

Planning for Sea Level Rise Adaptation in Coastal Dunedin

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Flooding in the settlement of Long Beach 24 July 2017 Photo: Alfie West

Abstract

Sea level rise (SLR) is leading to many social, environmental and financial implications for low-lying coastal communities across the globe. For Aotearoa New Zealand, the impending threat of SLR and the long-term challenges it will bring will significantly impact the entire country. Adaptation provides a method to cope with the challenges of SLR for communities and local authorities. However, adaptation has been difficult due to a number of reasons, including: ambiguity of what constitutes “successful adaptation” and effective community engagement within adaptation, varying degrees of understanding of the effects of SLR, and varying capacities of communities and local government authorities to deal with the effects of SLR.

This study aims to explore how local authorities and small coastal communities can successfully adapt to accelerating SLR. Qualitative research methods are used to explore the case studies of two small coastal communities in Dunedin, Otago (Aramoana, and Long Beach). Methods employed include extensive literature and policy review, as well as interviews with community members, relevant agencies and local authority staff.

The findings are threefold: firstly, it is found that stakeholders have mixed views on the current adaptive responses. There is a common perception that national level responses are weak, and the blurred roles and responsibilities for Regional Council and Territorial Council are a significant barrier to effective adaptation. Community informants called for adaptive responses to focus on providing greater support to facilitate their mobilisation and specific needs.

Secondly, there are barriers to effective engagement with legislated forms of public consultation. These being, lack of resourcing, the nature of the climate change issues, participant burn-out and a lack of two-way conversations. The findings suggest the role of community engagement in adaptation planning must expand to become a tool for: Providing information about climate change impacts and responses; allowing a communication channel for community members to share their knowledge and experiences with each other and council; Achieving shared community aspirations.

Thirdly, responses in Aramoana and Long Beach should focus on strengthening community characteristics that facilitate resilience building and enhance adaptive capacity overall. The community characteristics highlighted were social capital, self-organisation, flexibility, and local knowledge. Strengthening these characteristics will enhance their ability to not only respond to SLR, but also embrace these changes and to use them to create future opportunities for the communities (Heidkamp & Morrissey, 2018; Nelson, Adger, & Brown, 2007).

Overall, to address the lack of enthusiasm towards current adaptive actions, difficulties experienced with formalised engagement processes, and to facilitate positive resilience building characteristics, the findings suggest implementing a community-based adaptation approach that focusses on both adaptation and development, while benefiting from existing local resources.

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Table of Contents

<i>Abstract</i>	<i>iii</i>
<i>Acknowledgments</i>	<i>v</i>
<i>List of Figures</i>	<i>xi</i>
<i>List of Tables</i>	<i>xii</i>
<i>List of Abbreviations</i>	<i>xiii</i>
1. Introduction	1
1.1 The Threat of Sea Level Rise	1
1.2 Challenges for Planned Adaptation to Sea Level Rise	2
1.3 Stating the Gap within Research	3
1.4 Research Aims and Questions	4
1.5 Case Study: Long Beach and Aramoana.....	5
1.5.1 Long Beach	6
1.5.2 Aramoana	6
1.6 Methodology.....	7
1.7 Thesis Structure.....	8
1.8 Research Significance	9
2. Literature Review	10
2.1 Introduction.....	10
2.2 The Shift from Mitigation to Adaptation Responses	11
2.3 Adaptation and Vulnerability Reduction.....	13

2.3.1 Defining Vulnerability	13
2.3.2 Strategies to Reduce Vulnerability	15
2.3.3 Vulnerability, Resilience and Sustainable Adaptation.....	16
2.4 Resilience and Adaptation.....	18
2.4.1 Adaptive Capacity.....	21
2.4.2 Critiques of Resilience Theory	21
2.5 Transformational Adaptation	22
2.6 Approaches to Adaptation	26
2.6.1 Conventional methods of adaptation	26
2.6.2 Adaptive Pathways Approach.....	29
2.7 The complexity of “Successful Adaptation”	30
2.8 Community Engagement	33
2.9 Community Engagement with Climate Change Effects.....	36
2.9.1 Difficulties of public engagement with perceived ‘distant’ effects of climate change	39
2.10 Community Development for Adaptation.....	40
2.11 Conclusion.....	42
3. Methodology	44
3.1 Introduction.....	44
3.2 Research Approach	45
3.2.1 Constructivist Epistemology	45
3.2.2 Political Ecology	45
3.3 Research Design.....	46
3.3.1 Case Study Research.....	46
3.3.2 Semi-structured Interviews	48
3.3.3 Data Analysis	49
3.3.4 Document Analysis	49
3.4 Ethics and Positionality	50

