social construct and does not exist without the presence of people (Morrissey & Oliver-Smith, 2013; Tschakert et al., 2017). For instance, natural features such as beaches and the ocean are not considered values

in themselves, but they give rise to values (Lockwood 2011 as cited in Munro, Moore, Kobryn, & Palmer, 2015, p. 7). They can be seen for their beauty, for their spiritual/cultural benefits and/or for the provision of recreational amenity (Lockwood 2011 as cited in Munro, Moore, Kobryn, & Palmer, 2015, p. 7).

In environmental management literature, values are often classified as held or assigned. Held values are principles or ideas that are important to people (Schwartz, 2012) such as liberty or justice, whereas assigned values are those that people attach to materials, experiences or opportunities (Lockwood, 1999). Assigned values are a subjective concept and they reflect the cultural, temporal and spatial (geographical) contexts and the perceptions and held values of the person assigning the values (Brown, 1984). There is also a connection between values, time and geographic location via place identity, place attachment, and sense of place (Kenchington et al., 2012; Tschakert et al., 2017) Sense of place is, in part, a function of 'lived values' which are defined as "valuations that individuals make, in isolation or as part of a group, about what is important in their lives and the places they live in" (Tschakert et al., 2017, p. 5). These valuations may be articulated verbally or expressed through everyday activities. (Graham et al., 2013). It has been argued that in regards to researching place based values at a particular geographical location, assigned values are more useful than lived values (McIntyre et al., 2008) and identifying these values is particularly important for decision-makers, as it influences how people behave and any concerns they have for a particular place (Munro et al., 2015).

Lived values are valuations that individuals make, in isolation or as part of a group, about what is important in their lives and the places they live in (Tschakert et al., 2017). They are a beneficial concept in undertaking values based approaches to adaptation as they enable decision-makers to better identify and evaluate the impacts of climate change, and any actions taken to alleviate these impacts on community values (Graham et al., 2014).

There are numerous other typologies of values that have been developed for various policy related purposes. The Millennium Ecosystem Assessment (2005) for example, arranges ecosystem service values into direct use, indirect use and option values (existence and bequest), with direct use being divided into consumptive and non-consumptive (Munro et al., 2015). A similar classification was adopted by Lockwood (2011) as cited in Munro, Moore, Kobryn, & Palmer, 2015, p. 7), who arranged the values of protected areas into: direct use; such as nature-based recreation, education and research; indirect use such as air and water filtering and regulation of climate; non-use or existence such as spiritual connection and appreciating the environment just because it is there, as well as knowing it will be there for future generations (bequest values); and economic values.

Using the term 'social values' in relation to the coast Anthony et al. (2009) developed a typology of four broad categories that will vary according to the local community settings and cultural norms: pragmatic, scholarly, inspirational, and tacit. The simplest values to identify and quantify and therefore the most frequently assessed are pragmatic values; they include revenue generated from recreation, commercial and the tourism industry. Scholarly values are educational/learning activities and include scientific and historical studies. Inspirational values include artistic activities such as photography, literature and painting . Tacit values, which include sense of place and enjoyment of scenery and landscape are often not a major factor considered in coastal decision-making as these values can be difficult to quantify. However, it is important to note that tacit values are often the most significant and emotive as they "derive from and shape individual experiences and beliefs" (Anthony et al., 2009, p. 17). Identifying and including tacit values it is of the utmost importance as tacit values are the reason many people choose to live in coastal environments that possess aesthetic amenities and are often at risk of coastal erosion and inundation (Couzin, 2008). Including tacit values in coastal planning and management is vital as these values underpin all social values and,

arguably, economic values can be highly effective in engaging the community and stakeholders in coastal decision making (Anthony et al., 2009). However, this approach to values classification is problematic because it does not include the physical features of the coast, namely the natural features of the coast and the assets added by governments and residents, on which the social values are based; nor does it express the relationship between social values and physical features. Furthermore, it does not include a normative dimension, that is, how these values intersect with the sustainability of the coast or predicted climate impacts.

Given the wide variety of definitions and typologies, it is not surprising that in coastal planning and management discourse, the term 'values' is often ambiguous and lacks rigour. It can refer to physical attributes of the coast and/or to the wide range of attributed uses and benefits. It is of great importance, particularly in the environment/social science disciplines that values are well-defined and classified, in such a way that the definitions can be put to practical use. How the community values an environment such as the coast not only plays a part in dictating what we value, but is a significant factor in the preferred adaptation actions to manage the environment and the associated values (Dietz, 2013).

2.7   Development of values framework

Coastal areas are inherently physically complex in that they are dynamic terrestrial and marine ecological systems that interact with multiscale climate processes. Coastal areas also often accommodate complex socio-economic systems and are subject to numerous pressures ranging from urban development to climate change. There can also be a multitude of stakeholders often with competing interests and several governing bodies, a characteristic of wicked problems (Kenchington et al., 2012).

There are many coastal community values typologies but they generally have similar categorisations, including: the natural environment with its intrinsic values; the built environment and associated infrastructure, which not only has economic value in itself, but can also provide economic benefits to individuals and groups in the community; social values including sense of community and belonging; and cultural values such as lifestyle, heritage and identity (Barnett et al., 2011; Kenchington et al., 2012). In order to determine what values should be maintained, all these values must be identified and assessed as part of the decision-making process (O' Brien & Wolf, 2010). There is limited research investigating the assessment of all values (O' Brien & Wolf, 2010) and research suggests it is difficult, and perhaps problematic, to quantify environmental and social values (McGuire, 2013). Furthermore, the interactions between values in different categories can be important and complex. For example the coastal zone is also an area where values can conflict, particularly between urban development and environmental and social values (Ware, 2017). There is also research which indicates that the community appreciate and derive social and cultural value from areas deemed to have high environmental values (Ruiz-Frau et al., 2011). In order to better understand these real and perceived incompatible values and incorporate these into the decision-making process, effective engagement and public participation is necessary.

The existing values typologies reviewed for this thesis were found to be neither comprehensive nor sufficiently attentive to these interactions for the purposes of this research. Therefore, a new analytical framework that complements and extends existing theory in this field (Anthony et al., 2009; Munro et al., 2015; Schwartz, 2012) was developed to inform the design and analysis of the coastal values survey and deliberative mapping workshops. In order to gain useful information about participants coastal 'values' there was a need to bring order to this highly ambiguous concept, informed by previous research, stakeholder and governance requirements, and the different perspectives outlined on what constitutes, and does not

constitute, value.

In this framework, coastal values are understood as the product of a cascading set of relationships between four 'orders' of elements:

1. the first order *Natural Features* of the environment include the ocean ecosystem, the beach (including the intertidal zone), the dunes and/or the foreshore, which is often highly modified for human use and flora and fauna. As various authors (James & Anthony; Tschakert et al.; and Lockwood) have made clear, such features are not, in themselves, values but are the foundation for values associated with the coast;

2. the second order *'Built Assets'* depend on, impact on, take advantage of or add value to the first order natural features. For the purposes of coastal adaptation, built assets include public infrastructure such as access and parking (e.g., roads, paths, boat ramps, carparks), picnic/play areas, ablution blocks, utilities (e.g., sewage and power) etc., as well as private enterprises such as cafes and recreation (e.g., surfboard hire);

3. the third order *Uses* that can be seen as equivalent to Anthony's pragmatic, scholarly and inspirational values, as they include activities deriving from both the first order Natural Features and second order Built Assets: businesses, recreation (e.g. boating and fishing), research and education, arts, socializing, as well passive uses such as 'just being there' or observing nature; and

4. the fourth order *Benefits* are derived from the Uses of the coast. Benefits reflect the ways that 'uses' enhance the physical, mental, spiritual, financial, social or cultural wellbeing and experiences of coastal residents and visitors. As such, they relate to Anthony et al. (2009) 'tacit' values, and are arguably the most significant element in defining whether or not 'value' is being created from the first to third order elements.

First order: Natural Features
•Ocean ecosystem, beach, dunes, foreshore

Second order: Built Assets
•Access & parking, picnic/play areas, ablution blocks, cafes &
recreation enterprises, utilities

Third order: Uses
•Active, passive, social

Fourth order: Benefits
•Physical, mental, spiritual, financial, social, cultural

Figure 2.7.1   Coastal values framework.

Sustainability also informs the research design, that is, how some of the values above impact

upon or are impacted by ongoing human activity (Miller et al., 2014; Stocker et al., 2012). As,

sustainability deals with social, cultural, economic and environmental aspects of the coast, it

is important that technical information supports, and is supported by, clear understanding of

how the community interprets and values the coast. This research project encompasses a wide

range of aspects of sustainability, not just economics:

- environmental, that is the natural world. This relates to the first order elements of the

  coastal values framework;

- economic aspects, reflecting the life cycle of production, consumption and

  recycling/waste management, which relate to the second and third order elements of

  the coastal values framework;

- social, reflecting how people organize to meet their various needs, and how they feel

  they belong. This relates to the third and fourth order elements; and

- cultural, reflecting how people make meaning of their lives through their customs. This relates to the fourth order elements.

Timeframes are also critical to the issue of climate risk (Pahl et al., 2014). In the context of coastal planning in WA, this means looking at the present coastline and the 100 year planning timeframe, to better understand what communities currently value on the coast and how these values may be impacted as a result of climate change. As noted in the introduction of this thesis, the latest IPCC report (AR6) states that the impacts of climate change will continue to increase as warming continues. As such, the way the community relates to, and values the coast will change as the coast changes (Anthony et al., 2009) not only as a result of climate change, but also potentially as a result of the adaptation options we implement to minimise the risks. For example, the construction of a sea wall to address coastal erosion to protect built assets will have an impact on community values. There may be loss of values associated with a sandy beach, but other values related to the construction of a boardwalk could be created.

3   Identification of community coastal values

3.1   Introduction

The images and narratives people often see, hear and read regarding climate change are of fires, drought, shrinking ice caps, loss of wildlife habitat, flooding and coastal erosion. However, research suggests that what is truly important to some are not the physical impacts themselves, but the effects these have on people's lifestyle and what they value; both economic and non-economic (Fankhauser & Dietz, 2014), as discussed above. The loss of these intangible non-market values, have been argued by some as being beyond measure (Adger, Barnett, Chapin, & Ellemor, 2011); therefore, it is suggested that processes should be developed and adopted to identify and assess qualitatively what is valued by the community (Fankhauser & Dietz, 2014).

There are diverse ways to gather social values data through for example; public value and preference surveys and participatory workshops. This chapter focuses on surveys. Surveys are utilised in psychological and social research to describe and explore human behaviour, opinions, attitudes and intentions etc (MacCallum et al., 2019; Singleton & Straits, 2018). Surveys can use quantitative approaches, through for example: questionnaires with numerical ratings and codified responses; or qualitative approaches such as open-ended questions; or a combination of these (mixed methods). There are many methods to collect survey data, including: in person (face to face), online, by mail, and by phone.

3.2   Survey design

As identified in the introduction, the case studies are located in the southwest of WA at Bunbury Back Beach (City of Bunbury), Old Dunsborough (City of Busselton) and Waikiki Beach (City of Rockingham). These sites have varied economic, social, environmental and

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cultural assets that have been identified as being vulnerable to the impacts of coastal climate change and are representative of many coastal communities. All three sites were identified as vulnerable in the Developing Flexible Adaptation Options for the Peron Naturaliste Coastal Region of Western Australia Reports (ACIL Tasman, 2012; Damara WA, 2012).

The research objective of the survey was to; identify how the community use and value the coast and how would this be affected by climate change? Based on the model presented in the previous chapter, the survey questions were developed to identify:

1.   What are the environmental features of the coast that are important to the community?

2.   What are the built assets on the coast that are important to the community?

3.   What are the uses (direct, indirect, existence) that the community has for the coast?

4.   What are the benefits that these uses bring?

The survey was developed in consultation with the local governments mentioned above and the PNP. The survey instrument drew on the values, sustainability and timeframe concepts described in Chapter 2. In addition to gathering some basic demographic and residential location data, questions were developed to elicit perspectives on what elements of the coast are valued by participants, and/or contribute to the region's sustainability, and need to be preserved for the future. They were structured in three sections addressing demographics; the features/assets, uses and benefits of the coast; and the potential impacts of climate change. The second and third sections included Likert scale questions as well as open questions designed to generate qualitative data. The survey (for Bunbury Back Beach) is provided as Appendix A.

Two survey methods were adopted: face to face and online (using the same survey questions which noted the geographical boundaries of the sites). The survey was promoted using a number of techniques: online via the local government and PNP website (www.peronnaturaliste.org.au); and in local media. Data collection for the survey was undertaken by PNP Officers with assistance from volunteers at Old Dunsborough, which was made available to the present researchers. The face to face survey was undertaken by intercepting random consenting adults at the beach. The online survey was unrestricted and self-selected. Qualitative comments and stories were also collected. To ensure that a wide demographic of beach users had the opportunity to participate, the face to face survey was delivered at different days and times over the survey period. Key stakeholders in the study areas such as businesses, non-government organisations, schools and community groups were also asked to complete the survey using purposive sampling.

Those who did not wish to complete a face-to-face survey were provided a handout that included a link to the online survey. Two signs at each survey site were erected providing a brief summary and a link to the online survey. A letterbox drop of approximately 100 letters was undertaken to households in the streets directly adjacent and a couple of streets back from the Waikiki Beach study area. The letter provided an overview of the project and directed people to the online survey. The online survey comprised the same questions as the face-to-face survey and was delivered using Survey Monkey.

To complement the face to face survey, the PNP set up an Information Booth at Bunbury Back Beach on two days for approximately four hours on each occasion. The booth provided beach users an opportunity to complete a survey, discuss issues, provide qualitative comments and stories (as did the face to face surveys) and view information and examples of coastal adaptation.

The online and face to face surveys commenced in September 2017 and concluded in April 2018. They thus included the seasons of spring, summer and autumn. The survey comprised of 31 questions. In total, 87 surveys were completed at Bunbury Back Beach, 87 at Waikiki Beach and 88 at Old Dunsborough Foreshore. Of these, 19 were face to face at Bunbury Back Beach, 6 at Waikiki Beach and 27 at Old Dunsborough. Note that in some instances not every question in the survey was answered.

3.3   Survey results and analysis

The number of surveys completed was relatively small when compared to the population of the 3 local government areas. As such, it should be noted that the results should not be used to make inferences of these local government areas and/or the wider population.

3.3.1   Demographics

To assess if the beach users survey dataset was representative of the broader local government populations, an analysis was undertaken to compare the age and gender profiles of respondents completing the beach user surveys (the sample) with the populations of the relevant local government areas.

As can be seen in Figure 3.3.1.1, Figure 3.3.1.2 and Figure 3.3.1.3, there are differences, but the demographics of the beach user survey are generally representative of the local government populations across all three sites. There is an under representation in the under 18 category, but this was expected as the survey was not designed for minors. Other notable differences include an under representation in the 18 – 20 category in Bunbury and Waikiki, but an over representation in Old Dunsborough. This over representation in Old Dunsborough could reflect anecdotal reports that more young people seem to be actively engaged in social and environmental issues in this community than in the other two communities. There is also

an over representation in the middle age categories across all sites. This over representation could reflect the demographics of those that go to the beach and/or completed the survey. An alternative or additional explanation lies in the observation that this over representation is not dissimilar to community surveys on other matters undertaken by local governments and could suggest simply that middle age community members are more likely to complete surveys.
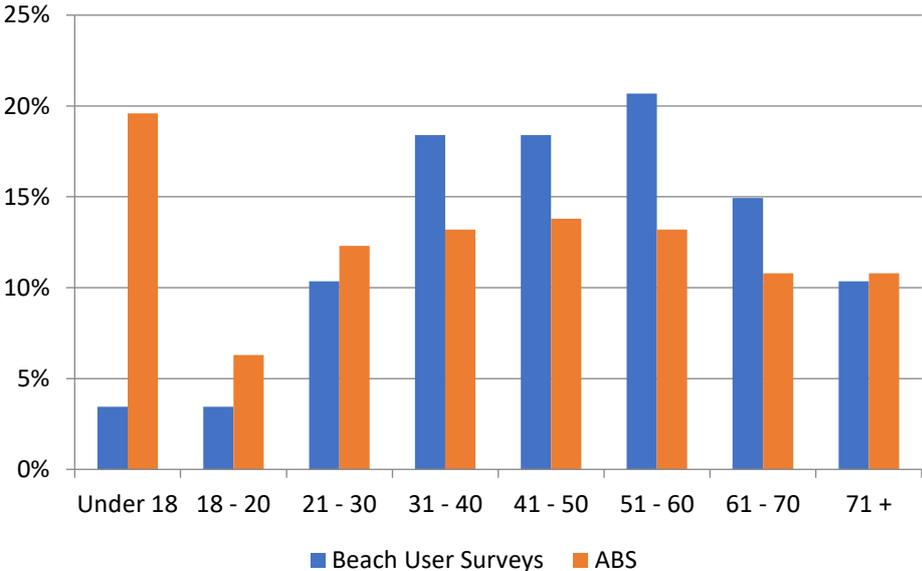
Figure 3.3.1.1   Bunbury Back Beach comparison by age of ABS data and beach user surveys (n=87).
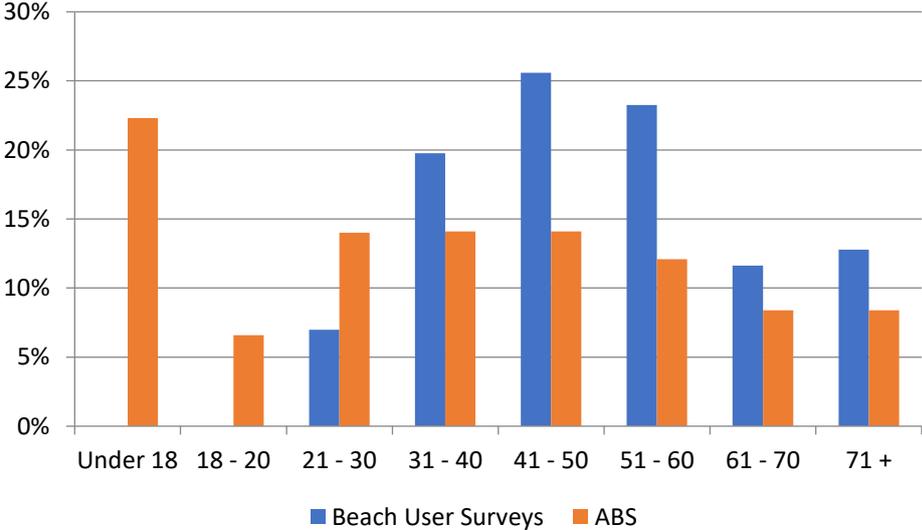
Figure 3.3.1.2   Waikiki Beach comparison by age of ABS data and beach user surveys (n=87).
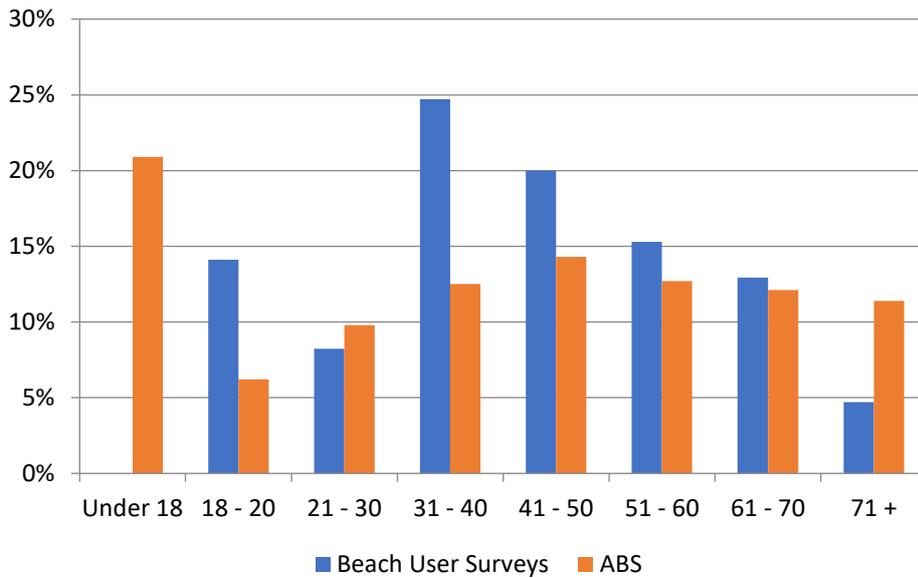
Figure 3.3.1.3   Old Dunsborough Foreshore comparison by age of ABS data and beach user surveys (n=85).