3.4.1 Ethical Considerations	50
3.4.2 Positionality	51
3.5 Limitations	52
3.6 Conclusion	53
4. Policy and Planning Context	54
4.1 Introduction	54
4.2 National Level Responses	55
4.2.1 Central government and climate change adaptation	55
4.2.2 The Resource Management Act (1991)	56
4.2.3 Central Government Policies – The NZCPS	60
4.2.4 Central Government Guidance	61
4.3 Regional Council Responses	68
4.3.1 Otago Regional Council Plans and Policy	68
4.4 Territorial Authorities (District and City Council) Responses	72
4.4.1 Dunedin City Council District Plan	72
4.4.1 Civil Defence Duties of Local Authorities	78
4.5 Local Adaptation Responses Beyond the RMA.....	79
4.5.1 Aramoana and Long Beach Community Emergency Plans.....	81
4.6 Conclusion	82
5. Adaptive Responses in Long Beach and Aramoana	83
5.1 Introduction	83
5.2 Views on National Level Responses to SLR	84
5.2.1 Uncertainty of how to respond to SLR	84
5.2.2 Uncertainty of who should respond to SLR.....	86
5.3 Views on Local Government Responses to SLR	87
5.3.1 Views on Dunedin City Council Responses and ‘the Right to Assume Risk’	88
5.3.2 Selective Response from Dunedin City Council	89
5.4 Views of Local Adaptation Responses Beyond the RMA	90

5.4.1 Views on CDEM Aspect of Responding to Sea Level Rise	91
5.4.2 Community Responses to Sea Level Rise	93
5.5 Conclusion	94
6. Community Engagement in Long Beach and Aramoana.....	97
6.1 Introduction.....	97
6.2 Formal Statutory Engagement Process within Planning for Sea Level Rise.....	98
6.3 Non-Statutory Engagement within Planning for Sea Level Rise	101
6.4 Barriers to Effective Engagement	105
6.4.1 Lack of resourcing	105
6.4.2 The nature of the climate change issue	106
6.4.3 Participant burnout.....	107
6.4.4 Lack of a two-way conversation	109
6.5 Community Attitudes Towards Effects of Sea Level Rise	111
6.6 Conclusion	115
7. Planning for Adaptation to SLR in Long Beach and Aramoana	117
7.1 Introduction.....	117
7.2 Community Characteristics.....	118
7.2.1 Social Capital	118
7.2.2 Self-organisation	121
7.2.3 Flexibility.....	123
7.2.3 Social Memory and Local Knowledge	127
7.3 How to Enhance these Community Characteristics	131
7.3.1 Actions that deal with uncertainty	131
7.3.2 Actions that mobilise community	133
7.4 Key Challenges for Planned Adaptation in Aramoana and Long Beach.....	134
7.4.1 Lack of Power	134
7.4.2 Perceived Relevance of Sea Level Rise Effects	136
7.5 The Value of Community-based Adaptive Responses	139

7.6 Conclusion	141
8. Conclusions	142
8.1 Introduction	142
8.2 Key Findings	143
8.3 Implications for Planning.....	146
8.4 Future Research	148
8.5 Conclusion	149
9. References	150
10. Appendices.....	159
Appendix A	160
Appendix B	161
Appendix C	163
Appendix D.....	164

List of Figures

Figure 1.1: Location map showing the case study communities.	7
Figure 2.1: Arnstein's Ladder of Citizen Participation (1969).....	34
Figure 2.2: Progressive scale of public participation based on the IAP2 framework.....	35
Figure 4.1: The 10-Step Decision Cycle, Grouped around Five Questions (source:(Ministry for the Environment, 2017b).	65
Figure 4.2: The Process for Clifton to Tangoio Coastal Hazards Strategy.....	66
Figure 4.3: Example of hazard overlay in DCC 2GP Map (Aramoana).....	76

List of Tables

Table 2.1: Advantages and disadvantages of coastal adaptation options (Source:(Rouse et al., 2017b).	27
Table 2.2: The Failure-to-Success Continuum (Adapted and extended from Moser and Boykoff (2013).	32
Table 4.1: A Number of Issues and Policies in the Coast for Otago Plan addressing SLR.....	71
Table 4.2: Tools for avoiding or mitigating coastal hazards (sourced from Quality Planning, 2018)	73
Table 4.3: DCC 2GP Planning Principles for Natural Hazards.	75
Table 4.4: Policies, rules, notes and guidance triggered by the hazard 3 (coastal) overlay zone.	77
Table 5.1: Local Government Informants’ Comments on National Guidance and Direction .	85
Table 6.1: Community Informants’ Barriers to Engaging with the DCC2GP Process.	99
Table 6.2: Comments from community on the connection between coastal hazards and SLR	112

List of Abbreviations

CDEM	Civil Defence Emergency Management
CCATWG	Climate Change Adaptation Technical Working Group
CVE	Climate Variability and Extreme Events
DCC	Dunedin City Council
DCC 2GP	Dunedin City Council Second Generation Plan
LGA	Local Government Act
MfE	Ministry for the Environment
NZ	New Zealand
NZCPS	New Zealand Coastal Policy Statement
ORC	Otago Regional Council
RPS	Regional Policy Statement
RMA	Resource Management Act
SLR	Sea Level Rise

1

Introduction

1.1 The Threat of Sea Level Rise

Sea level rise (SLR) is one of the most significant long-term challenges of the 21st Century. Accelerated SLR will lead to many social, environmental and financial implications for low-lying coastal communities (Alexander, Ryan, & Measham, 2011). For coastal nations such as Aotearoa-New Zealand, the impending threat of SLR and the long-term challenges it will bring will significantly impact the entire country (Ministry for the Environment, 2018). Consequently, a challenge for coastal policy and planning in the near future will be to design and implement a framework that will prevent or lessen the social, environmental and financial costs to coastal communities threatened by accelerated SLR.

Aotearoa-New Zealand has begun forming adaptation strategies alongside mitigation responses to combat the issue of climate change (Ministry for the Environment, 2017). Although both adaptation and mitigation responses are implemented to address climate change, they do so through very different means. Adaptation can be understood as “the process of adjustment to actual or expected climate and its effects in order to lessen or avoid harm or exploit beneficial opportunities” (IPCC, 2014, pp. 76). Whereas mitigation is “the process of reducing emissions

or enhancing sinks of greenhouse gases, so to limit future climate change” (IPCC, 2014, pp. 76). There has been a global shift of focus from mitigation to adaptation (Rouse et al., 2017b). Responses to natural hazards (including climate change effects) is mandated through legislation in Aotearoa-New Zealand, notably through Section 6 and Section 7 of the Resource Management Act (1991). However, there is ambiguity regarding how local authorities can and should implement these climate adaptation responses.

Adaptation is a strategy that gives both local authorities and communities a way to deal with the current and future issues that SLR imposes. There is no set way to design or carry out adaptation. Successful adaptation is determined by the individual context and what the community perceive successful adaptation to be. Due to this, the localised nature of the effects of climate change, effective engagement between local authorities and communities is essential for the successful implementation of any adaptation strategy (Nelson et al., 2007). Although, many academics, politicians and communities are calling for further adaptation to climate change effects, there are a number of challenges for carrying out adaptation to SLR.

1.2 Challenges for Planned Adaptation to Sea Level Rise

There are many challenges for implementing planned adaptation to SLR. Short-term planned responses to climate change lead to maladaptation, that passes on the vulnerability of hazards to future generations (Barnett & O’Neill, 2010). However, long term planned responses to climate change are often controversial and evoke widespread debate. Planning academics have highlighted to balance these issues, community engagement is essential for successfully implementing sustainable planned adaptation strategies that also gain public acceptance (Few et al., 2007; Hance et al., 1988; Wandersman and Hallman, 1993).

The uncertainties involved in predicting future SLR negatively influence both political and public will to initiate sustainable adaptive responses. Political and public will to adapt is generally triggered from sudden natural hazard events that elicit shock and fear within the community. In order to encourage proactive responses to planned adaptation for slower climate change impacts (such as SLR), community characteristics such as resilience must be fostered to strengthen their adaptive capacity (Nelson et al., 2007; & Miller et al., 2010).