Note: There was a relatively minor discrepancy in the age categories between the beach user survey and the Australian Bureau of Statistics (ABS) data. As the differences were fairly insignificant, comparison between the two datasets was considered to be adequate for the purpose of this research.

In regards to gender (Figure 3.3.1.4), more females than males completed the survey. This result reflects the ABS data showing a larger proportion of females than males in all three sites. However, a discrepancy between the beach user survey and ABS data in the female/male ratio is notable in Bunbury and Waikiki: a disproportionately large number of females completed the survey. There is no such discrepancy at Old Dunsborough Foreshore.
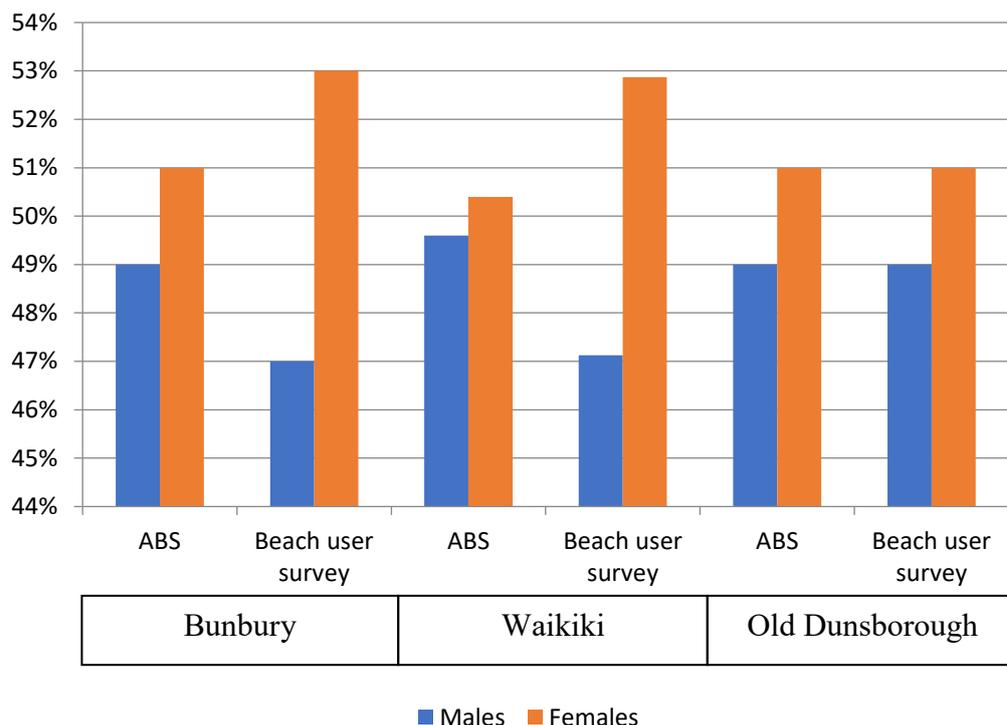
Figure 3.3.1.4 **Gender differences between ABS data and completed surveys and by location.**

In regards to where respondents who completed the beach user survey reside, Figure 3.3.1.5 shows whether they live in/near the study area, in the wider local area, in the local government area or outside of the local government area. As can be seen there is range of responses across a wide geographical area for all three sites, which illustrates that the survey reached community members who did not live in the immediate vicinity. Targeting all beach users and not just residents was an intention of this survey.
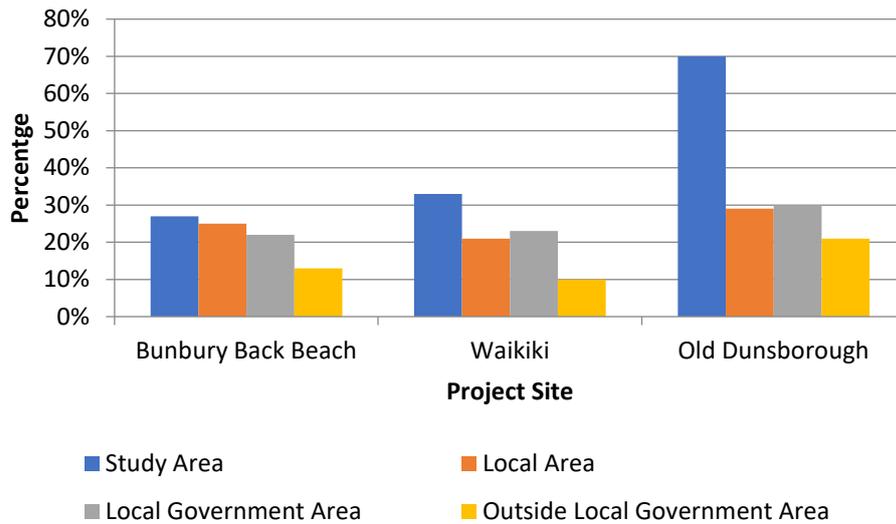
Figure.3.3.1.5   Responses to survey question - What suburb do you live in? (n=261).

In relation to how close respondents live to the beach (Figure 3.3.1.6), there was a wide spread of responses across the three sites, with most living between a couple of streets back from the beach/foreshore to between about one and ten kilometres. The smallest cohort in Bunbury and Waikiki was those living further than 10km away and in Old Dunsborough those directly adjacent. This could reflect that Bunbury and Waikiki are more 'local beaches' as compared to Old Dunsborough, which is more of a 'regional beach' that people drive to or visit whilst on holidays.

Figure 3.3.1.6   Responses to survey question - How close to this beach/foreshore do you live? (n=250).

3.3.2 Online and face to face survey differences

When comparing the online results to the face to face results overall there were no notable difference in the results.

3.3.3 Seasonal differences

There were no remarkable seasonal differences in trends across the three sites.

3.4 What is valued?

Following is a summary of key results from the survey that combines the online and face to face surveys.

3.4.1 Open questions – what is important?

Regarding the benefits of living close to the beach and what the associated coastal values are, the following word clouds were generated from open questions in the online surveys. The size of the text reflects the number of times the word was cited by respondents.

As can be seen in Figure 3.4.1.1, Figure 3.4.1.2 and Figure 3.4.1.3, there were common themes across the three sites. The framework was used to analyse the data. First order: Natural features such as the beach and environment were prominent as were Third order: Uses of the coast such as swimming and walking and the Fourth order: Benefits (physical, mental and spiritual) provided by the coast. Built assets were not mentioned to any great extent, despite the fact that these assets enable and support some of the uses and benefits (third and fourth order) and can add value to the natural features (first order). On the other hand, the benefits of the coast to the community featured strongly. It is argued that these tacit values are the most important and significant (Anthony et al., 2009; Couzin, 2008) and difficult to identify (McGuire, 2013). This demonstrates the usefulness of this framework and the rationale for its

development to bring order to the often obscure concept of value.

Figure 3.4.1.1   Responses to survey question - Why is it important to you [to live close to this beach], what are the benefits? Bunbury Back Beach (n = 59).

Figure 3.4.1.2   Responses to survey question - Why is it important to you [to live close to this beach], what are the benefits? Waikiki Beach (n = 70).

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Figure 3.4.1.3 Responses to survey question - Why is it important to you [to live close to this beach], what are the benefits? Old Dunsborough (n = 47).

3.4.2   First and second order elements – natural features and built assets

Regarding the importance of natural features and built assets of the beach/foreshore, across the three sites (Figure 3.4.2.1, Figure 3.4.2.2 and Figure 3.4.2.3), *environmental features such as clean water, vegetated dunes, native trees and animals* were rated as being most important. *Public safety, public facilities, facilities for active recreation* and *Indigenous and other cultural sites* were rated highly important by many. *Private residences adjacent to the beach* were rated by many respondents at all three sites as being not important. This could reflect that the majority of respondents did not live directly adjacent to the beach/foreshore. *Restaurants, cafes, tourism ventures* and *access infrastructure* were rated as being of least importance at Old Dunsborough compared to other sites This could be due to there being no permanent cafés at/or relatively close to this beach and this beach/foreshore not being on a major road as is the case in Bunbury and Waikiki.

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Figure 3.4.2.1   Responses to survey question - How important are the following assets and qualities of this beach/foreshore to you? Bunbury Back Beach (n = 87).
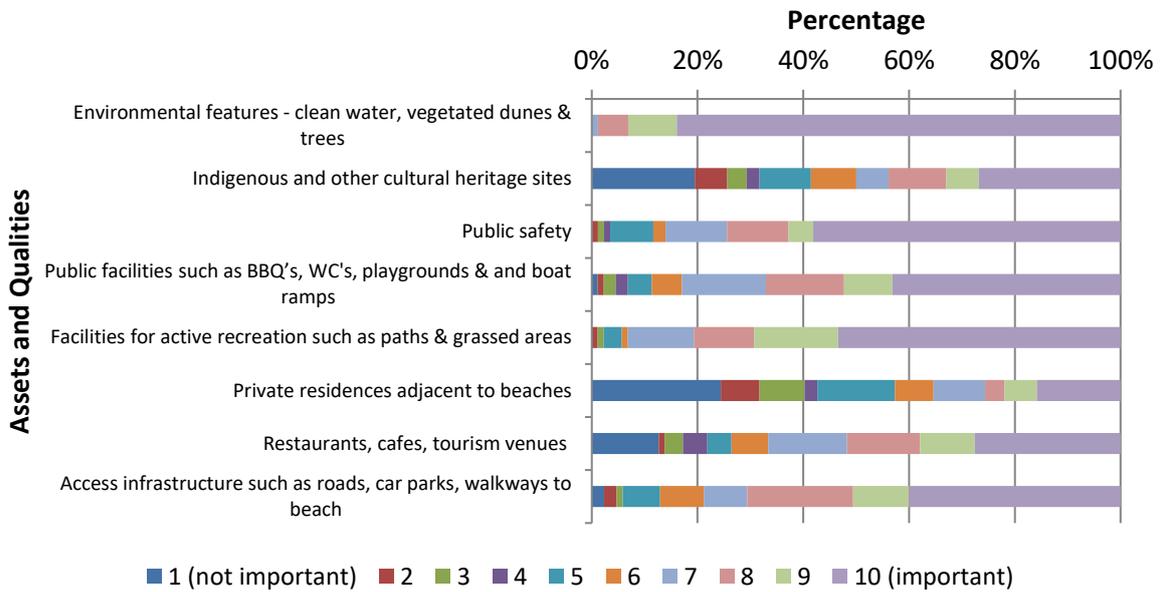
Figure 3.4.2.2   Responses to survey question - How important are the following assets and qualities of this beach/foreshore to you? Waikiki Beach (n = 87).
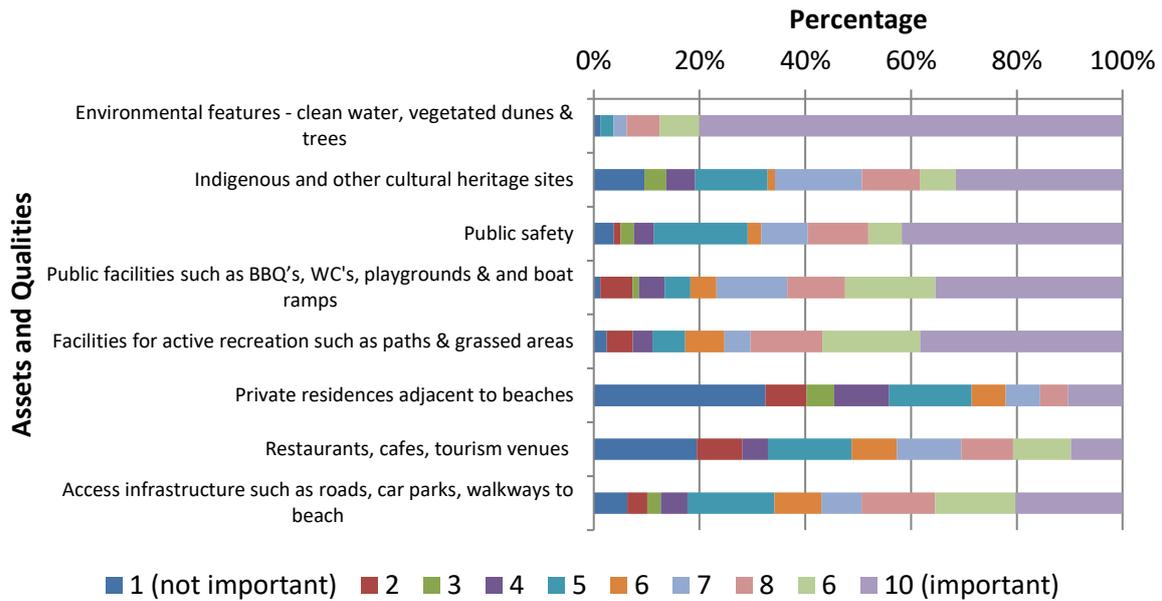
Figure 3.4.2.3 **Responses to survey question - How important are the following assets and qualities of this beach/foreshore to you? Old Dunsborough (n = 88).**

3.4.3 *Third order elements - uses*

The main uses of the beach are shown in Figure 3.4.3.1. Results are similar across the three sites. Active uses such as walking/running and swimming, which are generally supported by the Natural features and/or Built Assets elements and social uses such as time with family/friends, which are arguably dependent upon the relationship humans have with an Environmental Feature or Built Asset, were the highest ranking uses across all sites. These uses correspond with the importance of living close to the beach illustrated above in Figure 3.4.1.1, Figure 3.4.1.2 and Figure 3.4.1.3. Boating/jet skiing was the lowest ranking use, although more respondents undertook this activity at Old Dunsborough, probably due to the location of the boat ramp at this site. Passive uses such as observing nature and relaxing/spending time alone, also rated a strong mention.
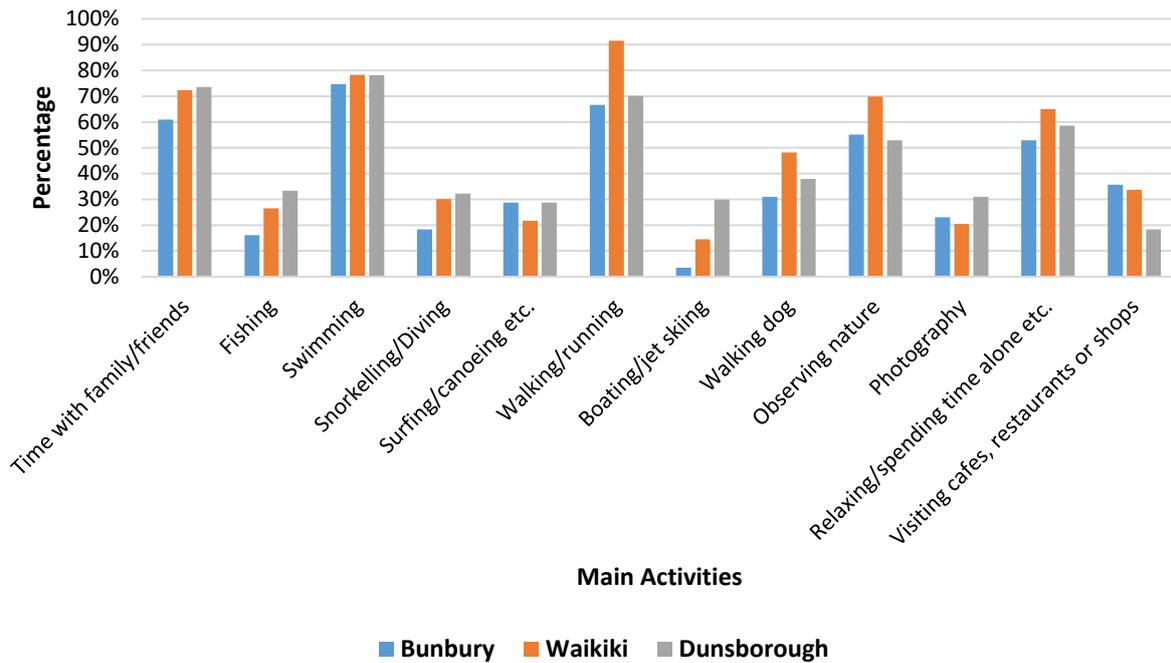
Figure 3.4.3.1   Responses to survey question - What are the main activities you do while you are at this beach/foreshore? (select all relevant) (n = 257).

3.4.4   Fourth order elements - benefits

In terms of the benefits to lifestyle, health and/or wellbeing of being at the beach/foreshore, the results were similar across all sites. Mental/emotional health benefits were rated as having the highest importance by approximately 60% or respondents across the sites. Physical benefits were rated highest importance by about 50% and spiritual/cultural benefits were rated highest importance by about 30%. The results indicate that the beach/foreshore provides benefits across the board and is an important place for physical/mental health for the majority and has spiritual and cultural benefits for many. These responses align with the answers provided to the importance of living close to the beach question (Figure 3.4.1.1, Figure 3.4.1.2 and Figure 3.4.1.3).

3.4.5   Sustainability and timeframes

Respondents were asked to consider the sustainability of the future of the coast, and the potential need to manage climate impacts. In relation to adaptation options needed to manage

coastal hazards such as erosion and flooding into the future (Figure 3.4.5.1, Figure 3.4.5.2, and Figure 3.4.5.3) results were comparable at the three sites with stronger support for fencing of dunes/revegetation and preventing further development in hazardous areas. There was more support in Old Dunsborough for preventing further development in hazardous areas. Respondents at all sites were strongly against doing nothing. There was not a high level of support for installing hard coastal protection.
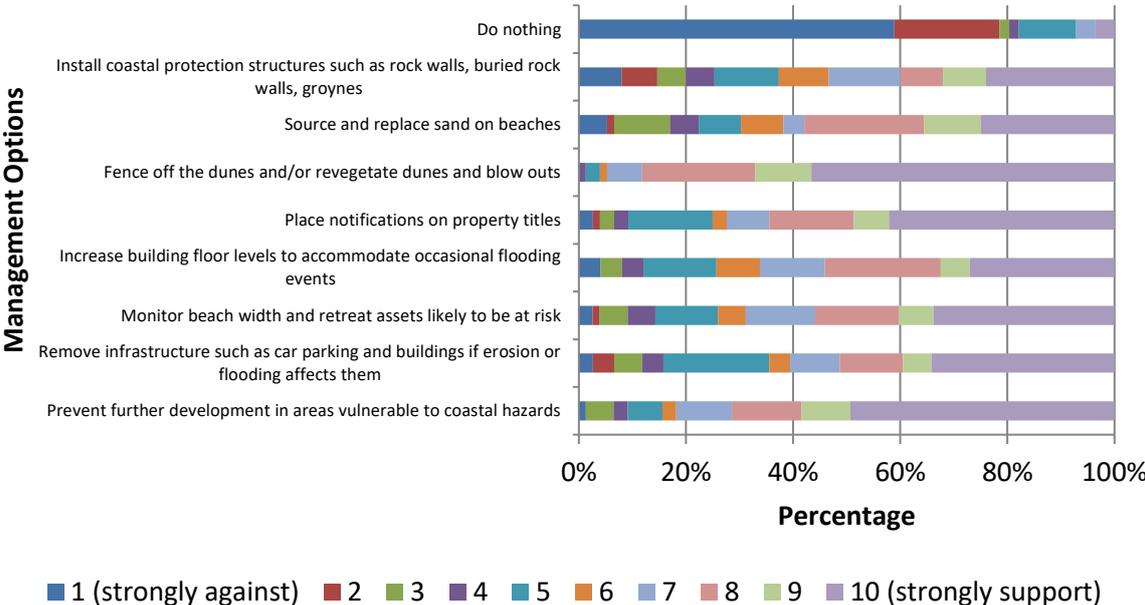
Figure 3.4.5.1   Responses to survey question - There will probably be a number of different options needed to manage coastal hazards such as erosion and flooding into the future. Please rate your level of support for the following management options for this beach/foreshore. Bunbury Back Beach (n = 87).
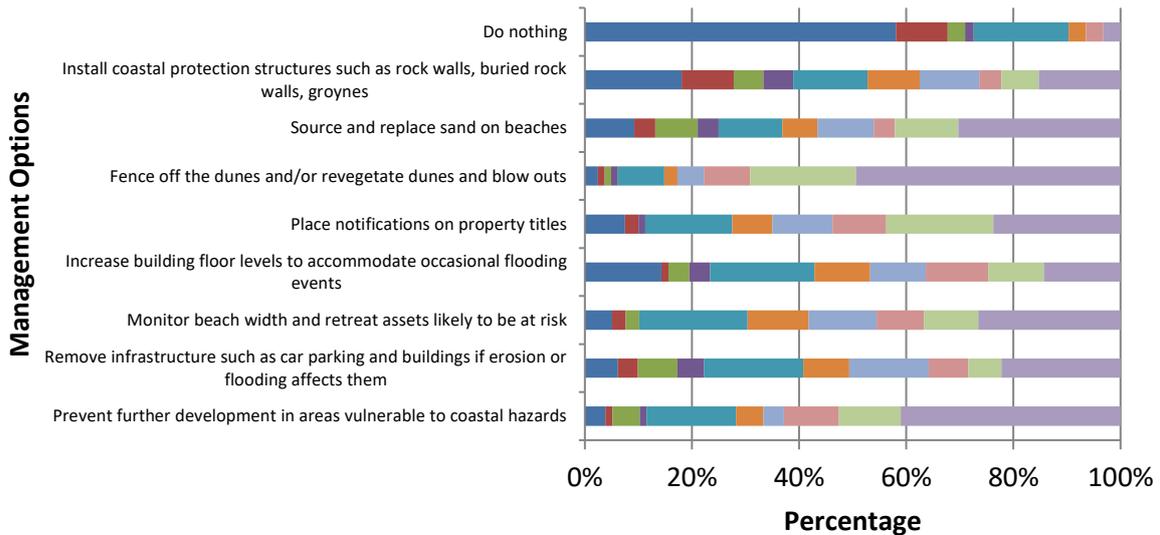
Figure 3.4.5.2 Responses to survey question - There will probably be a number of different options needed to manage coastal hazards such as erosion and flooding into the future. Please rate your level of support for the following management options for this beach/foreshore. Waikiki Beach (n = 87).
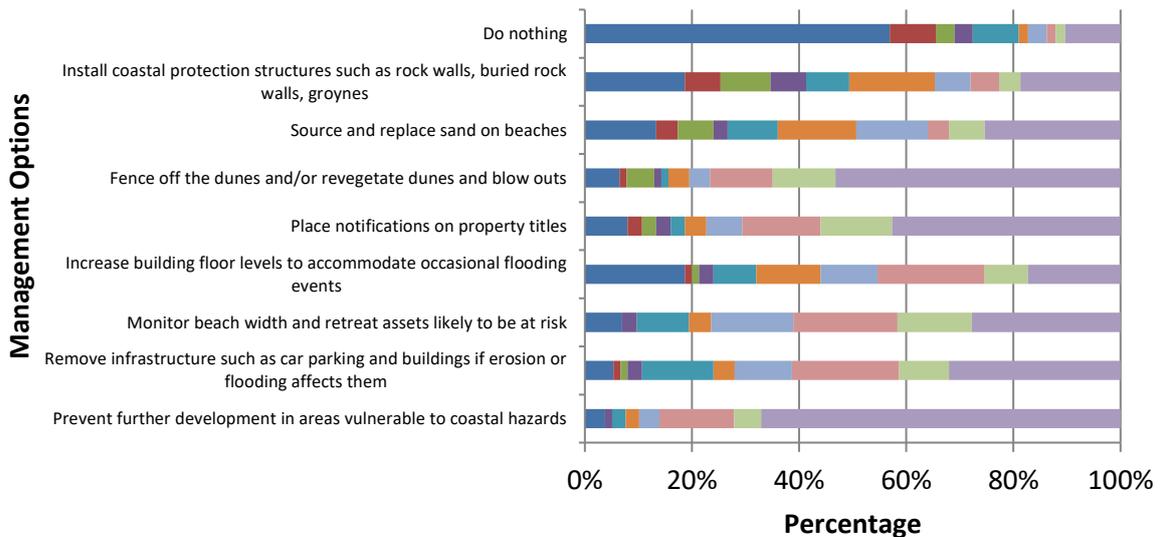
Figure 3.4.5.3 Responses to survey question - There will probably be a number of different options needed to manage coastal hazards such as erosion and flooding into the future. Please rate your level of support for the following management options for this beach/foreshore. Old Dunsborough (n = 88).

3.5 Discussion

3.5.1 Summary of survey results

The results of the surveys across the three sites were fairly similar. However, Bunbury and

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Waikiki were more similar to each other in many respects than either was to Old Dunsborough. This could be due in part to the physical differences at the Old Dunsborough site that included assets such as a regional park and a boat ramp. The results also indicated that more young adults frequent and/or live in the Old Dunsborough area. Furthermore, people travel further to visit Old Dunsborough, a finding that corresponds with it being more of a holiday destination and 'regional beach' than Bunbury and Waikiki. Other key findings across all sites included:

- the importance and benefits of living close to the beach at all three sites were similar. Natural features such as the natural beach and environment and the physical, mental and spiritual benefits these provided were of greater importance to respondents than were built assets;

- the most popular uses at the three sites were walking/running, swimming and spending time with family and friends. More people indicated walking/running in Waikiki (Figure 3.4.3.1), which could be due to the extensive footpath/cycleway and facilities along the foreshore reserve;

- the mental/emotional health benefits of visiting the beach/foreshore were of highest importance to the majority of respondents across the sites, followed by physical and spiritual/cultural benefits;

- environmental features such as clean water, vegetated dunes, native trees and animals were of most importance while private residences adjacent to the beach were not important to the majority; and

- in regard to the management of coastal hazards, respondents at all three sites indicated strong support for fencing dunes/revegetation, preventing further development in hazardous areas and planned retreat and minimal support for doing nothing.

In order to determine if there was any bias in the results between those that live directly adjacent to the beach/foreshore and those that do not, a simple analysis was undertaken. The responses reveal several differences, as set out below. It should be noted that the responses from those living directly adjacent were relatively few (Bunbury n=6, Waikiki n=12 and Old Dunsborough n=9).

3.5.1.1 *Bunbury*

- In relation to the importance of assets and features of the beach/foreshore, the responses from those living directly adjacent to the beach placed higher importance on *public safety* (~67%) compared to all responses (~36%) and *private residences adjacent to beach* (~50% as compared to ~8%).
- In regards to options to manage coastal hazards, those living directly adjacent were more against *placing notifications on titles* (~25% [strongly against] as compared to approximately ~6%) and not supportive of *removing infrastructure if hazards impact them* (0% [strongly support] as compared to ~26%).

3.5.1.2 *Waikiki*

- In regards to the importance of assets and features of the beach/foreshore, the responses from those directly adjacent to the beach placed more importance on private residences adjacent to beach (~55% [high importance] as compared to ~13%).
- In regards to options to manage coastal hazards, those adjacent to the beach were more supportive of installing coastal protection (~30% [strongly support] as compared to ~11%) and more against placing notifications on titles (~36% [strongly against] as compared to ~6%).

3.5.1.3 *Old Dunsborough*

- In regards to the importance of assets and features of the beach/foreshore, the responses from those directly adjacent to the beach placed more importance on: public safety (~60% [high importance] as compared to ~33%); and private residences adjacent to beach (~60% [high importance] as compared to ~8%).

- In regards to options to manage coastal hazards, there were some noteworthy differences between those adjacent to the beach and all responses. For example: all of the responses from those directly adjacent were strongly against *doing nothing* (compared to ~33% for all responses); more were against *placing notifications on titles* (40% [strongly against] as compared to ~6%); more were against *sand replenishment* (60% [strongly against] as compared to ~10%); more were against *removing infrastructure if hazards impact them* (~40% [strongly against] as compared to ~4%); and more were against *installing coastal protection* (~40% [strongly against] as compared to ~14%). This is in contrast to responses received from Waikiki, who were more supportive of installing coastal infrastructure.

Many of the differences noted above are not surprising given that those living directly adjacent to the beach/foreshore have homes at potential risk and as such it could be argued that they would likely place greater importance on these assets and the subsequent (economic and non-economic) benefits and in the selection of management options.

It was of interest to note that those living adjacent to the beach in Old Dunsborough were against installing coastal protection. This is in contrast to those in Waikiki who were supportive of installing coastal protection. Those living adjacent to the beach in Old Dunsborough were also against sand replenishment, but strongly against doing nothing. This is a somewhat surprising result and suggests a need for further research in this area.

3.5.1.4 *Review of survey methodology*

When comparing the face to face and online surveys, face to face surveys provided participants with an opportunity for further discussion and assisted in meeting key stakeholders, but required significant time and resourcing. The assistance of the volunteers in Old Dunsborough resulted in considerably more face to face surveys being completed and was of great benefit. Furthermore, the information booths held at Bunbury were of value as people were able to approach officers to complete a survey, gain further information and enter into discussion. The online surveys were highly beneficial as they delivered the most responses, with the vast majority of people answering most, if not all questions and the process required limited resourcing. The distribution of letters in Waikiki directing them to the online survey could have been a contributing factor for the high level of online responses in this locale.

Survey response from the under 18 and 18 – 20 age brackets was underrepresented as compared to the ABS population data. This reflects the fact that the face to face and online surveys did not target under 18's. Schools were contacted for assistance, but no responses were received and the survey ended up excluding minors. Contacting schools (and identifying interested teachers) earlier in the process and clearly linking the project to the school curriculum could have increased feedback from the under 18 cohort.

In order to minimise potential biases in the results, surveying a wide range of community members including those who may not visit the beach frequently is important. To capture this information, the survey posed the question: 'how often do you visit this beach/foreshore for recreation?', approximately 14% in Bunbury; 11% at Waikiki; and 28% in Old Dunsborough, visited the beach occasionally, seasonally or rarely. Furthermore, as local government rates are utilised in management of coastal areas it is important that responses on coastal values are

sought from residents that may not live and/or regularly frequent the beach. Although there was some promotion online via the local government and PNP websites, in local newspapers and in social media, increased promotion on local government social media platforms such as Facebook and Twitter could have assisted in getting feedback from a broader range of the community, including the younger demographic. Setting up a booth at local government events and shopping centres could also have assisted.

In regards to the length of the survey, it took on average about 15 to 20 minutes to complete. If the number of questions was reduced to only include those that are of primary significance, more people would potentially have completed the survey. For example, could exclude questions related to; timing and duration of visit to beach, and association of the beach to business and comminity groups Furthermore, for the the face to face surveys, more surveys could have been completed in a given time period.

3.6 Conclusion

In conclusion, the survey was an effective tool to identify how the community use and value the coast and how they perceive these uses and values could be affected by climate change. Specifically, the survey results identified;

- What are the environmental features of the coast that are important to the community - clean water, vegetated dunes, native trees and animals were rated as being most important.
- What are the built assets on the coast that are important to the community - public facilities and facilities for active recreation were rated highly important by many.
- What are the uses (direct, indirect, existence) that the community has for the coast - active uses such as walking/running and swimming, and social uses such as time with family/friends, were the highest ranking uses across all sites

- What are the benefits that these uses bring - mental/emotional health benefits were rated as having the highest importance followed by physical benefits, then spiritual/cultural benefits.

The outcomes partly addressed the objective to explore how an understanding of community values can improve coastal adaptation to climate change and sustainability and addressed the first of four research questions to identify how the community use and value the coast and how would the values be affected by climate change. However, this survey instrument did not capture spatial observations, which are a very important aspect of coastal management; nor did it facilitate collaborative learning. Mapping the intersection of coastal hazards and community values was explored in the participatory workshops, which also supported collaborative learning The following chapter seeks to answer the research question; how collaborative learning practices enhance understanding and knowledge uptake of coastal climate change in the community.

4   Collaborative learning through participatory processes

4.1   Introduction

This coastal climate change research project included participatory workshops that used collaborative learning practices to enhance understanding and knowledge uptake of coastal climate change in the community and informal coastal decision makers dealing with the challenges of climate change. In this chapter, I examine the learnings and outcomes from three communities in south west of WA where we held deliberative/participatory workshops. The workshops demonstrated collaborative learning and created opportunities for community dialogue about values and priorities. It was effective in identifying coastal values and verifying and deepening our understanding of coastal values identified in the beach user surveys. Importantly, the workshops extended and complemented the survey results with qualitative, deliberative, and place-based data through the method of participatory values mapping.

Research and practice show that frameworks are needed to rigorously assess those values of great importance to the community, and subsequently incorporate these into coastal planning and management. For example, values based approaches, including surveys and deliberative or participatory workshops such as values mapping, can generate both qualitative and quantitative data (Singleton & Straits, 2018; Stocker et al., 2012). Public Participation Geographic Information System (PPGIS) is one method used to spatially map assigned values (Seymour et al., 2010). McIntyre et al. (2008) demonstrated how assigned values could be mapped and integrated into environmental planning and management. PPGIS can also be used to engage the community in decision making to spatially prioritise trade-offs between conflicting values (Seymour et al., 2010) and land use (Brown & Weber, 2012). Previous research and practice (Johnson et al., 2018; Stocker et al., 2012) have designed and developed

PPGIS workshops that involve the general community, technical experts and policy makers, in jointly exploring issues and options, visually and semantically, to generate open discussion between all participants in the creation of empirical and experiential knowledge that is qualitative and interpretive (Stocker et al., 2012). PPGIS can also be used to identify hotspots where areas with environmental, cultural, economic and social values intersect (Brown & Raymond, 2007; Stocker et al., 2012).

Furthermore, effective community engagement, as enabled by values based approaches such as PPGIS is a requirement in current coastal policies such as SPP2.6. PPGIS can do more than generate valuable data, it can increase understanding and knowledge uptake in the community on matters such as coastal climate change. Values based approaches can promote higher order collaborative learning. Collaborative learning is more than just a consensus of participants' ideas and/or an increase in their knowledge; contemporary and consultative knowledge is created that incorporates the individual participants' subjective views, predispositions, norms and worldviews (Hartz-Karp & Stocker, 2013; Stocker et al., 2012). The process necessitates individual, societal and governance (institutional) learning where the mutual learnings can inform public policy; often referred to as 'deliberative governance' (Johnson et al., 2018; Peterson et al., 2004) or 'participatory decision making' (Jankowski & Nyerges, 2003).

4.2 Workshop design

The participatory Google Earth mapping workshops included spatially explicit scenario building and planning exercises (hereafter GE scenario planning workshops). The GE scenario planning workshops built on the beach user surveys and used the same analytical framework. The research objectives of the workshops were to:

- explore and spatially examine how the community use and value the coast and how would this be affected by climate change;

- explore how collaborative learning practices can enhance understanding and knowledge uptake of coastal climate change in the community, policy makers and researchers; and

- show how the resulting shared understanding can improve coastal risk management and adaptation planning; and

- explore how Google Earth Mapping (PPGIS) can enable collaborative learning in coastal adaptation to sea level rise.

The workshop questions were explicitly developed to discuss, explore and spatially map:

1. What are the uses (direct, indirect, existence), benefits; and assets and environmental features in the case study areas?

2. What areas are beach users most concerned about regarding coastal climate impacts?

3. What areas that provide amenity would be lost if the beach was eroded and how concerned are beach users about these losses?

The GE scenario planning workshops included spatially explicit scenario building and planning exercises. The workshops built upon and expanded previous Google Earth participatory mapping methods such as those undertaken in WA at Rottnest Island (Stocker et al., 2012). The workshops drew on non-economic methods to measure a range of values. The workshops complemented and extended the analysis of the surveys, and sought to identify and spatialise values and potential adaptation pathways at each of the three sites.

The half-day GE scenario planning workshops were held at each of the three study areas and included: a Welcome to Country by Traditional Owners (excluding Old Dunsborough); presentations; and participatory maping exercises. The workshop agenda is Appendix B to this thesis. The presentations provided context and included: preliminary results of the beach user surveys; policy settings; and approaches to coastal management and adaptation. Before and after surveys (included as Appendix C) were undertaken to assess: the impacts of the workshops on the levels of knowledge and concern among the participants; and the attitudes of the participants towards roles of stakeholders in coastal adaptation.

Participants were seated at tables in three groups of between four and six community members and stakeholders. Each group had a laptop loaded with Google Earth and a layer of hazard maps of the study area. A Google Earth template of Folders and Placemarks with appropriate icons was developed for dedicated use in the workshops to make the recording and analysis processes easy and consistent. A physical A1 map of the site with transparent overlays was also spread out at each table to increase visual access, and to enable participants to draw or write contributions. Each group had a facilitator with background and expertise in climate change adaptation. The facilitators' key role was to lead the discussion among participants and to communicate with the scribe at their table. The scribes were experienced and/or instructed with the Google Earth mapping tool. Their key task was to input the information from the discussion and from the transparent overlays into the Google Earth tool. It is the challenging job of skilled facilitators and scribes to ensure that as many perspectives as possible are discussed, negotiated and recorded (Sarkissian, 2009).

The scenario selected used a sea level rise of 0.9m, with no expected timeframe provided. This scenario was informed by the 2110 erosion (high) line from Coastal Hazard Mapping for Economic Analysis of Climate Change Adaptation in the Peron-Naturaliste Region (Damara

WA, 2012) and is in accordance with State Government Planning Policy (Western Australian Planning Commission, 2013).