Climate change is a process that affects the entire population, yet not everyone shares an understanding of what it actually means, how it will impact society, or what we should do about it (Adger, 2005). Therefore, it is important that conversations begin to take place regarding the localised effects of climate change and how communities experience, perceive and want to prepare for climate change effects. Coastal communities will be the first to experience the impacts of accelerated SLR due to climate change, therefore these communities are more susceptible to harm (Reisinger et al., 2011). However, vulnerable populations are less likely to have the means to proactively seek out participation opportunities within planning (Butler et al., 2015). Local authorities need to account for democratic processes and power imbalances if they wish to foster genuine community resilience in the face of SLR (Butler et al., 2015; Few, Brown, & Tompkins, 2007).

The literature on implementing planned adaptation to climate change effects suggest episodic relationships that are quickly built and then abandoned by local authorities through planning tools such as District Plans and resource consents, will not be adequate for responding to climate changes (Serrao-Neumann, Harman, Leitch, & Low Choy, 2015a; Stephenson et al., 2019; Stephenson & Orchiston, 2018). The community development for adaptation approach has been highlighted as an innovative and more appropriate response to climate effects than traditional styles of planning (Stephenson et al., 2019). The community development for adaptation approach may help overcome some of the challenges of implementing adaptation to SLR. With this in mind, the research aims and questions in Section 1.3 have been developed to explore how to facilitate planned adaptation for SLR in small coastal communities. Specifically focussing on the role of community engagement.

1.3 Stating the Gap within Research

There is a wide breadth of research focussing on climate change effects and response in Dunedin City (Heyd, 2019; Stephenson, 2019a, 2019b). Specifically, there is a significant amount of research currently being undertaken investigating the community of South Dunedin, the largest Dunedin community predicted to be impacted by climate change effects (including SLR). Previous research has also investigated planned adaptation to flooding (associated with climate change) within the Dunedin community of the Taieri Plains (Heyd, 2019).

Due to the immediacy of hazards such as flooding, it is easier for communities and local authorities to understand the importance of a planned adaptation response. In comparison, the impacts of SLR on coastal communities are more gradual but will become more frequent over time. The differences in the temporal scale between these two impacts of climate change result in different conversations regarding how communities understand climate change and how they should adapt to it (Adger, Arnell, & Tompkins, 2005; Heyd, 2019). Therefore, the author argues there is value in exploring how to facilitate planned adaptation to SLR in coastal communities.

Additionally, there is lack of research focusing on planned adaptation to SLR in smaller coastal communities that are often marginalised in formalised planning processes. This provides an opportunity to investigate how to facilitate planned adaptation to SLR in smaller Dunedin communities that often do not have a voice in these conversations regarding climate change responses.

1.4 Research Aims and Questions

This research aims to explore how local authorities and small coastal communities can successfully and sustainably adapt to accelerating SLR associated with climate change. The coastal communities selected as case studies for this research are already beginning to deal with the impacts of the sea compromising their infrastructure (Otago Regional Council, 2012).

This research will explore case studies from two small coastal communities located within Dunedin, these being: Long Beach, and Aramoana. The case studies will inform how to facilitate planned adaptation in small coastal communities in Aotearoa-New Zealand. In order to do this, this thesis will investigate the following research questions:

Research Question 1: *What are the different views on different level adaptive responses to SLR in Aramoana and Long Beach?*

Research Question 2: *What is the role of community engagement in planned adaptation to SLR, and what are the primary barriers to engagement in Long Beach and Aramoana?*

Research Question 3: *How can local authorities enable adaptive responses to accelerated sea level rise (SLR)?*

1.5 Case Study: Long Beach and Aramoana

Long Beach and Aramoana are both small coastal communities located in the South East of Aotearoa-New Zealand. The Otago Regional Council (2012) have highlighted both of these communities as vulnerable to elevated SLR and other climate related hazards. Long Beach and Aramoana will provide an insightful case study to investigate the adaptive responses to SLR currently at play, and what lessons can be learnt from them moving forward.

Both Aramoana and Long Beach are situated on the north-eastern tip of the Otago Peninsula, close to the Otago Harbour and the Pacific Ocean. The settlements are made up of mostly low-density residential development with large sections. The physical characteristics of the Aramoana and Long Beach settlements are similar. The dune system that separate each settlement from the ocean are of a similar extent. Therefore, these settlements are considered a similar level of vulnerability to SLR (The Otago Regional Council, 2012). These communities provide an interesting case study because they are smaller vulnerable settlements that are often marginalised within conversations regarding SLR adaptation. Long Beach and Aramoana are both represented by the West Harbour Community Board (who provide representation of the area stretching from Ravensbourne to Aramoana and up the coast past Long Beach to Pūrākanui).

The communities of Long Beach and Aramoana have a small number of residents, therefore it was anticipated it may be difficult to obtain a large sample size of community participants for this study, given the restricted research period required for the Master of Planning. Using two case studies, rather than one, allows for a higher number of participants to be obtained. Additionally, multiple case studies create strong and reliable results, and thus wider exploration of the research questions (Eisenhardt & Graebner, 2007).

1.5.1 Long Beach

Long beach is located between the mouth of the Otago Harbour and Waitati (see Figure 1.1). Approximately 100 homes are situated in the settlement. However, the population fluctuates between seasons due to several weekend and holiday homes residing in the area (ORC, 2012). The Long Beach settlement is low-lying and situated upon sand deposits set back 200-300 metres from the beach. Properties at Long Beach are already prone to inundation during high 'king tides' (The Otago Regional Council, 2012).

1.5.2 Aramoana

Aramoana is a low-lying settlement situated at the entrance of the Otago Harbour (see Figure 1.1). There are 140 permanent residents within Aramoana. Akin to Long Beach this is also a popular destination for holiday and weekend homes and therefore the population fluctuates over the year (The Otago Regional Council, 2012).

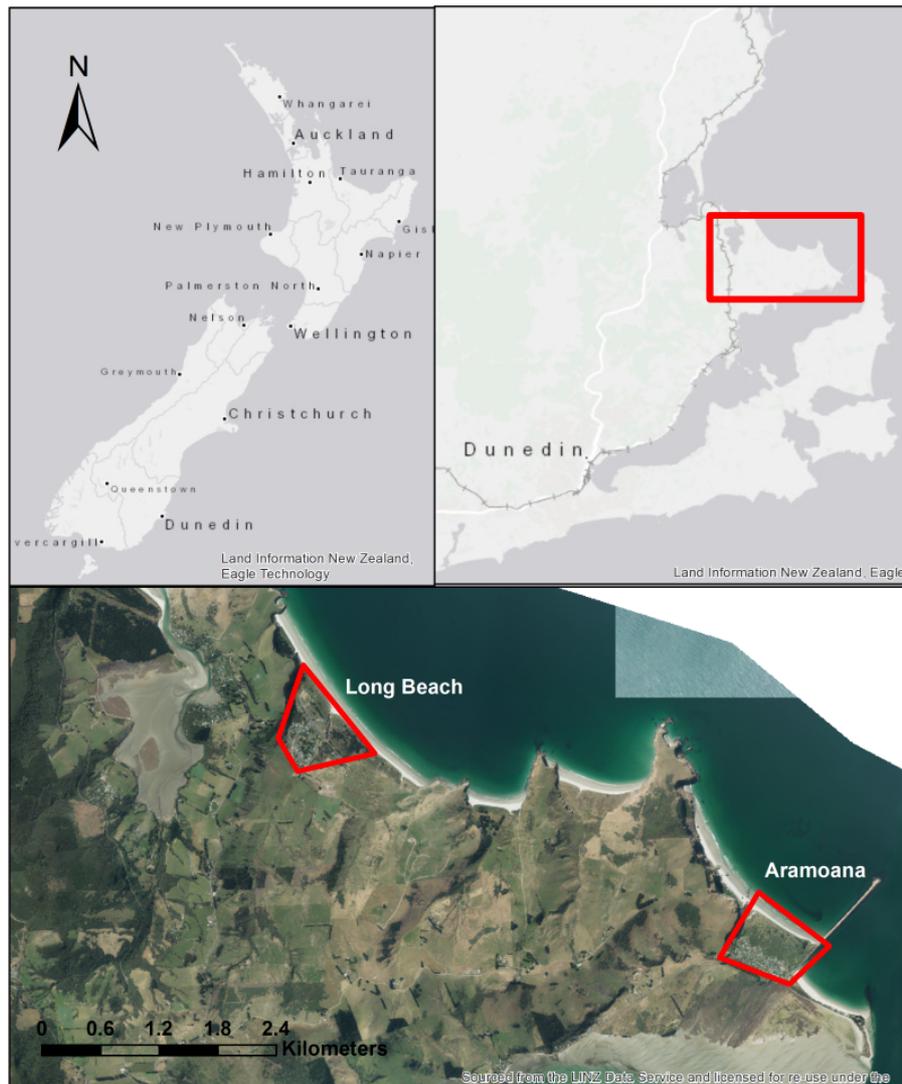


Figure 1.1: Location map showing the case study communities.