The first group mapping exercise (as below) focused on identifying and prioritizing the potential consequences of sea level rise.

- Discuss how you as individuals use this site and how you benefit from those uses.

- What are your top three priority uses and benefits for this site (e.g., use = walking; benefit = fitness)? Locate these on the map using Google Earth.

- What are the physical consequences of 0.9 m sea level rise to your site if we do not respond to climate hazards (e.g., loss of beach, road access)? Locate these on the map using Google Earth.

- What are the impacts on your uses and benefits identified at the sites for 0.9m sea level rise (e.g., can't walk anymore; lose fitness). Locate these on the map using Google Earth.

The second group mapping exercise (as below) focused on adaptation actions.

- For each of your group's three priority uses and benefits, identify what natural features and built assets need to be maintained to provide for these (e.g., accessible beach). Locate these on the map using Google Earth.

- Consider the adaptation options and identify practical actions for adaptation at your Old Dunsborough Beach sites (e.g., soft protection of dunes with revegetation). Locate these on the map using Google Earth.

- Identify roles that should be taken by individuals, communities, local and state governments (e.g., community involvement in local government organised planting days)?

- How do we resource the adaptation actions? Who should pay? Ratepayers? Contributions from State/Federal governments?

Recruitment of workshop participants was carried out primarily by the PNP with assistance from the relevant local governments. Participants who provided contact details to attend the workshops in the beach user survey and information sessions were also invited to the workshops. In addition, the relevant local governments sent approximately 150 letters to random street addresses in Bunbury and 300 in Busselton. The number fo letters sent was at the discretion of the local government. The workshop was also promoted via media releases, PNP website and on the City of Rockingham Facebook page.

Participatory workshops have been delivered in Mandurah and Busselton in the past and have proven to be successful. A key output of these past workshops was the identification of environmental, social and economic hotspots (Stocker et al., 2016). The outcomes of the workshop held in Busselton are outlined in the Busselton Coastal Adaptation Community Awareness Plan (Booth & Cox, 2013). One benefit of participatory workshops such as these is the the ability to modify the methodology and scope to meet the required objectives and desired outcomes, which in the case of this project was to gain an understanding of how the community values the coast.

4.3 Workshop results and analysis

4.3.1 Attendance

The Bunbury workshop was attended by a total of 22 people (13 being community members) on 4 April 2018, Rockingham was attended by a total of 22 people (14 being community members) on 6 April 2018 and Busselton was attended by a total of 21 people (13 being community members) on 13 April 2018. The number of attendees was relatively small and as

such whilst I suggest the results demonstrate the benefits of collaborative approaches, they should not be inferred to represent the wider population.

The results are summarised below.

4.3.2   Priority uses/benefits

Table 4.3.2.1 outlines the priority uses/benefits noted by participants at each workshop. Note that the uses and benefits were developed and defined by the participants themselves. The benefits column lists the benefits suggested in all workshops. The highlighted cells indicate if the 'use' was identified as a priority for that site. The classification of Uses into the themes; Active Recreation, Passive Recreation and Socialising was applied following the workshop to indicate classification. Figure 4.3.2.1, Figure 4.3.2.2 and Figure 4.3.2.3 how the priority uses spatially at Bunbury, Waikiki and Old Dunsborough. While there were some uses that occur along the length of the beach/foreshore, others were more spatially specific. For example, people may have a particular spot for swimming or fishing. This can be seen on the Google Earth maps. A spatially explicit approach is important for planning and management as locations can be identified that are important for particular uses.

Table 4.3.2.1   Priority uses/benefits suggested by workshop participants.

Classification	Use	Identified Benefits	Bunbury	Waikiki	Old Dunsborough
Active Recreation	Swimming	Physical fitness	▓	▓	▓
		Mental health	▓	▓	▓
		Social	▓	▓	▓
		Environmental connection	▓	▓	▓
		Swim classes (Bunbury)	▓	▓	▓
	Walking (paths and beach)	Physical fitness	▓	▓	▓
		Aesthetic benefits	▓	▓	▓
		Mental health	▓	▓	▓
		Social	▓	▓	▓
		Environmental connection	▓	▓	▓
		Exercise dog	▓	▓	▓
	Cycling	Physical fitness		▓	
		Close to sea (sight/smell)		▓	
	Basketball	*Not provided*		▓	
	Professional training	Fitness and financial		▓	
	Snorkeling	*Not provided*	▓		▓
	Sailing	*Not provided*			▓
	Surfing/ kayaking/ SUP	*Not provided*	▓	▓	
	Boat launching	*Not provided*			▓
	Fishing	*Not provided*	▓		▓
Passive Recreation	Observing nature	Mental health	▓	▓	▓
		Spiritual	▓	▓	▓

		Appreciation	▓	▓	▓
		Education	▓	▓	▓
		Shell collecting	▓	▓	▓
	Solitude	Recharge		▓	▓
		Just being there		▓	▓
	Views while driving	Mental health		▓	▓
	Rest/use facilities	Relaxation		▓	
Socialising	Time with family/friends	Making friends	▓	▓	▓
		Bonding with family and friends	▓	▓	▓
		Mental health	▓	▓	▓
		Feel safe	▓	▓	▓
		Place to bring tourists	▓	▓	▓
		Community connection	▓	▓	▓
		Spiritual	▓	▓	▓
	Visiting café	*Not provided*	▓		
	Visiting Surf Club	*Not provided*	▓		
	Visit seasonal food trucks	Different vibe		▓	▓
		Financial		▓	▓

Note: Highlighted cells indicate if the 'use' was identified as a priority for that site.

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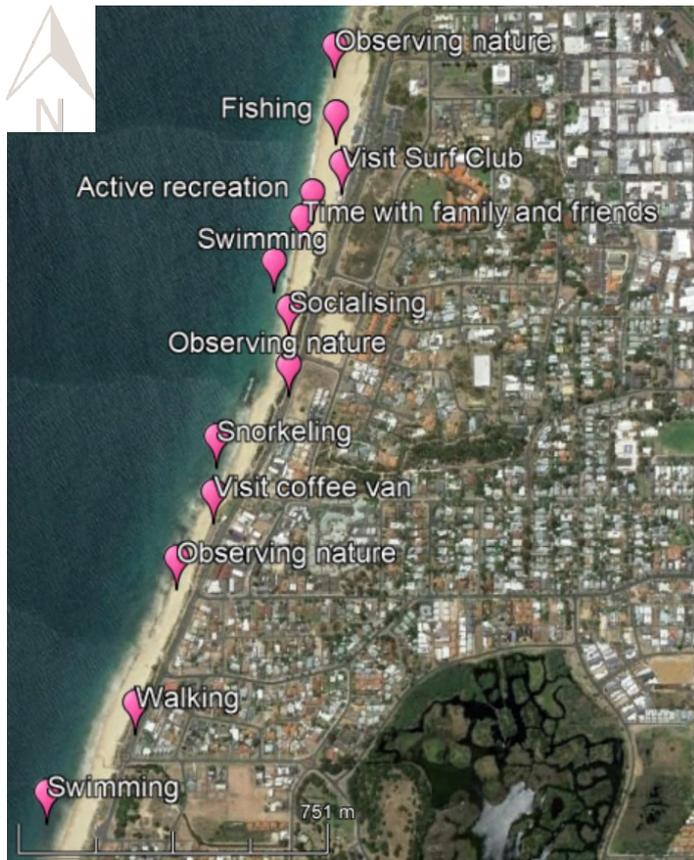
Figure 4.3.2.1   Bunbury Back Beach priority uses. The surf club and café were highlighted as key assets that supported a number of uses/benefits.
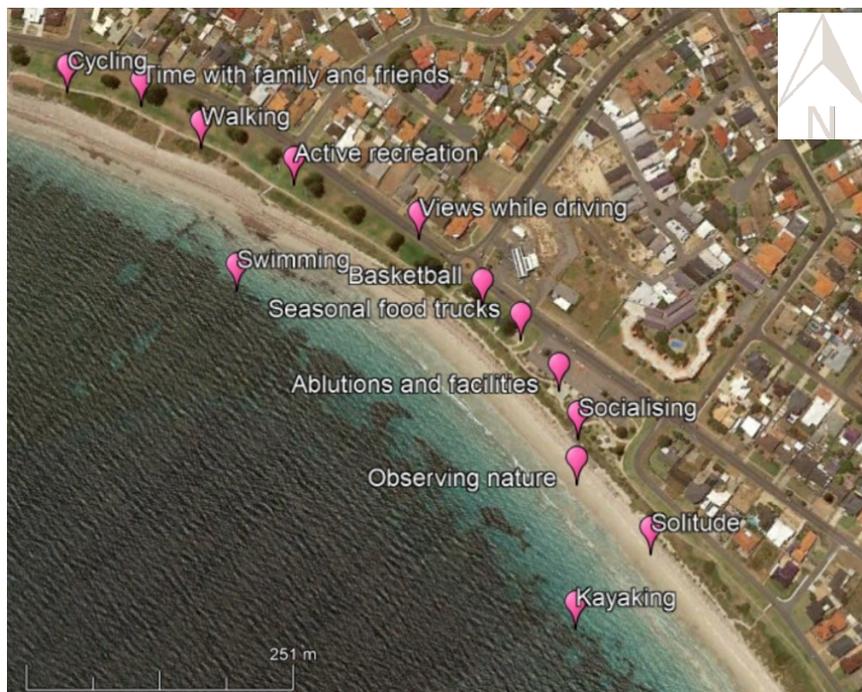
Figure 4.3.2.2   Waikiki Beach priority uses. The BBQ's, picnic areas, access ramp, shaded play areas and basketball court were highlighted as key assets that supported a number of uses/benefits.
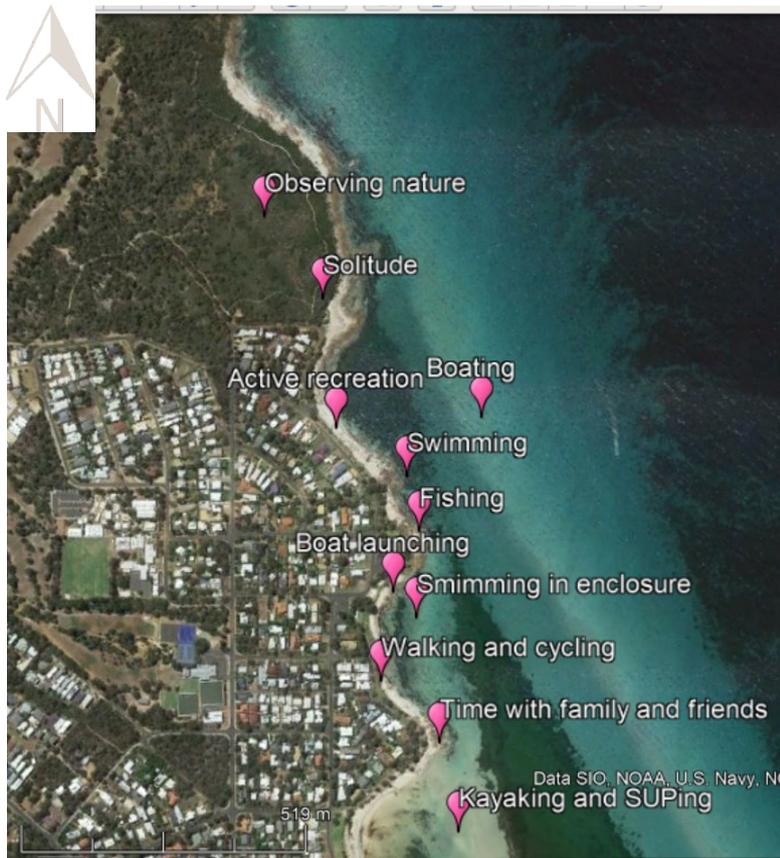
Figure 4.3.2.3   Old Dunsborough Foreshore priority uses/benefits. The boat launching area, playground, toilets and Meelup Regional Park were highlighted as key assets that supported a number of uses/benefits.

4.3.3   Consequences of climate change

The consequences of climate change to the sites if we do not respond to the climate hazards that were identified by workshop participants are outlined in Table 4.3.3.1.Figure 4.3.3.1, Figure 4.3.3.2 and Figure 4.3.3.3 show consequences spatially at Bunbury, Waikiki and Old Dunsborough.

Table 4.3.3.1   Consequences of climate change.

Classification	Consequences	Bunbury	Waikiki	Old Dunsborough
Features	Loss of swimming amenity	▨		
	Loss of sandy beach	▨	▨	▨
	Loss of foreshore reserve		▨	▨
	Loss of natural environment/habitat	▨	▨	▨

	Marine intrusion on wetlands/rivers	▪		
Built Assets	Loss of access paths to beach	▪	▪	▪
	Loss of footpaths/cycle ways	▪	▪	▪
	Loss of infrastructure (e.g. roads, carparks)	▪	▪	▪
	Loss of public facilities (e.g. toilets, BBQs etc.)	▪	▪	▪
	Loss of road/public access		▪	▪
	Loss of private assets (housing)	▪	▪	▪
	Increased sand deposition on infrastructure	▪		
	Loss of commercial assets	▪		
	Loss of meeting places		▪	

Note: Highlighted cells indicate if the 'consequence' was identified at the site.
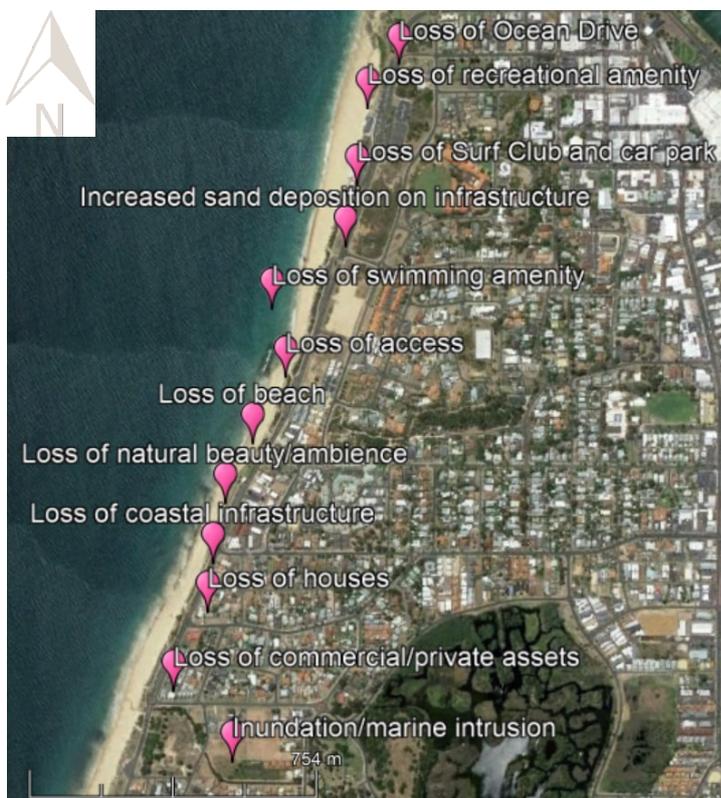
Figure 4.3.3.1   Consequences of climate change at Bunbury Back Beach.
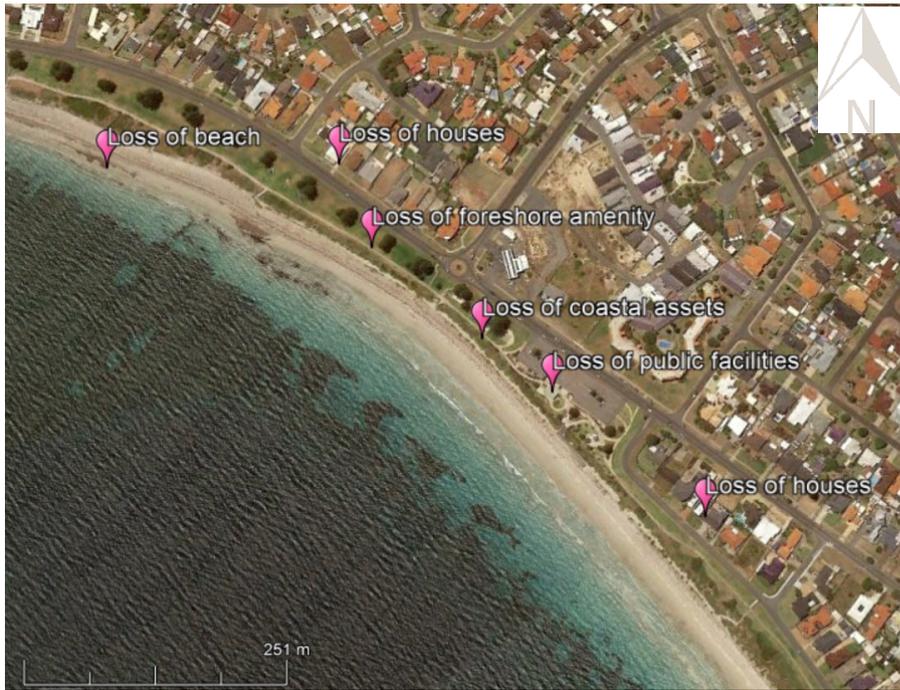
Figure 4.3.3.2   Consequences of climate change at Waikiki Beach.
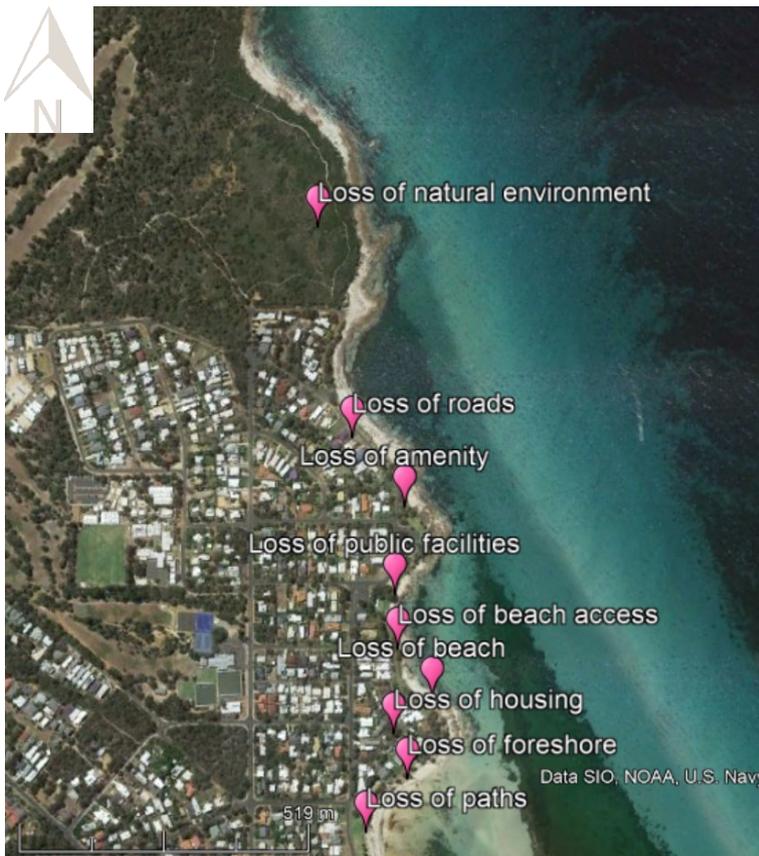
Figure 4.3.3.3   Consequences of climate change at Old Dunsborough Foreshore.

4.3.4 Impacts on the uses and benefits

The impacts on the uses and benefits identified at each site with 0.9m sea level rise if no action is taken to address climate change were mapped. Table 4.3.4.1 summarises these impacts. Note that the highlighted cells indicate a priority 'use' in the corresponding workshop. The benefits column lists the benefits suggested in all workshops.

Table 4.3.4.1   Impacts on uses and benefits.

Classification	Impact on Uses	Benefits lost	Bunbury	Waikiki	Old Dunsborough
Active Recreation	Cannot swim due to loss of access and change to water safety/quality	Physical fitness			
		Mental health			
		Social			
		Environmental connection			
		Swim classes (Bunbury)			
	Cannot walk due to loss of paths	Physical fitness			
		Aesthetic benefits			
		Mental health			
		Social			
		Environmental connection			
		Exercise dog			
	Cannot cycle due to loss of paths	Physical fitness			
		Close to sea (sight/smell)			
	Cannot undertake water activities	*Not provided*			
	Cannot fish (water quality etc)	*Not provided*			

	Cannot launch boat	*Not provided*			
Passive Recreation	Cannot observe nature as impacts on natural environment	Mental health			
		Spiritual			
		Appreciation			
		Education			
		Shell collecting			
Socialising	Cannot spend time with family/friends due to loss of meeting places / assets	Making friends			
		Bonding with family and friends			
		Mental health			
		Feel safe			
		Place to bring tourists			
		Community connection			
		Spiritual			
	Cannot visit Surf Club	*Not provided*			

Note: Highlighted cells indicate if the 'impact on uses' was identified at the site.

Further impacts identified in this exercise included: damage to subsurface services, groundwater for irrigation, marine intrusion on wetlands/rivers, contamination of ocean and coastline and subsequent health, business, public safety and economic impacts.

A notable issue identified by Bunbury participants was the potential for conflicting land uses and competition between uses (and stakeholders) of the coast. For example, conflicts between private residences versus public uses and space to locate services and infrastructure.

4.3.5 Features and built assets to be maintained

Natural features and built assets (e.g., accessible beach) that need to be maintained to provide

for the identified priority uses and benefits were mapped (Figure 4.3.5.1, Figure 4.3.5.2 and
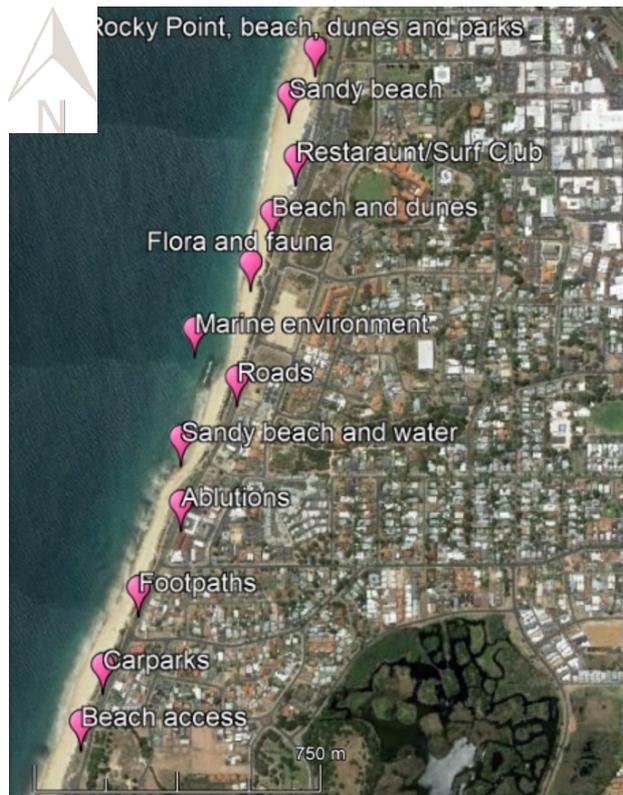
Figure 4.3.5.3).

Figure 4.3.5.1   Bunbury Back Beach natural features and built assets identified to be maintained in order to provide for the identified priority uses and benefits.
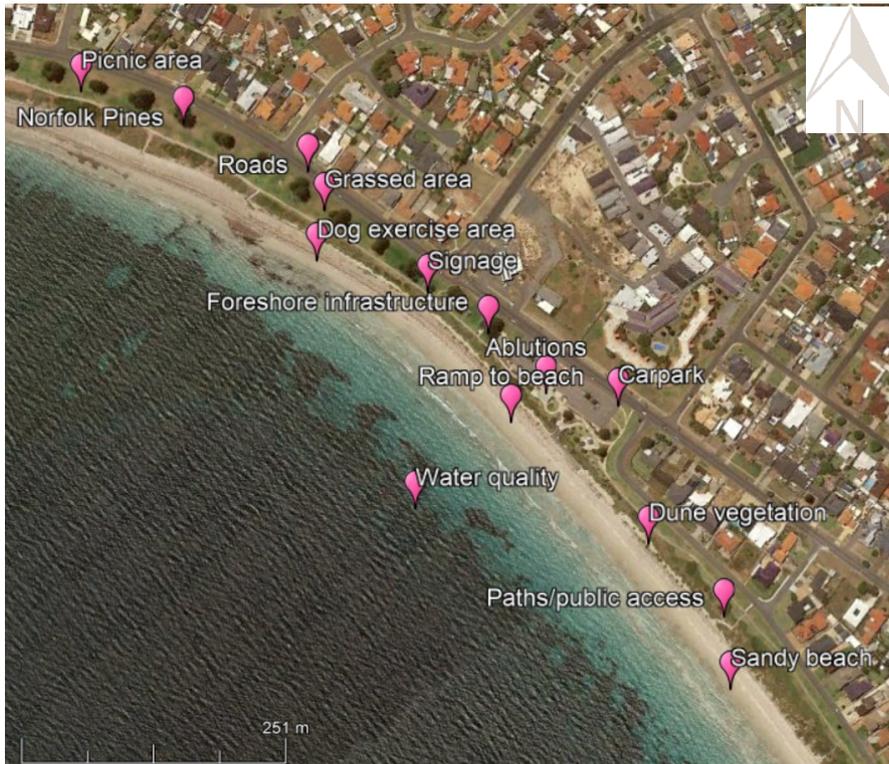
**Figure 4.3.5.2   Waikiki Beach natural features and built assets identified to be maintained in order to provide for the identified priority uses and benefits.**
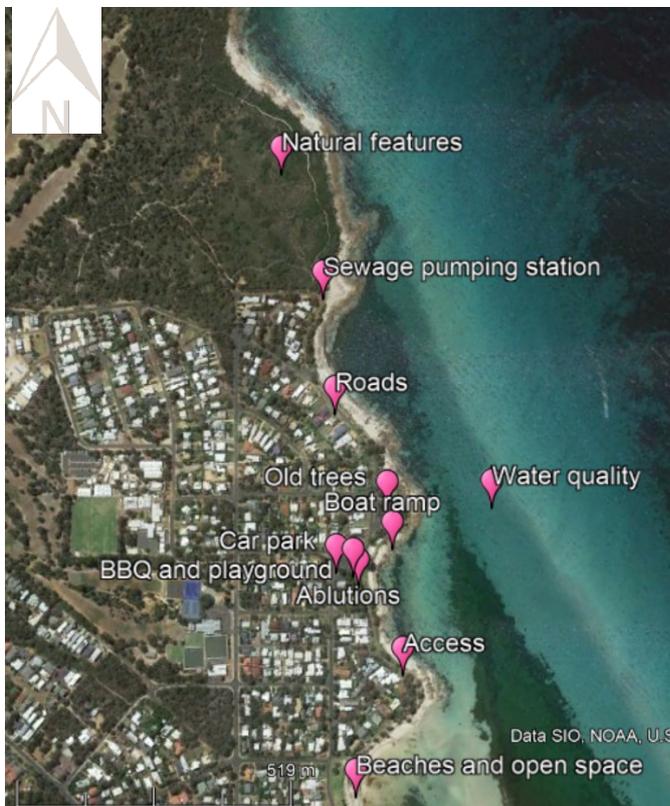
Figure 4.3.5.3   Old Dunsborough Foreshore natural features and built assets identified to be maintained in order to provide for the identified priority uses and benefits.

4.3.6 Adaptation options

The final mapping exercise asked that attendees suggest and locate on the map the actions for adaptation that are likely to be effective and practical at each site (e.g., soft protection of dunes with revegetation). The adaptation hierarchy in SPP2.6 (avoid, planned or managed retreat, accommodate, protect) was considered by participants in this exercise. Note that there was no requirement to prioritize adaptation options and all suggested options are shown in Table 4.3.6.1.

Planned retreat was the only option suggested at all three workshops that could be effective and practical and would allow the identified coastal values (being the features, assets, uses and benefits of the beach/foreshore) to be maintained and enjoyed into the future.

Participants also nominated as important several options not included in the adaptation hierarchy including monitoring, research and community engagement. This result highlights the importance of the benefits of taking a more holistic approach beyond the 'planning' space that are inclusive of other aspects that has the potential to deliver more sustainable outcomes.

Table 4.3.6.1   Suggested adaptation options.

Type	Adaptation Options	Bunbury	Waikiki	Old Dunsborough
Avoid	No new development in hazard area	▨	▨	
	No development on undeveloped land#	▨	▨	
Retreat	Planned retreat	▨	▨	▨
Accommodate	Caveat on houses in hazard area		▨	
Protect	Artificial reefs	▨	▨	
	Seawall ^	▨		▨
	Enhance existing reefs	▨		
	Dune Rehabilitation		▨	

	Sand nourishment			▓	▓
	Offshore breakwater			▓	▓
	Natural rock defense				▓
Monitoring	Beach monitoring (ongoing)			▓	
Research	Soil testing (Friends of Big Swamp)	▓			
	Engineering study (protect pumping station)				▓
Community Engagement	Community education			▓	

Notes: Highlighted cells indicate if the 'adaptation option' was suggested for the site.

to provide future public shoreline

^Protect road to Hasting St, Bunbury

Other points of interest noted in this exercise included suggestion at the Old Dunsborough workshop to sacrifice Curtis Bay for Bay View Tce amenity. Should this be considered as an option, it would likely be contentious for Council and the community, and would result in loss of natural features and values associated with the Meelup Regional Park in order to protect built assets. But these are the types of decisions that will confront coastal communities into the future. A recommendation at the Bunbury workshop was to construct an artificial surfing reef. It was noted that this is not an effective adaptation response in itself, but it could be constructed cost effectively as part of other protection measures.

4.3.7   *Roles and who should pay*

Potential roles that could be taken by individuals, communities', state and local governments were explored. The issue of who should pay was also discussed. A summary of key points raised included:

Retreat

- Planned or managed retreat: local government should explore how this could be

achieved, including proposed funding mechanisms such as Council differential rates and Specified Area Rates.

Protect

- Dune nourishment: community groups, schools, environmental groups could undertake this with support and funding from State and Local Government.

Monitoring

- Beach monitoring: community, schools and local governments to action with support and funding from Federal, State and Local Government.

Research

- Assessment to be undertaken to cost retreat options to be undertaken by Federal, State and Local Government.

- Study to compare cost of retreat versus protection to be undertaken by Federal, State and Local Government.

Community Engagement

- Awareness raising: environment groups/volunteers to action with support and funding from Federal, State and Local Government.

- Clearly articulated and uniform message to come from governments, scientists, and community leaders on climate change.

4.3.8 Costs / responsibility

- Government to buy back affected land with option to lease back.

- Federal government to pay for disaster relief and fund proactive prevention.

- Insurance industry to play a role in risk education.

- Differential rates to be applied to properties adjacent to the beach.

- Some costs to be equally distributed as all of the community benefits.

- PNP is a good example of a collaborative approach, should build on this.

A number of other notable points were raised during the workshops, including;

- retreat needs to be considered at some point as protection will not work in the long term; and

- there is a need to deal with critical infrastructure.

4.3.9   Traditional Owner interviews

Additional interviews were held with three Traditional Owners who were suggested by the South West Aboriginal Land and Sea Council Aboriginal Corporation (SWALSC), relevant Local Government Authorities, and the PNP as authorities on coastal matters in each of these locations. The Traditional Owners also participated in the workshops at Bunbury and Waikiki. These supplementary interviews were important because the study sites do not exist as isolated beaches, but are part of a larger interconnected cultural landscape used by the Traditional Owners over the long course of their stewardship of the land and still used into the present.

Some Traditional Owners comments related to their occupation of the coast during the last ice age when sea levels were lower and they obtained the stone chert for their tools from places that are now under water. There was concern about ongoing erosion leading to the discovery and disturbance of their ancestors' remains, and the need to rebury the remains with cultural

respect and according to cultural protocol. Coastal managers need to be particularly aware of this significant issue as it is likely to increase in the future.

4.3.10 Key findings

A summary of the key results of the GE scenario planning workshops is set out below.

- Priority use and benefits were identified (Table 4.3.2.1) and mapped spatially (Figure 4.3.2.1, Figure 4.3.2.2 and Figure 4.3.2.3) in the workshop. The identified uses were classified into three themes: active recreation, passive recreation and socialising. This classification was undertaken by the researchers following the workshop to assist in refining the analysis of results. This classification is also of assistance to coastal decision makers in planning and managing coastal areas, as the first two themes correspond to land use categories used in open space planning. Walking/running, swimming, observing nature and spending time with family and friends were common priority uses across the three sites. The outcomes largely corresponded with the beach user survey results, but added spatial/locational data.

- The consequences of climate change if we do not respond to the climate hazards were identified (Table 4.3.3.1) and mapped (Figure 4.3.3.1, Figure 4.3.3.2 and Figure 4.3.3.3). The results were similar across all sites and included: loss of swimming amenity, sandy beaches, access paths, infrastructure, and meeting places. These consequences were grouped into themes that correspond with the framework for classification of coastal values: features, built assets and uses. As with priority uses and benefits, the consequences were grouped by the researchers following the workshop to refine the results and to aid in the analysis. The classification also assists coastal decision makers in planning and managing coastal areas.

- The impacts on the uses and benefits with 0.9m sea level rise if no action is taken to address climate change were identified (Table 4.3.4.1) and mapped. Again, the results were similar across the sites: impacts on active recreation, passive recreation and socialising occur due to loss of access and changes to water safety/quality, loss of paths and meeting places.

- The natural features and built assets that need to be maintained to provide for the identified priority uses and benefits were mapped (Figure 4.3.5.1, Figure 4.3.5.2 and Figure 4.3.5.3). Results were similar across sites, notably: access and water quality, together with some specific local features and assets such as the Norfolk Pines at Waikiki, sewerage pumping station at Old Dunsborough and café at Bunbury.

- Adaptation options to maintain the uses and benefits were recommended. Planned retreat was the only option recommended at all three sites with options to avoid, accommodate and protect also being put forward at the sites. Monitoring, research and community engagement were other options suggested.

- In terms of roles and responsibility, a multitude of stakeholders were recommended including all levels of government, partnerships such as the PNP, the insurance industry and the community.

- With regards to funding options, a common proposal was that the costs should be equally distributed across all those that benefit. It was also suggested that those living adjacent to the beach should pay more as they gain the most (economic) value. Specific suggestions included government purchasing affected land with option to lease back and the application of differential rates.

4.3.11 Before and after survey

A survey (attached as Appendix C) was completed by 13 community members (3 female, 9 male, 1 did not state) at the Bunbury workshop, 10 (5 female, 5 male) at Rockingham and 10 (6 Female, 4 Male) at Busselton. Attendees were asked before and after the workshop to self-assess their awareness of impacts of climate change on coasts generally (including sea level rise, coastal erosion, flooding and changing severe weather events such as storms (Figure 4.3.11.1). At all three workshops awareness increased. This would suggest that the workshop was effective in terms of raising awareness of issues with most attendees agreeing or strongly agreeing. Furthermore, as a 'participant observer', I noted that the depth and breadth of conversations around the tables showed that attendees were learning from each other as well as from the specialists. Specialists also noted similarly. This would seem to indicate that collaborative learning was occurring. Coastal values (i.e., the natural features, built assets, uses and benefits that the coast provides) to attendees were rated as very important before and after all workshops. That is, the importance of coastal values remained unchanged as a result of the workshops, which would suggest that those in attendance already valued the coast highly.

In regards to the effectiveness of the workshop in terms of: bringing together relevant stakeholders; enabling fairness in participation and conflict resolution; presenting information in an accessible form; and co-producing worthwhile knowledge, results were similar at the Bunbury and Busselton workshops with most attendees agreeing or strongly agreeing. Compared to these two workshops, at the Rockingham workshop more attendees were unsure of its effectiveness, particularly in regards to bringing together relevant stakeholders. This could be due to the perceived relatively low attendance rate, which was raised by community members at the workshop as a concern.
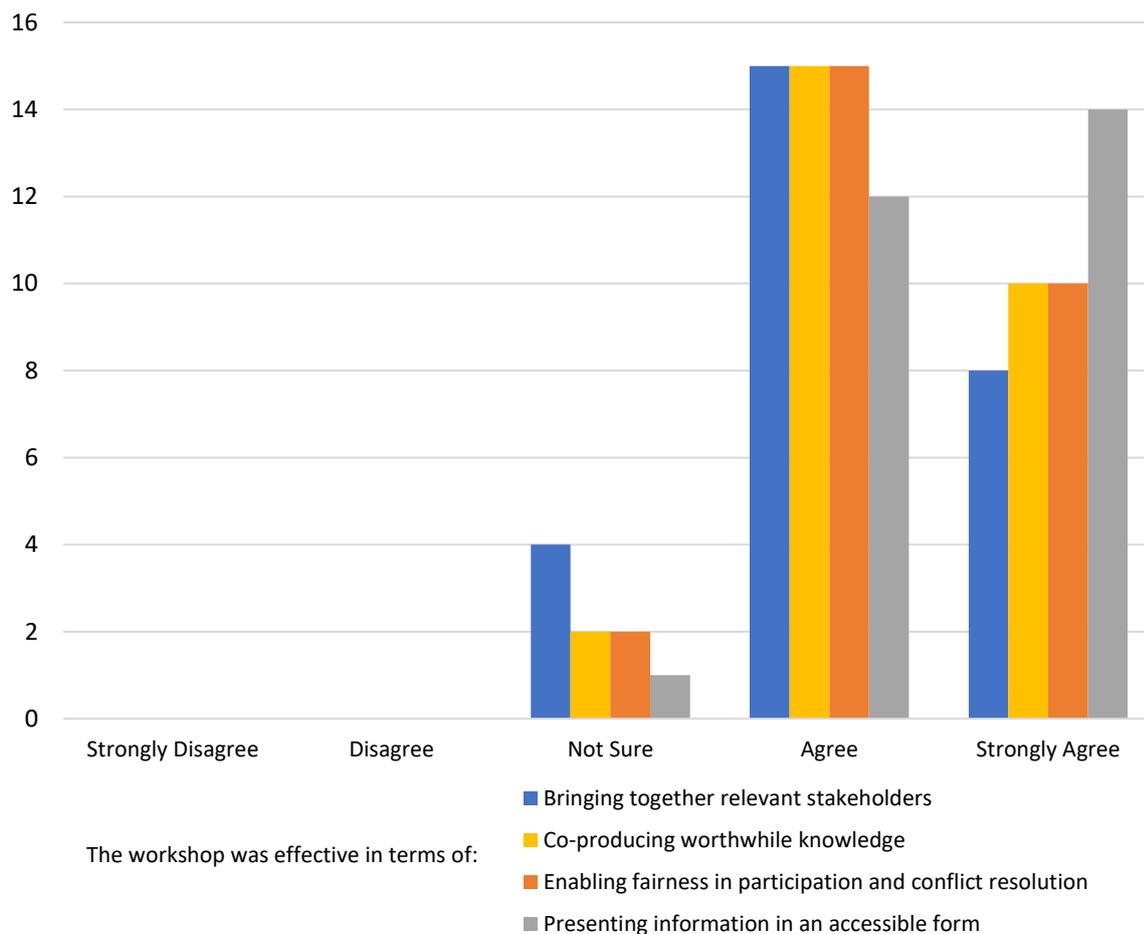
Figure 4.3.11.1   Combined results (Bunbury, Waikiki and Busselton) for survey question - The workshop was effective in terms of; bringing together relevant stakeholders; enabling fairness in participation and conflict resolution; presenting information in an accessible form; and co-producing worthwhile knowledge (n=27).