1.6 Methodology

In order to explore how local authorities and small coastal communities can successfully and sustainably adapt to accelerating SLR, a research approach built upon constructivism and political ecology principles is employed. The research questions will be explored using a qualitative methodological design, to allow for an open and general approach to data collection. Primary data will be collected through semi-structured interviews, allowing the key informants to lead the interview discussion. A qualitative approach has been selected for this study to employ an interpretive and evaluative study of research. Qualitative data allows human experiences to be explained within conceptual frameworks and provides an avenue to gain an

understanding of human day-to-day thoughts and practices (Lach, 2013). Ethics and positionality will be maintained throughout the research process. Although there are limitations in the current research, these were mitigated with adequate sensitivity and acknowledgment. The methodology employed in this thesis will be further discussed in Chapter 3.

1.7 Thesis Structure

The structure of this thesis follows a linear progression in relation to the three research questions. Initially the focus will be broad, this will narrow toward a more specific focus as it develops throughout the research process.

Chapter 2 is made up of a literature review of relevant research exploring the dominant themes pertaining to theories of sustainable adaptation, resilience and community engagement.

Chapter 3 will describe the research methodology. As discussed earlier due to the evaluative nature of this study, the research was conducted using a qualitative design. This involved multiple key informant interviews with both community members and staff from the local authority. Chapter 3 outlines the research design used throughout the study and the theoretical framework that informed selection of the methods of data collection and analysis. The rationale of the research approach and the limitations of the research is also discussed in detail.

Chapter 4 provides a backdrop to understand coastal adaptation responses to climate change effects (notably SLR) in Aotearoa-New Zealand. Chapter 4 presented the legislative and policy context for dealing with climate change effects at the differing levels of government (central government, regional council, city council and community levels). The information presented in Chapter 4 informed Chapter 5 and Research Question 1.

Chapter 5 is the first of the chapters centred on a research question. In order to address Research Question 1, Chapter 5 investigates informant views on adaptive responses to SLR from a national level through to the community level.

Chapter 6 explores the second research question. Through investigating current engagement processes and barriers to community engagement in the small coastal communities of Long Beach and Aramoana.

Chapter 7 then focusses on the third research question, through exploring informant experiences and views on adaptation actions in Long Beach and Aramoana. This chapter reveals community characteristics that enhance a community's ability to adapt, methods to facilitate these characteristics, and key challenges for planned adaptation.

Chapter 8 concludes this thesis, drawing on the key findings of the study to provide future opportunities for exploring planned adaptation to SLR.

1.8 Research Significance

It is important to prepare communities for future change. The first step towards this is effective community engagement (Nelson et al., 2007). Understanding community engagement's role in the future planning of small coastal communities builds invaluable local knowledge into the design and implementation of planning tools. The planning tools discussed in this thesis are designed to reach optimal outcomes for the environment and community. Therefore, it is essential to understand the community views on these instruments to uncover how they can be improved for localised needs. This research hopes to use these perspectives to identify how local authorities can facilitate successful adaptation to accelerating SLR in small coastal communities of Dunedin.

2

Literature Review

2.1 Introduction

Throughout the history of the Earth, the climate has fluctuated vastly. In the last 100 years, the Earth's climate is warming at a rate unseen during the 12,000-year Holocene period, due to the enhanced greenhouse gas effect (Wanner et al., 2008). The enhanced greenhouse effect is a product of contemporary human activities, increasing the greenhouse gases (Carbon Dioxide, methane and nitrous oxide) emitted into the Earth's atmosphere. Sea level rise (SLR) is a consequence of a warming climate and will impact the vast coastal populations around the world (Barnett & Adger, 2003; Jones & Henderson-Sellers, 1990). How we plan for this overwhelming climate change problem is uncertain, yet critical, for the future well-being of our cities and towns, and those who dwell in them.

Climate change refers to “a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer)”(VijayaVenkataRaman, Iniyan, & Goic, 2012). There is consensus among the scientific community of the threat of climate change; and the impacts can already be seen - from rising sea levels to melting ice, to changing weather patterns. Although climate change cannot be avoided entirely, over the last few decades there have been global efforts towards how to address the problem (VijayaVenkataRaman et al., 2012). Historically, mitigation has received much greater attention in the climate change discussion compared to adaptation. This focus on mitigation has occurred within the scientific community, the media and policy (Füssel, 2007). In recent years, the concept of climate change adaptation has gained the political backing to form a more prominent role in responses to climate change. Climate change adaptation although considered a new concept on the political stage, has been developed over the last two decades within planning and climate science literature. Engagement is increasingly becoming cited as crucial component to successful climate change adaptation.

This chapter aims to unpack the research surrounding climate change adaptation and the role of engagement within this process. First the shift from mitigation to adaptation will be explored. Then the broad approaches and methods of adaptation will be discussed. Subsequently, concepts will be presented of what contributes to “successful adaptation”. Finally, what constitutes successful engagement with climate change and how people engage with long-term issues such as these will be explored.

2.2 The Shift from Mitigation to Adaptation Responses

Anthropogenic climate change places substantial risk on both society and the environment. The two key responses to address these risks are mitigation of climate change, and adaptation to climate change (Füssel, 2007). In the context of climate change literature and policy, mitigation refers to limiting global climate change by reducing emissions or enhancing sinks of greenhouse gases (Füssel, 2007). Whereas climate change adaptation can be understood as the “actions targeted at the vulnerable system in response to actual or expected climate stimuli with the objective of moderating harm from climate change or exploiting opportunities”(Füssel, 2007, p. 265).

Initially the global response strategies (both in scientific research and policy) that received the most attention were mitigation strategies. This was primarily due to their ability to reduce damaging impacts on all climate-sensitive systems. Whereas adaptation strategies have a limited impact on many systems (Füssel, 2007). Another reason for this bias towards climate change mitigation, is that quantitatively measuring greenhouse gas emissions is relatively easy in comparison to measuring the effectiveness of adaptation in terms of future impacts avoided (Füssel, 2007).

Although mitigation remains an essential strategy to combat climate change effects, there are valid arguments for developing adaptive responses. For example, anthropogenic greenhouse gas emissions and aerosol emissions are already impacting average climate conditions and climate extremes. Even the small climate changes observable at present have had substantial impacts on both natural and social systems (Rosenzweig et al., 2007). Notably these changes to climate will continue into the future. Due to this accumulation of greenhouse gases emitted and the continued changes to the climate system, the rate of global warming is projected to be considerably faster over the following decades compared to previously. This projected rate will occur, independent of the emission scenario (Füssel, 2007), as the positive effects of reducing emissions will take at best several decades to be of any significance. This means that adaptation is needed irrespective of continued attempts to mitigate the effects of climate change. As communities will be placed at risk due to climate change effects.

Another argument supporting adaptation strategies is that they can be carried out at a national, regional, or even community scale, and the effectiveness of these strategies are much less reliant on input from wider organizations (Füssel, 2007). Mitigation mostly remains an expert-centric domain (which is still necessary), whereas adaptation provides a space for communities to act. This shift gives scope to recognise localised community agencies and opportunities to build adaptive capacity that have additional co-benefits (e.g. social capital, and resilience) (Smit & Pilifosova, 2003b). Additionally, efforts made to adapt to the effects of climate change can have significant additional benefits experienced on a smaller temporal scale, such as reducing climate-sensitive risks. The positive impacts of adaptation are also experienced on a smaller spatial scale. As adaptive capacity is built locally, and the positive impacts are felt locally. Whereas, mitigative capacity is different for each activity and needs to be aggregated at a global scale to assess its positive impacts (Jones, Dettmann, Park, Rogers, & White, 2007)

This shift towards climate change adaptation is apparent in the development of research and real-world practice of climate change responses. The popularity of climate change adaptation has transferred through to increased public support from political figures, organizations, and funding bodies (Carter et al., 2007; Füssel, 2007).

2.3 Adaptation and Vulnerability Reduction

The scope of adaptation within climate change response literature has widened over recent years to include vulnerability reduction. It has been argued that the most effective way to adapt to the uncertain future climate conditions is to improve adaptation to current climate variability, while reducing vulnerability to extreme events (Burton, 1997). There are existing policies and practices in coastal management that lead to increased community vulnerability, these management practices are termed ‘maladaptive’ (Burton, 1997). Calls for carrying out adaptation to present risks and reducing vulnerability have obvious appeal. For example, for many communities it is more practical to focus on the problems they are experiencing now, rather than on an uncertain threat that will manifest at a future undetermined date. On the other hand, coastal countries, such as Aotearoa-New Zealand, have to consider longer term climate change, as the potential losses in infrastructure and biodiversity are potentially catastrophic (Burton, 1997). It is for these reasons that an adaptation agenda in Aotearoa-New Zealand needs to address both present and future vulnerabilities.