A question was asked to ascertain the best ways of resolving regional coastal impacts of climate change and enabling sustainability. From the options provided there was highest agreement across the three study areas for governments to take a strong leadership and coordination role and to involve a wide range of stakeholders including the community. At all three workshops there was general disagreement with the proposal to allow market forces to find the most efficient technological/innovative solutions. This would indicate that there is more trust in governments taking a leading role with community involvement rather than relying upon markets to take action. Of note, a higher percentage in Busselton compared to Bunbury and Rockingham disagreed with letting nature take its course and minimising human

interventions. Combined results for Bunbury, Rockingham and Busselton are provided at Figure 4.3.11.2.
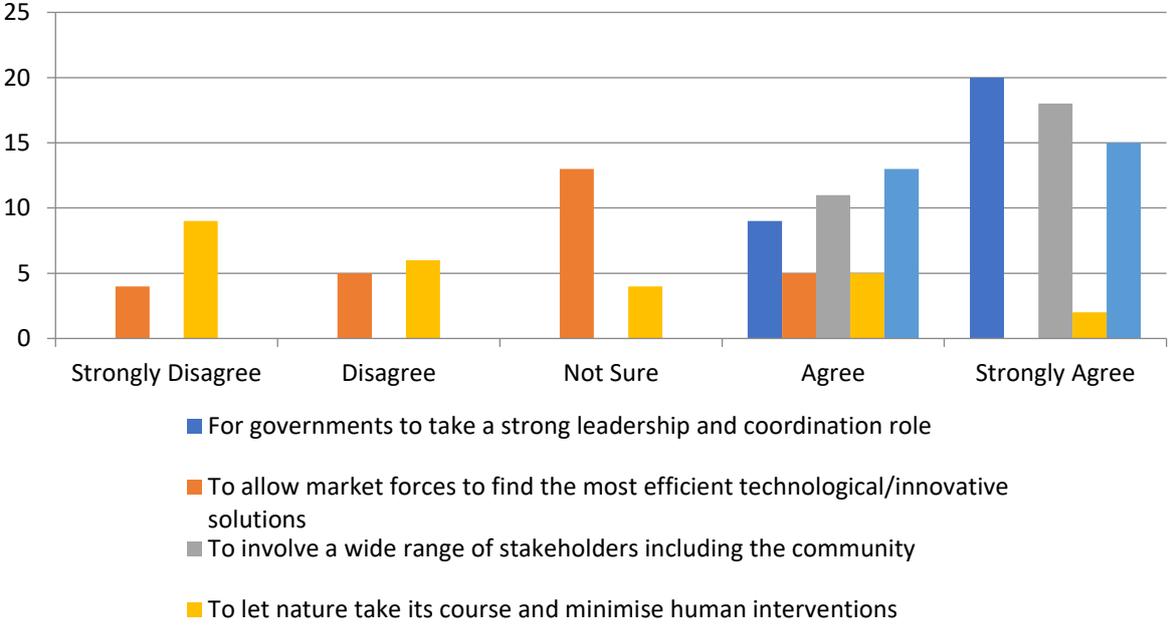
Figure 4.3.11.2   Combined results (Bunbury, Waikiki and Busselton) for survey question - The best ways of resolving regional coastal impacts of climate change and enabling sustainability are (n=43).

In regards to level of support for adaptation options to manage coastal hazards such as erosion and flooding into the future, across all sites there was highest support for avoiding putting development (either new on increasing density) in hazardous areas. The second highest support was for planned or managed retreat. In Busselton and Bunbury there were similar numbers supporting and not supporting a protect option, but in Rockingham there was more support for protection.

Accommodation by raising floor level of buildings had a mixed response across all the sites. Bunbury was not as supportive, Busselton was supportive and there was roughly 50/50 support at Rockingham. The results suggest that in order to have and maintain a beach and foreshore reserve for the community, avoiding is the preferred adaptation option, but planned or managed retreat is supported, when and where required.

4.3.12 Review of workshop methodology

The exercises developed for the workshops effectively addressed the workshop objectives and research questions and feedback from participants suggests that they valued the opportunity and believed the workshops were delivered professionally and efficiently.

The level of expert participation at the workshop, which included the Western Australian Planning Commission (WAPC), Department of Planning Lands and Heritage (DPLH), relevant local governments, PNP and Curtin University, was adequate and assisted in the delivery and provision of assistance and advice during the workshops. These stakeholders are actively involved in the planning and management of coastal lands, foreshores and beaches. The WAPC is responsible for strategic and statutory land use planning and development as determined under the *Planning and Development Act 2005*, with DPLH providing administrative and technical expertise and support. The roles and responsibilities of Local Government are wide and varied and includes provision of recreation facilities and public assets, community and health services and planning and development enforcement and approvals. The PNP as a collaboration of local governments is working to address the challenges of coastal climate change adaptation and Curtin University is involved in coastal education and research. These stakeholders provided context by delivering presentations and expert advice during the workshop exercises. Community participation was sufficient to provide indicative results about the methodology and the community's values. Increased participation from the community, in particular youth, could be achieved by sending invitations to schools and community groups as well as greater promotion via local government networks and social media.

Another avenue for maximising the benefit of the workshops in the future would be to add in additional planning overlays to Google Earth, for example the critical infrastructure overlay,

to provide more information to the participants on which to base their deliberations.

4.4   Conclusion

The workshops outcomes significantly extended the survey results to meet the objective to explore how an understanding of community values can improve coastal adaptation to climate change and sustainability. The workshops addressed the research questions to identify: how the community use and value the coast and how would the values be affected by climate change; and how collaborative learning practices enhance understanding and knowledge uptake of coastal climate change in the community. The workshops led to an increase in understanding of coastal values, identified and demonstrated collaborative learning and created opportunities for community dialogue about values and priorities.

In conclusion, the workshop enabled collaborative learning through the discussion of values and co-production of knowledge. The approach adopted a number of key processes that promoted the standing and legitimacy of the outcomes by;

- bringing the community, technical experts and policy makers together;
- translating technical and complex information to community members with no known technical coastal knowledge;
- facilitation of differing thoughts, values and opinions etc through processes with no pre-determined outcomes; and
- collaboration through open discourse.

Thus, processes to identify and collect social values and co-produce knowledge have the potential to form the basis of an enhanced coastal hazard risk management and adaptation planning (CHRMAP) framework. In the next chapter, I consider how this might work within the context of WA's existing policy framework.

5 Enhancing the risk management process with values based collaborative learning

5.1 Introduction

Risk management frameworks such as SPP2.6 in WA are being implemented to address the uncertain impacts of coastal hazards and climate change (Thom et al., 2018). Similar approaches elsewhere in Australia include the Coastal Management Program in New South Wales and the Coastal Hazard Adaptation Strategy in Queensland.

The limitations of risk based approaches to coastal planning and management have been highlighted in the literature review. These include: inadequacies of the relatively simple risk assessment process to address the community's complex understanding of risk (Kasperson et al., 1988); subjectivity of various elements of the risk assessment process (Pannell et al., 2012); and the limited capacity of risk based approaches to tackle wicked problems such as climate change (Kennedy et al., 2010).

Acknowledging the fact that risk-based approaches are firmly entrenched in coastal planning and management in Australia, I suggest that many of their inadequacies can be overcome if the community are appropriately engaged and actively involved in the risk process, through values-based participatory processes that develop shared governance and learning. Indeed, it is suggested by Johnson et al. (2018) that shared understanding should be a central pillar in the governance process, where the community is an active participant who seeks and co-designs the governance model (Stocker & Burke, 2017).

State Governments have developed guidance and frameworks to assist decision makers in the management and planning of coastal areas and to involve the community in the decision-making process. For example, in WA, the CHRMAP Guidelines, developed to support the

implementation of SPP2.6, note that statutory decision-makers such as local governments are responsible for identifying and assessing the vulnerabilities and risks to public goods and assets that they manage, in order to determine and treat priority coastal hazard risks. This is also one of the key principles for managing risk in the WA Coastal Zone Strategy (2017), along with State and local governments collaborating with the community to identify and manage risks and to build the resilience and adaptive capacity of the community.

However, in spite of the above acknowledgement, the currently preferred methodology adopted in WA to plan and manage for current and future coastal hazards applies quantitative modelling and assessment of hazards and risk. Such methods can rarely lead to an understanding of either the lived reality of risk or the complexity and dynamism of evolving social-ecological systems (Kennedy et al., 2010). Moreover, they tend to be inattentive to the role that values play in shaping sustainable communities. Enabling community members to actively participate in identifying values and risks that underpin risk assessment and management is therefore crucial to broadening and legitimating our understanding of risk.

This present research project responds to this imperative. It was designed to demonstrate, through the application of three case studies, alternative values-based approaches to those currently preferentially applied in WA. The methodology adopted collaborative learning practices that enhance understanding and knowledge uptake of coastal climate change in the community. Drawing from the findings of this research, this chapter argues that values-based approaches, which place what the community value and the perceived risks to these values at the forefront of the risk management process, rather than the asset based approaches promoted in policies such as SPP2.6, will deliver improved sustainability outcomes. It includes an analysis of relevant sections of the CHRMAP Guidelines and identifies stages where values

based approaches could usefully be incorporated into the current coastal hazard risk management and adaptation planning process.

5.2   Values based collaborative learning approaches

As noted in this thesis, values based approaches such as participatory workshops that support collaborative learning offer great opportunity to effectively involve the community in the decision-making process. This research considered numerous factors to effectively involve the community in the civic process around coastal hazard risk management and adaptation planning. For example, Smith et al. (2016) notes that to successfully communicate climate change risk with a goal to elicit behaviour change, it is necessary to consider issues such as individual capabilities, cognitive processes, biases, values beliefs, norms, identities, worldviews, social relationships and vested interests.

However, these are difficult to incorporate into public policy (Adger et al., 2012). It is not just a matter of consulting with the community; rather, collaborative learning is required in order to find ways to discuss uncertainty, complexity and/or ambiguity (Clayton et al., 2015). As this research has shown, collaborative learning can occur in social settings such as workshops; it involves people learning from each other and results in a change in thinking (Smith et al., 2016).

Further, current approaches to incorporating community values into public policy is problematic, because they are not based on a coherent understanding of 'value'. Existing values typologies are not comprehensive and do not adequately address all facets of sustainability; in particular, the social aspect of sustainability is often neglected (O' Brien & Wolf, 2010). As such, it is difficult to determine what accurately constitutes value. The values framework developed for this research, provided a solid foundation for the values based

approach adopted in this research, which characterised value as being the result of the interelationships between four 'orders' of elements – natural features, built assets, uses and benefits. This framework informed the coastal values survey and deliberative mapping workshops, which resulted in a much improved understanding of what is valued in the coastal area and what should be maintained for future generations.This empirical data can be used for current and future coastal management and planning.

Stocker and Burke (2017) argue that legitimacy of decision making can be enhanced with approaches that enable re-engagement among the normally siloed domains of governance, knowledge, management and the community (or constituency). Similarly, the method adopted in the workshops included convening groups face to face; mediating potential conflict; translating across language and cultural boundaries, e.g. the science/community/policy interfaces; and collaborating to co-produce knowledge.

5.3   WA Government coastal planning policy - asset based approach

The WA Government coastal planning policy SPP2.6 and the CHRMAP Guidelines advocates that risk based approaches ensure that coastal hazard risks are appropriately considered in sustainable land use and development and statutory and strategic decision making. This includes the consideration of risks and the vulnerability of specific assets (Western Australian Planning Commission, 2014). Assets may be natural or artificial and are defined as something that has potential or actual value (tangible or intangible, financial or non-financial) to the decision-maker, community and stakeholders (Western Australian Planning Commission, 2014). Value can also be positive or negative, dependent upon the risk and liabilities over the life of the asset (Western Australian Planning Commission, 2014).

The CHRMAP process requires that all assets (social, economic, environment) are identified together with their function, services and value to help identify the consequences of coastal hazards. Figure 5.3.1 shows this asset based model as compared to the values based framework developed for this research.


a)   b)
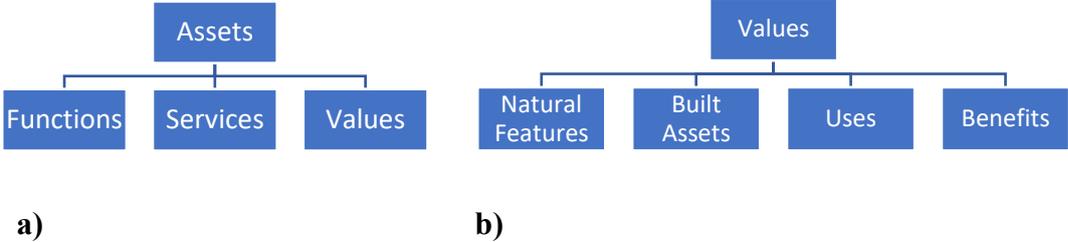
Figure 5.3.1   Model frameworks to determine 'value' in (a) CHRMAP Guidelines and (b) thesis project.

5.3.1   Defining and determining value of assets

In terms of how value is defined, the CHRMAP Guidelines provide examples of environmental, infrastructure, economic and social values; however, there does not appear to be a consistent definition of 'value' and incongruity with functions or services. For example, page 30 of the Guidelines provides examples of 'environmental values' as being: 'ecosystem services provided by dune habitats'; and 'dunes trapping and storing sand to replenish beaches', although technically these are respectively a service and a function (Western Australian Planning Commission, 2014). Figure 5.3.1.1 shows how 'values' are identified and interpreted in the CHRMAP Guidelines as compared to how this research determined value. As can be seen there are some similarities with: 'natural features' and 'environmental values'; 'built assets' and 'infrastructure'; and 'benefits' and 'social values'. 'Uses' are not explicitly addressed in the CHRMAP guidelines, but could be considered a 'social value'; and 'economic values', which was not a specific element in this research, was considered to be one of the 'benefits'.

Present Research

In the framework developed for this research, 'values' are provided by the hierarchal relationship of four 'orders' of elements.

Natural features are the ocean, beach, dunes, foreshore, and flora and fauna. Noting that natural features have intrinsic values, but in this research they are defined as not having values in themselves, however they give rise to values.

Built assets include public infrastructure such as access and parking, community facilities such as recreational areas and ablutions, private enterprises such as cafes and utilities such as sewage and power. Note that built assets are contingent upon or add value to natural features.

Uses include businesses, recreation such as boating and fishing, research and education, arts, socializing, as well passive uses such as observing nature. Uses arise from the natural features and built assets.

Benefits are the physical, mental, spiritual, financial, social, and cultural outcomes gained from the uses of the coast..

CHRMAP Guidelines

'Values' are identified as one of the elements of 'assets'. along with 'functions' and 'services'.

Environmental values include ecosystem services provided by reserves and dunes, flora and fauna, and sand source for beaches. They support coastal habitats, for their biological diversity and landscape.

Infrastructure values includes buildings, roads, services, ablutions, access and Surf Life Saving Clubs. These physical asset values support economic, social and environmental values.

Economic values support sectors such as employment, tourism and industrial. They are also associated with matters that have economic implications.

Social values include social benefits and services provided by the natural environment and built assets or land. Social values are those that support quality of life and the health and wellbeing of the community.

Figure 5.3.1.1   Comparison of interpretation of how 'values' are determined in this research and CHRMAP Guidelines.

The CHRMAP Guidelines suggest that the assets' function, service and values should reflect community and stakeholder views. For example, the functions, services and values of foreshore reserves and beaches include coastal access, recreation, tourism, and habitat for

flora and fauna including conservation value for rare and threatened species. They also

support biodiversity and ecosystem integrity and can include significant landforms and

provide a buffer to other 'higher value' assets (Western Australian Planning Commission,

2014). It is of interest to note that although there is no further detail provided for what 'higher

value' assets may constitute, in determining appropriate setbacks for urban development, the

Guidelines suggest that the foreshore reserve should be used as a buffer to coastal erosion

hazards over the 100-year planning timeframe (Figure 5.3.1.2). Hence, it is implied that

'higher value' assets include built assets with economic value that are situated behind the

foreshore reserves.
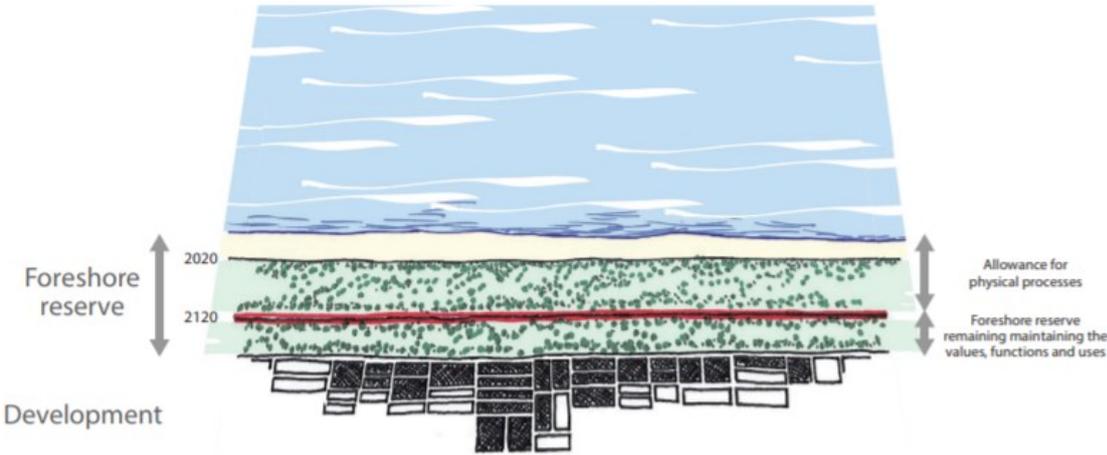
Figure 5.3.1.2   Illustration of a typical foreshore reserve on a sandy coast.

Source: SPP 2.6 - State Coastal Planning Policy Guidelines (WAPC 2020, p. 14)

This research argues that foreshore reserves should not be seen as a buffer to 'higher value'

built assets - they can in themselves include significant natural features that provide uses and

benefits that are valued by the community. The CHRMAP Guidelines appear to treat the

values associated with foreshores as being secondary to built assets. Coastal planning and

management practice would seem to support this inference as historically built assets have

been prioritised over natural features (Gurran et al., 2007; Pranzini, 2018). In contrast, the framework developed for this research project promoted natural features such as foreshores as 'first order' elements on which all other elements, and therefore all value, rest.

5.3.2 *Community involvement in risk management and adaptation planning*

The CHRMAP Guidelines refer to the International Association of Public Participation (IAP2) as a guide to determine level of participation throughout the process. The level ranges from: informing (to impart information); consulting (to seek advice or information); involving (to engage or include as participants); collaborating (to work together); and empowering (to invest with legal power, to authorise). These levels of participation are based upon Arnstein's ladder, which includes 'informing', a symbolic engagement, and 'citizen power' where the community are empowered (Collins & Ison, 2009).

As suggested in this thesis and in previous research (Collins & Ison, 2009), it is suggested that models based on Armstein's ladder are not an effective framework to engage the community in wicked problems such as coastal climate change. The predominant use of approaches based on this model was a contributing factor to this research project's adoption of collaborative learning methods; we wished to show that such methods could be a more effective means to engage the community, stakeholders and decision makers to explore opportunities to address coastal climate change (Stocker et al., 2012; van de Kerkhof & Wieczorek, 2005).

The Guidelines state the necessity for the community and stakeholders to be involved in the development of coastal hazard risk management and adaptation planning. In addition to , the identification of the asset's values, further stages where I suggest community involvement is fundamental, and from personal experience is currently lacking, is in the; assessment of the consequence and tolerability of risks; and evaluation (and acceptability) of adaptation options.

This is important for a number of reasons. Firstly, to ensure that the subjective risk assessment process involves all stakeholders in the decion making process; and secondly, to ensure that the outomes includes and reflects what the community values. Furthermore, in relation to these two stages in particular, I argue that the values based approaches adopted in this research would be a more effective process than the approaches generally applied in WA. These two phases of the CHRMAP process are examined in further detail in 5.3.2.1 and 5.3.2.2.

5.3.2.1 *Consequences and tolerability*

A key stage of the CHRMAP process where community engagement is a fundamental requirement is determining the consequencesof coastal hazards. Consequence is of prime importance in terms of evaluating the impacts to assets when a coastal hazard is realised. It is imperative that communities are involved to assess the level of impact on assets and associated values. This is particularly important when evaluating consequences of hazards on social and cultural assets and values.

The consequence scale of CHRMAP's, which are informed by community values can have subtle differences, but the scale ranges and attributes are generally similar. The following criteria were used to rate consequence for the social/heritage variable in the Draft Mandurah Northern Beaches CHRMAP Coastal Vulnerability Assessment.

- catastrophic – loss of vital social or heritage values, experiences and/or sites. No alternative exists;

- major – loss of important social or heritage values, experiences and/or sites that would impair quality of life. No convenient alternative exists;

- moderate – loss of important social or heritage values, experiences and/or sites that would somewhat impair quality of life. No convenient alternative exists;

- minor - loss of important social or heritage values, experiences and/or sites that would have minimal impact on the quality of life. Alternative sites exists; and

- insignificant - loss of important social or heritage values, experiences and/or sites that would have little to no impact on the quality of life. Many alternatives exist (GHD Pty Ltd, 2021).

These criteria rest on two crucial points of knowledge: firstly, accurate identification of social values; and secondly, communities' evaluation of the impact of their loss. the impact of their loss on quality of life, considering such factors as access to similar values in other locations. This, I suggest, demonstrates the importance of community involvement in assessment of consequences and risks. Furthermore, as the determination of consequences is a subjective process, values based collaborative learning approaches, such as participatory workshops, are a good mechanism for reaching consensus in determining consequences. There is no other party better suited to assess the impacts, particularly social and cultural impacts, than the community itself.

5.3.2.2 *Evaluation of adaptation options*

Further stages where the Guidelines note that community involement and values are important contributing elements is in the evaluation of adaptation options using multi-criteria analysis (MCA) and cost benefit analysis (CBA) phases. Firstly, in the MCA phase, risk treatment options are assessed against the assets and their function, services and values identified by decision makers, stakeholders and the community. This process, which ideally should be

undertaken in collaboration with the community and stakeholders or informed by a comprehensive assessment of community values, assesses the performance of risk treatment options against social, environmental, economic and cultural criteria. Importantly, the criteria are weighted to reflect the 'perceived' importance in maintaining the asset including its function, services and values and in the realisation of the success criteria. This weighting of criteria is of great imporance. If the community are not involved, and/or if a comprehensive community values assessment has not been undertaken, then the weightings will not refelct the coastal values deemed to be of significance to the community. If this is the case, the weightings are generally determined by decision makers who sometimes have limited appreciaion of what the community values on the coast. If the community are thoughtfully and effectively involved in the process, then the outcomes of the MCA, which has been used in the coastal zone to address conflicting views and values (Roca et al., 2008), will maintain those values deemed to be of significance to all actors, including the community.

Following the MCA stage, the CBA process identifies the costs and benefits of priority risk treatment options, including social and environmental values according to their net economic benefit. Importantly, the assets value (both tangible and intangible) and implementation costs are needed in CBA. The CHRMAP Guidelines suggests that non-market valuation techniques can be utilised to place a dollar value (quantitative) on 'non-market' or intangible values, although they do note that this is only one approach. Qualitative (values based) methods, such as those used in this research, can also be used to place a value on non-market goods and services.

It is of importance to clarify that the term 'non-market values' as defined in economics encompasses the intangible or non-financial values including environmental, social and cultural values (Baker, 2014). In relation to coastal assets, non-market use values can include;

amenity and aesthetic values; safety values; option values; and recreation values. Whilst, all non-use values are considered as non-market values and can include altruistic; existence; and bequest values (Baker, 2014).

There are a number of non-market valuation techniques that are used to place a monetary value on both market and non-market values. The methods suggested in the CHRMAP Guidelines, to quantify how much people are willing to pay for coastal assets are the discrete choice experiment (stated preference) and travel cost method (revealed preference).

In practice, in WA non-market quantitative evaluation approaches have not been utilised to any great extent (S. Bishopp, personal comnunication, January 25, 2022). It has been suggested by coastal researchers, policy makers and practitioners in an unpublished White Paper, this could be likely due to a number of factors:

- significant resourcing (financial and human) required to develop and gather the data;

- requirement for specialist expertise is required to collect, analyse and communicate the data;

- current lack of quantitative socio-economic data; and

- inconsistent collection methods and use of data adopted by decision makers such as local governments, across local government areas and regions, and types of decisions (Lowe et al., 2022).

Furthermore, some research questions the validity of non-market valuation techniques to quantify non-market values, due to: the limited ability to estimate intrinsic values; capacity to consider potential future changes; limited datasets; and in the case of discrete choice

experiment, potential issues regarding survey design (Baker, 2014). Additionally, it can be argued that these techniques are methodologically flawed in so far as: they reduce rich and deep information to a single monetary unit; and the dollar is neither a stable unit of account (due to fluctuating exchange rates) nor an objective store of value (due to extensive quantitative easing) (Boyer & Polasky, 2004). Moreover, methods such as Willingness to Pay can easily be gamed by both organisers and participants, in the absence of any process for reaching consensus (Mould Quevedo et al., 2009).

As such, the collarborative learning approach applied in this research, which replaces the blunt distinction between market and non-market value with a holistic, qualitative view of how value is created, is a useful alternative or complement to these quantitative techniques.

5.4 Application of values based approaches to current risk based framework

In recognition of the limitations noted in this thesis, other research and practice regarding community coastal values, and in the absence of appropriate 'ready-made' analytical frameworks, a new framework (Figure 2.7.1) was developed This framework informed the design, delivery and analysis of this project including the coastal values survey and GE scenario planning workshops. As suggested by Munro et al. (2015), by identifying these values we now have a better understanding of concerns the community have for a particular place; in this case the coastal areas in Old Dunsborough, Bunbury and Waikiki. Moreover, we now have a greater understanding of the values that will be beneficial in evaluating the impacts of climate change and identifying and prioritizing potential adaptation actions to preserve these values (Dietz, 2013; Graham et al., 2014) and recognizing sense of place/lived values in coastal decision-making processes has been acknowledged as being an important factor (McIntyre et al., 2008).

The framework developed for this research, which sought to bring logical structure to what is recognised as 'value' by the community, could be adopted and applied in coastal hazard risk management planning, in for example the identification and assessment of values and adaptation options using surveys and participatory workshops. The outputs from these surveys and the workshops can also inform decision support tools such as MCA and CBA to incorporate and analyse qualitative intangible values into the decision-making process. Values based approaches ensure that the analysis includes a thorough understanding of how the community values the coast. In the case of MCA, selected risk treatment options are assessed against social, environmental, economic and cultural criteria and weighted appropriately to ensure that the values determined to be of significance to the community are maintained. Similarly in the CBA, all costs and benefits, not just economic, are assessed to ensure that the risk treatments reduce the risks to the values deemed to be of greatest importance to the community. Furthermore, social, cultural and environmental considerations are particularly important if a risk treatment option is determined to not be financially feasible due to the costs of a treatment being greater than the benefits. For example, the community may be willing to fund a risk treatment option in order to maintain coastal areas with high evironmental or social value. This highlights the need for a qualitative and holistic understanding of community values that values based approaches provide.

The CHRMAP Guidelines suggest stages in the process where community involvement and engagement should occur. Using this guidance, a modified community engagement flowchart (Figure 5.4.1), informed by the learnings from this thesis was developed. This flowchart identified a number of points (in green) within the coastal hazard risk management and adaptation planning process where meaningful community involvement could be undertaken to inform the relevant stages of the CHRMAP process. This involvement can range from provision of information, and collection of data such as coastal values to one where there are

opportunities for collaborative learning. For example: the identification of values can be gathered via surveys; and participatory workshops can be held to assist with; the assessment (determining consequences) of values; identification and determination of tolerable risks; and analysis of risk treatment options (inckuding MCA and CBA elements). In determining consequences, the risk assessment process typically focuses on the impact of a hazard on the object of interest first. In the CHRMAP process, this is the asset. As such, by switching the focus from assets to values, coastal planners can prioritise value as being a higher order of interest.
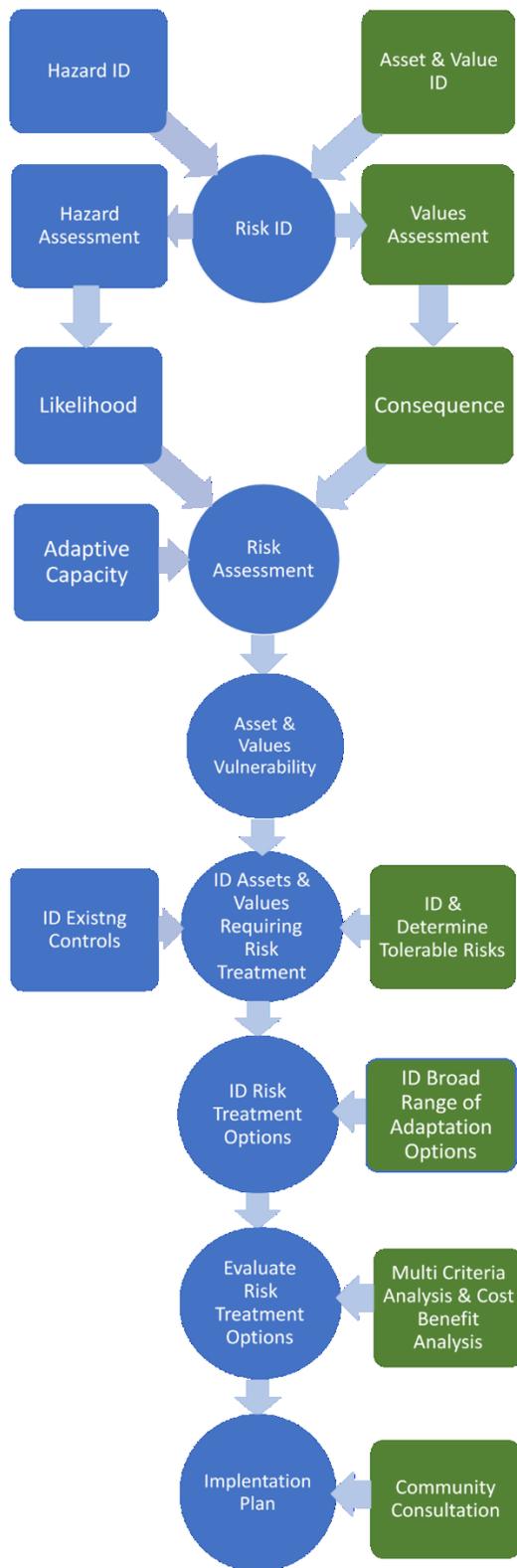
Figure 5.4.1   Coastal risk management planning process flowchart. Adapted from "Coastal Hazard Risk Management and Adaptation Planning Guidelines", by Western Australian Planning Commission, 2014, p11.

5.5   Values based approaches and sustainability

In regards to the relationship of SPP2.6 to 'values' and 'sustainability', objectives of this policy includes to: "protect, conserve and enhance coastal zone values, particularly in areas of landscape, biodiversity and ecosystem integrity, indigenous and cultural significance"; and "ensure the identification of appropriate areas for the sustainable use of the coast for housing, tourism, recreation, ocean access, maritime industry, commercial and other activities." (Western Australian Planning Commission, 2013, p. 3). The policy also states that there should be opportunities available for the community to be engaged and participate in planning for the coastal zone and that the often competing environmental, social, cultural and economic values need to be considered and balanced (Western Australian Planning Commission, 2013).

Values based approaches that examine the environmental, social, cultural and economic elements can create opportunities for sustainable outcomes. This research complements previous research via the identification and exploration of values and sustainability. As noted by Stocker et al. (2012), the attainment of sustainability involves innovative approaches to better understand and represent the differing norms, worldviews and values of individuals to co-produce new knowledge. The development of the cascading values theoretical framework, which informed the design and delivery of surveys and participatory mapping workshops, is an example of an innovative approach. This framework also explored the relationship between the environmental, economic, social and cultural dimensions and coastal communities. The framework acknowledged the pivotal role that the environment plays in supporting socio-economic factors through the built assets, and the uses and benefits provided by the natural and built environment for coastal societies. The results from the surveys and workshops acknowledged the critical function of the natural environment ranking it as the highest coastal value for the community.

In the context of this research and sustainability, there is a relationship between participatory processes, collaborative learning, risk and values. I suggest that the development of sustainable coastal communities requires a shift in focus from built assets with high economic value to one where community values are at the forefront. The framework developed for this research and the adoption of values based approaches such as GE scenario planning workshops accomplishes this reframing of the key focus. These participatory processes that support collaborative learning are the key to identify and prioritise, environmental, social, cultural and economic values deemed to be of significance to the community. The sustainability of risk treatments is also assessed as part of this collaborative learning process. The workshops held as part of this research: generated a shared understanding of risk; identified those values that make their coastal communities important; and identified sustainable treatment options for the future.

Coastal hazard risk management and adaptation planning is an evolving process over temporal dimensions, as coastal hazards and risk change into the future due to climate change, so to will the associated values. A further level of complexity will be changing communities who may relate to and value this evolving coastal environment in a different way as compared to how coastal communities do presently. Values change as the meanings that society places on the natural and built environments change (Adger et al., 2011). Thus, there is an inherent importance to continue to engage and connect with the community to raise awareness and involvement in coastal climate change matters and to identify and assess how the community relates to and values the coast.

5.6   Conclusion

This chapter further examined the research objective: to explore how an understanding of community values can improve coastal adaptation to climate change and sustainability.

Learnings from the survey and workshops and examination of literature, policy and practice addressed research questions regarding: how community values can be better incorporated into coastal hazard risk management and adaptation planning; and how coastal hazard risk management and planning can better address sustainability.

This research has shown that the values based framework and tools designed and implemented in the case studies can be effective means to involve the community in coastal hazard risk management and adaptation planning. The approaches can assist in: identifying coastal values and success criteria; determining consequences; identifying and evaluating risks; and evaluating adaption options. Unlike the approach recommended in the CHRMAP Guidleines, where it is assumed that power is the goal of community participation, collaborative learning approaches seek open and ongoing dialogue with the community with the goal being shared understanding and creation of knowledge. Stages where values based approaches, inlcluding where collaborative lerarning can occur, are shown in Figure 5.4.1.

Although some specifics of the methods could be modified, such as improving levels of participation and representation, the methods demonstrate how community engagement can develop and generate knowledge that incorporates not only individual views, perceptions, norms and worldviews (as in conventional consultation processes), but also new understanding of issues, which are shared by communities, stakeholders and decision makers. The results and feedback from the participatory workshops indicate that the levels of awareness and understanding in the community of coastal processes, impacts of climate change and potential adaptation pathways were raised and collaborative learning was demonstrated.

It has been recognised that community values, which include environmental and cultural aspects are difficult to quantify and can be said to be immeasurable in terms of their worth to society and as such they should as a priority be maintained for current and future generations (Anthony et al., 2009; McGuire, 2013). Risk based approaches such as those currently undertaken in WA do consider values, but those values held by communities seem to be secondary to physical built assets. I suggest that the current risk based approach can be adapted to better consider community values, although a shift is required to direct resourcing and promoting new ways of thinking in order to do this effectively. This research, through the application of three case studies, has provided examples of how community values could be included in risk based approaches, although further research should explore and develop frameworks and tools to better incorporate qualitative community values into risk-based decision support tools that are for the most part quantitative. Furthermore, as noted by van de Kerkhof and Wieczorek (2005), transformative governance approaches should be adopted that encourage collaborative learning and shifts the power and knowledge base from the government to one where the community are involved in the generation of new knowledge and the decision making process.

6   Conclusion

The preservation of values in coastal planning has generally prioritized those 'values' with high economic worth (Pranzini, 2018), which have historically been properties and built assets that are relatively easy to identify and from a monetary standpoint are simply quantified (Graham et al., 2013). The results of this research, which included surveys and participatory workshops, supports previous research in that the natural environment (Ruiz-Frau et al., 2011) and the health and well-being benefits gained from visiting the coast (Gascon et al., 2017), are of greatest importance. Built assets, including private residences adjacent to the beach, were identified by the majority of respondents as being not important, although unsurprisingly they were of more importance to those living directly adjacent to the beach. This is supported by Hayward (2008) who noted that while private residences can be of high economic value in themselves, they are not always recognised by the broader community as possessing the greatest value.

However, built assets do provide and support many of the uses and benefits that are highly valued by the community. For example, provision of access, facilities and infrastructure enables the community to enjoy the numerous mental/emotional, physical, spiritual/cultural and health benefits gained from visiting the beach. As suggested by Munro et al. (2015), by identifying theses values, we now have a better appreciation of concerns the community have for a particular place. Moreover, we now have a greater understanding of these values that will be beneficial in evaluating the impacts of climate change and identifying and prioritizing potential adaptation actions to preserve these values (Dietz, 2013; Graham et al., 2014). Furthermore, recognizing sense of place/lived values in coastal decision-making processes has been acknowledged as being an important factor (McIntyre et al., 2008).

The development and utilisation of the cascading values framework, which built upon

existing frameworks (Anthony et al., 2009; Munro et al., 2015; Schwartz, 2012), was

effective in identifying and assessing those qualitative, non-economic social and

environmental values that have been observed in previous research (Anthony et al., 2009;

McGuire, 2013) as being problematic to quantify. This has been identified as a gap in

research, (Hartz-Karp & Stocker, 2013; O' Brien & Wolf, 2010) and practice (Damara WA,

2016b; GHD Pty Ltd, 2016).

Considering managing coastal hazards, notably erosion and inundation now and into the

future, there was significant support for fencing dunes/revegetation, preventing further

development in hazardous areas and planned retreat with minimal support for installing hard

coastal protection. It is of interest to note that although the case study sites already had some

form of hard coastal protection including seawalls in Bunbury and Waikiki, respondents were

in general not supportive of this approach. This result could indicate that some community

members are not aware of the active management already occurring, which would suggest a

need to raise awareness of local coastal processes and management in the community.

Additionally, in regards to managing coastal hazards, those living directly adjacent to the

beach were less supportive of mechanisms to advise prospective owners that the land is

subject to coastal hazards such as notifications on title (Western Australian Planning

Commission, 2013). This is potentially due to the greater importance put on the personal

financial implications associated with damage or loss of private houses and the perceived and

potential implications on property values associated with coastal hazards and placing

notifications on titles. Furthermore, at Old Dunsborough, the vast majority of responses from

those directly adjacent to the beach were against sand replenishment and installing coastal

protection. This could suggest a lack of understanding of the benefits and/or potential

implications associated with these forms of coastal protection measures, but does imply a need for further research in this area.

The outcomes of the case studies and examination and application of the research addressed the objective of the thesis, which was to explore how community values can improve coastal adaptation to climate change and sustainability. The results from both the survey and workshops suggest that we addressed the research question to identify how the community use and value the coast and how would the values be affected by climate change.

This thesis also aimed to explore how collaborative learning practices can enhance understanding and knowledge uptake of coastal climate change in the community. The GE scenario planning workshops brought together local and state government officers, elected representatives and coastal experts with community members to develop our understanding of coastal climate change science. One of the aims being the creation of new knowledge that could influence the development of practices and policy to address the risks and impacts to community values as a result of coastal climate change. The outcomes of the workshops suggest that collaborative learning occurred, and as noted by Johnson et al. (2018), this newly created knowledge was more than just a consensus of a group of individuals' judgements and values; it was the outcome of a shared approach that encouraged creative thought and discussion. This outcome was supported by the results of the pre- and post-survey of workshop participants, which indicated that the workshops brought together relevant stakeholders in an open, impartial and collaborative environment to co-produce knowledge. Participants' awareness of climate change and coastal values was also raised as a result of attending the workshops.

I suggest that the shared knowledge and heightened understanding of coastal climate change adaptation resulted in first order learning in the creation of new insights, specifically community values and sustainable coastal climate change adaptation practices and policy options. Furthermore, I submit that second order learning was attained in that the project could lead to a change in the framing of values in coastal hazard risk management and adaptation planning policy (Hartz-Karp & Stocker, 2013; van de Kerkhof & Wieczorek, 2005). Although, increased resourcing and commitment to collaborative learning practices is required in order to build social capital, which as noted by van de Kerkhof and Wieczorek (2005) can lead to behaviour change. I suggest that changes to current policy and practice such as SPP2.6 and the CHRMAP Guidelines in WA are needed to promote collaborative learning at the required scale in order to encourage sustainable change in behaviours in the wider community. This is supported by responses in the pre and post workshop surveys, where it was noted that governments working with the community is the preferred approach to address the challenges of coastal climate change.

The research also aimed to answer: how can community values be better incorporated into coastal hazard risk management and adaptation planning; and how can coastal hazard risk management and planning better address sustainability. In regards to the WA context, coastal planning policy SPP2.6 is the primary instrument and in the case of this research there are points rasied in this policy that are of particular relevance to this research, notably: (i) coastal planning and management undertaken by decision makers such as local governments should maintain those values and assets that support public values and provide public benefit; (ii) the identification of appropriate areas for the sustainable use of the coast such as residential development, community and commercial uses such as recreation and tourism, and provision of public access; (iii) the requirement that the often competing environmental, social, cultural and economic values need to be considered and balanced; and (iv) need for the community to

be involved in planning for the coastal zone (Western Australian Planning Commission, 2013).

These points exemplify the significant importance of identifying and assessing how the community uses the coast, and as values are social constructs (Morrissey & Oliver-Smith, 2013; Tschakert et al., 2017) that reflect different cultural models (Kenchington et al., 2012), there is a justifiable and innate need for the community to be involved in planning for the coast. In order to effectively utilize generally limited resources, in a time of increasing coastal hazard risk (Micheal et al., 2022), the approach adopted for this project incorporated more sophisticated learning into coastal hazard and risk management planning. I propose that this process and the research outlined in this thesis demonstrate an effective means to incorporate community values into coastal planning and meet the objectives and requirements of SPP2.6.

Although SPP2.6 notes that the community should be involved in planning for the coast, the current asset based risk management approach adopted in WA does not intuitively capture the often diverse views and opinions on what is valued by the community now and into the future. Furthermore, I suggest that the current governance model is one based on power whereby the decisions often made by government, being the foremost creator and owner of knowledge, does not reflect the often-conflicting community, government and stakeholder views and opinions. The present coastal policy approach should shift from one where power resides with government to one where government promotes and appropriately resources collaborative learning. I suggest this will help move the focus from assets to values. Although this may seem a subtle shift in attention, I believe that this will have a compounding impact on the outcomes.

Research supports the benefits of values based approaches that enable sustainable decisions, which better reflect the community's social, cultural, environmental & economic values (Smith et al., 2016; Stocker et al., 2012; Stocker et al., 2016). In practice, the adoption of more integrated and holistic coastal instutional frameworks such as those adopted in other Australian States (Harvey & Clarke, 2019), when combined with values based collaborative approaches, will I suggest, support the creation of more sustainable coastal communities.

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Appendix A – Beach User Survey (Bunbury Back Beach)

Coastal Values - Bunbury Back Beach

The PNP is working on a community focused coastal climate change study - Involving Communities in Developing Coastal Risk Management Frameworks in Western Australia or 'Coastal Values Study'.

A key aim of this Project is to gain a better understanding of what communities currently value on the coast and how these values may be impacted as a result of climate change. The information gathered will then be used to inform the risk management and adaptation planning process to better plan and manage coastal risks.

The study is focussed on 3 sites, one of which is Bunbury Back Beach, from around Wyalup-Rocky Point to Pendal Street, Bunbury.

The project team want to hear from you so that the features of our coast that we love are maintained into the future.

1. What suburb do you live in?

2. What age group are you in?

○ 18 - 20   ○ 51 - 60

○ 21 - 30   ○ 61 - 70

○ 31 - 40   ○ 71 +

○ 41 - 50

3. Gender

○ Female

○ Male

○ Prefer not to say

4. Do you have any personal cultural connections to this beach/foreshore or are you aware of any broader cultural heritage significance?

○ Yes

○ No

5. Do you own or rent a residential property in the City of Bunbury?

○ Own outright

○ Own with mortgage

○ Renting

6. How close to this beach/foreshore do you live?

○ Directly adjacent to the beach or foreshore – go to question 7 ○ Between about 1km to 10km – go to question 9

○ A couple of streets away from the beach (about 200m to 500m ○ Greater than 10km – go to question 9
away from the beach and/or foreshore) – go to question 7

○ More than a couple of streets away from the beach (more than
about 500m away from the beach and/or foreshore to about
1km) – go to question 7

7. How much do you disagree or agree with the following statement. It is important to me that I live close to this beach

○ Strongly disagree

○ Disagree

○ Agree

○ Strongly agree

8. Why is it important to you, what are the benefits?

[text box]

9. Do you operate or work in a business that is associated with the use of this beach/foreshore?

○ Yes - go to question 10

○ No - go to question 13

10. What is this business and how does it relate to this beach/foreshore and the use of these areas?

11. What benefits, if any, does this beach/foreshore offer your business and /or employees?

12. Could you estimate what percentage of your trade is a direct result of your proximity to this beach/foreshore?

( ) 0 - 24%   ( ) 75% - 100%

( ) 25% - 49%   ( ) Cannot estimate

( ) 50% - 74%

13. Do you belong to a community or social group that use this beach/foreshore?

( ) Yes - go to question 14

( ) No - go to question 15

14. What benefits does this beach/foreshore offer your group?

15. How often do you visit this beach/foreshore for recreation?

( ) Daily   ( ) Seasonally (e.g. Summer only)

( ) Weekly   ( ) Rarely

( ) Monthly   ( ) Depends upon the weather conditions

( ) Occasionally (when you feel like it)

16. How long on average do you normally stay?

( ) < 1 hour

( ) 1 - 2 hours

( ) > 2 hours

17. What time of the day do you normally visit this beach/foreshore?

○ Early to mid-morning   ○ Mid-afternoon to evening

○ Mid-morning to midday   ○ Evening

○ Midday to mid-afternoon   ○ No set time

18. How long have you been coming to this beach/foreshore?

○ Less than 6 months

○ 6 months to 1 year

○ 1 to 5 years

○ > 5 years

19. What are the main activities you do while you are at this beach/foreshore? (select all relevant)

☐ Time with family/friends   ☐ Boating/jet skiing

☐ Fishing   ☐ Walking dog

☐ Swimming   ☐ Observing nature

☐ Snorkelling/Diving   ☐ Photography

☐ Surfing/canoeing etc.   ☐ Relaxing/spending time alone etc.

☐ Walking/running   ☐ Visiting cafes, restaurants or shops

Other (please specify)

[ ]

20. In terms of benefits to your lifestyle, health and/or wellbeing, how important are your visits to this beach/foreshore?

	1 (not important)	2	3	4	5	6	7	8	9	10 (important)	No opinion
Physical fitness	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Mental/emotional health	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Spiritual/cultural	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

21. In what ways, if any, do you feel a sense of belonging or attachment to this beach/foreshore?

[ ]

22. How important are the following assets and qualities of this beach/foreshore to you?

	1 (not important)	2	3	4	5	6	7	8	9	10 (important)	No opinion
Environmental qualities such as clean water, vegetated dunes, native trees and animals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Indigenous and other cultural heritage sites	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Public safety	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Public facilities such as BBQ's, toilets, playgrounds, disabled facilities and boat ramps	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Facilities for active recreation such as paths for walking, jogging and grassed areas for playing / exercising	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Private residences adjacent to beaches	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Restaurants, cafes, tourism venues on foreshore areas or adjacent to beach/foreshore	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Access infrastructure such as roads, car parks, walkways to beach	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other assets and qualities (indicate below)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Other (please specify)

[   ]

23. Apart from changes you have seen as a result of building and development, what changes, if any, have you noticed at this beach/foreshore (select all relevant)?

☐ I have noticed that the beach/ sandy area has been eroding, with a narrower beach

☐ I have noticed occasional flooding of the foreshore area or in carparks etc.

☐ I have noticed dune vegetation becoming sparser, or more areas identified as 'dune under repair' etc.

☐ I have noticed significant changes to this beach/foreshore

☐ Nothing seems to have changed

☐ I have noticed that infrastructure such as jetty, boat ramp fences, footpaths etc. can be damaged and are affected by storm events

☐ Other - what changes you have noticed (please specify)

[   ]

24. How much do you disagree or agree with the following statement. I am concerned about the impacts of climate change on coasts generally

○ Strongly disagree

○ Disagree

○ Agree

○ Strongly agree

25. How aware are you about the general impacts of climate change on coasts, generally such as sea level rise, coastal erosion, flooding and increasing storminess)?

○ I do not believe climate change is occurring

○ I have no or limited awareness of the general impacts of climate change

○ I'm aware of general impacts of climate change on coasts such as sea level rise, coastal erosion, flooding and increasing storminess

○ I'm very aware of general and local impacts of climate change on coasts such as sea level rise, coastal erosion, flooding, increasing storminess and other impacts

Other comments (please specify)

[   ]

26. In your opinion, is erosion at this beach/foreshore? (select all relevant)

☐ The result of normal coastal processes (including cyclical and/or seasonal processes)

☐ The result of climate change (changes are due to sea level rise / increasing storminess)

☐ A combination of normal coastal processes and climate change

☐ Likely to get worse in the future

☐ Nothing to worry about

☐ Something needing urgent attention by government (all levels)

☐ I'm not well informed enough / aware enough to comment

☐ Other (please specify)

[   ]

27. How much do you disagree or agree with the following statement. I am concerned that the impacts of erosion, flooding and/or storms will impact my use of this beach/foreshore

○ Strongly disagree

○ Disagree

○ Agree

○ Strongly agree

28. When thinking about what should be preserved from potential future erosion, how important are the following assets and qualities of this beach/foreshore to you?

	1 (not important)	2	3	4	5	6	7	8	9	10 (important)	No opinion
Environmental qualities such as clean water, vegetated dunes, native trees and animals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Indigenous and other cultural heritage sites	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Public safety	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Public facilities such as BBQ's, toilets, playgrounds, disabled facilities and boat ramps	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Facilities for active recreation such as footpaths for walking, jogging and grassed areas for playing / exercising	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Private residences adjacent to beaches	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Restaurants, cafes, tourism venues on foreshore areas or adjacent to beach/foreshore	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Access infrastructure such as roads, car parks and walkways to beach	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other assets and qualities (indicate below)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Other (please specify)

[   ]

29. Are you aware that installing coastal 'protection' structures such as rock walls and groynes can over time, result in increased rates of erosion on the coast and without sand replacement, can lead to loss of the beach in these areas?

○ Yes

○ No

30. There will probably be a number of different options needed to manage coastal hazards such as erosion and flooding into the future. Please rate your level of support for the following management options

for this beach/foreshore

	1 (strongly against)	2	3	4	5	6	7	8	9	10 (strongly support)	No opinion
Prevent further development in areas vulnerable to coastal hazards	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Remove infrastructure such as car parking and buildings if erosion or flooding affects them	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Monitor beach width and remove (retreat) all assets such as buildings and infrastructure that are likely to be at risk of erosion and/or flooding	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Increase building floor levels of any buildings and infrastructure in foreshore areas or adjacent to the beach to accommodate occasional flooding events	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Place notifications on property titles advising that asset (land and house) is likely to be affected by coastal erosion and / or flooding	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fence off the dunes and / or revegetate dunes and blow outs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Source and replace sand on beaches	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Install coastal protection structures such as rock walls, buried rock walls, groynes	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Do nothing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (please describe below)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Other (please specify)

[   ]

31. Is there anything else you would like to add about the value / importance of this beach/foreshore to you, now and in the future?

32. If you would like to receive updates and/or be invited to upcoming workshop in your area, please provide contact details

Name

Address

Email

Appendix B – Workshop Agenda

Google Earth Scenario Planning Workshop Agenda

Aim

A key aim of the overall Project 'Identifying and incorporating community coastal values in coastal hazard risk management and adaptation planning: A case study of the south west of Western Australia' is to gain a better understanding of what communities currently value on the coast and how these values may be impacted as a result of climate change. The information gathered will then be used to inform the risk management and adaptation planning process to better plan and manage coastal risks.

The aim of the Scenario Planning Workshop is to improve dialogue about coastal adaptation by co-engaging key stakeholders, including scientists, decision-makers, managers, professionals and the general public. The rationale underpinning the workshop has been tested and adapted. It involves: convening (bringing stakeholders together face to face), translating (across 'language' barriers), mediating (ensuring procedural justice and managing conflict) and **co-producing new knowledge** about values, concerns and adaptive pathways. The results obtained are thus much more than the sum of the stakeholders' separate ideas and augments the views of individuals collected through the information sessions and coastal surveys.

Agenda

9.00am	Welcome to country by Traditional Owners
9.15am	Welcome by Councillor/Mayor
9.20am	Introduction to PNP/workshop by PNP/explanation of Craig Perry's research aims and provision of Information Sheet and Before and After Survey (completion of 'before' part and tick box to acknowledge consent to participate)
9.30am	Presentation of interim coastal survey results: values as features, assets, uses & benefits of Hotspot/study area; Q&A
9.45am	Presentation of climate futures & maps with coastal hazard lines; Q&A
10.00am	Group mapping of concerns about impact of climate hazards on coastal values; using GIS layers showing values & hazard lines in Google Earth
10.45am	Morning tea
11.00am	Group mapping of adaptive pathways based on Department of Planning Adaptive Hierarchy
11.45am	General discussion & recommendations
11.55am	Completion of 'after' part of survey and hand survey in
12.00pm	Workshop close

Appendix C – Workshop Before and After Surveys

Coastal Values Project Workshop – Before Survey

Thank you for attending the workshop on the *Identifying and incorporating community coastal values in coastal hazard risk management and adaptation planning: A case study of the south west of Western Australia* research Project.

We would greatly appreciate it if you could complete this survey **before** the workshop. Your involvemnt is critical in identifying what communities currently value on the coast and how these values may be impacted by climate change.

☐	I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent and possible risks of my involvement in this project and I voluntarily consent to take part.

• 1.　Do you live in the City of Busselton?	•　Yes	•　No
2. What suburb do you live in?	•	
•　　3. Age	•　18-19　•　20-29　•　30-39　•　40-49　•　50-59　•　60-69　•　70+	
•　　4. Sex	•　M　　•　F	•　Prefer not to say
•　　5. What do you hope to gain from today's workshop?	• •	

Please respond by ticking a box.	1 (Not at all)	2	4	5 (Very)
1.　How important to you are coastal values (i.e., the qualities, uses, assets & benefits that the coast provides)?				
2.　How aware are you of the impacts of climate change on coasts generally (including sea level rise, coastal erosion, flooding and changing severe events such as storms)?				
3.　Have you participated in coastal volunteer activities such as planting days etc before today?	Yes: please specify		No	

Please complete this survey **after** the Workshop. We would like to see how well it went.

Please respond by ticking a box.	1 (Not at all)	2	4	5 (Very)
1. How important to you are coastal values (i.e., the qualities, uses, assets & benefits that the coast provides), now? Are there specific coastal values that you now more important to you?........................				
2. How aware are you of the impacts of climate change on coasts generally (including sea level rise, coastal erosion, flooding and changing severe events such as storms), now? Are there specific impacts you are now more aware of ?..				
3. If you did not participate in coastal activities such as planting days etc before are you more likely to now?	N/A	Yes		No

4. What activities helped further develop a shared understanding of coastal impacts and adaptation (circle those relevant)?	Comments
Google Earth mapping	
Group discussions	
Speakers and panel	
5. What aspects of the workshop could be improved for next time?	

6. The workshop was effective in terms of:

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Bringing together relevant stakeholders					
Enabling fairness in participation and conflict resolution					
Presenting information in an accessible form					
Co-producing worthwhile knowledge					

7. The best ways of resolving regional coastal impacts of climate change and enabling sustainability are:

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
For governments to take a strong leadership and coordination role					
To allow market forces to find the most efficient technological/innovative solutions					
To involve a wide range of stakeholders including the community					
To let nature take its course and minimise human interventions					
To integrate economic, social, cultural & environmental objectives					

8. There will probably be a number of different options needed to manage coastal hazards such as erosion and flooding into the future. Please rate your level of support for the following options:	1 (Not at all)	2	4	5 (Very)
Avoid putting development (either new on increasing density) in hazardous areas				
Planned or managed retreat				
Accommodate, for example by raising floor level of buildings				
Protect				

Other comments	

For further detail about the project please visit www.peronnaturaliste.org.au