2.3.1 Defining Vulnerability

The notion of vulnerability reduction is not unique to climate change adaptation. In fact, it has been borrowed from the field of disaster risk reduction. Disaster risk reduction and climate change adaptation share the common goal of reducing the impacts of extreme events and improving urban and community resilience to disasters (Solecki, Leichenko, & O’Brien, 2011). Strategies for both of these fields rely on an analysis of the underlying causes of vulnerability and both seek to incorporate this information into planning, management and action.

A magnitude of other fields of research use the term vulnerability, including economics, anthropology, psychology and engineering. It is only in the discipline of human-environment

relationships where this term has a common, yet still contested meaning. Both human geography and human ecology have theorised vulnerability to environmental change (Adger, 2006). While there are similarities and differences in approaches to vulnerability to environmental change, a significant shared concept is the notion that this vulnerability does not operate in isolation from the political economy of resource use. Vulnerability is largely determined by human action that reinforces self-interest and power distributions, while simultaneously interacting with physical and ecological systems (Adger, 2006).

For the purposes of this research, vulnerability is best understood by the definition provided by Blaikie, Cannon, Davis, and Wisner (2005). Vulnerability is the ability or inability of individuals and social groupings to respond to, cope with, recover from, or adapt to, any external stressors (Blaikie et al., 2005). To be clearer, the term ‘social vulnerability’ will be used to underline the human emphasis of this approach to vulnerability. This human approach is useful to inform the current research on policy-relevant recommendations regarding vulnerabilities to long-term climate change that are relevant to the community’s immediate needs.

It is important to understand that vulnerability and poverty are not interchangeable concepts. That is, people who are vulnerable are not always poor, just as people who are poor are not always vulnerable to climate change effects. Amongst those who are considered both poor and vulnerable, there are varying levels and configurations of vulnerability. Depending on the dynamic processes in which individuals and communities respond to future changes, are open and flexible towards strategies, and recreate their collective well-being (Coetzee, 2002; Eriksen & O'brien, 2007).

This brief discussion of different understandings of vulnerability indicates how different epistemological positions are influenced by differing objectives of the research areas (W Neil Adger, 2006). Transparency, in terms such as vulnerability used in this research, is crucial for both avoiding confusion and understanding that social vulnerability is influenced by individual values of the assessor. The subjectivity of the analyst, decision-maker, or policymaker may skew recommendations regarding priorities for intervention (Kelly & Adger, 2000). For this reason, the community’s level of vulnerability should be assessed by the said community; this

is the approach that this thesis will adopt when determining how to reduce vulnerability through the method of adaptation.

2.3.2 Strategies to Reduce Vulnerability

As discussed above levels of social vulnerability are intrinsically linked to the process of adaptation; adaptation is facilitated by reducing social vulnerability. Case studies in the literature have demonstrated a wide variety of factors (i.e. poverty, collective action, and the distribution of resources) work together to influence a community's social vulnerability to climate change effects (Bohle, Downing, & Watts, 1994; Kelly & Adger, 2000). Two of these cases studies will be briefly discussed below. Whilst some of the findings are likely specific to the circumstances of these particular case studies, they are valuable as they indicate some strategies that have wider applicability and demonstrate that intervention strategies have some success.

Kelly and Adger (2000) present a case study investigating vulnerability reduction in Vietnamese communities. Kelly and Adger (2000) provided some key recommendations regarding strategies to reduce vulnerability and facilitate adaptation in rural Vietnam. It should be considered the context of this case study has very different socio-political pressures compared to Aotearoa - New Zealand. Nevertheless, it demonstrates the success of community intervention in reducing social vulnerabilities. The first key lesson is that for social vulnerability to be reduced, poverty reduction must occur. Acting alone, poverty reduction may not enhance wider access resources, however, it is not disputed that poorer members of the community require additional assistance in alleviating stressors. Secondly, loss of common property rights is a significant stressor, and where it cannot be avoided, compensatory measures should be implemented. Thirdly, reduced efficiency or total loss of collective action increases vulnerability of the entire community. Thus, promoting the development of community action is required. Lastly, the underlying causes of vulnerability must be addressed if the community are to develop a sustainable response to extreme events and climate change. For example, addressing the maldistribution of resources (Kelly & Adger, 2000). This case study provides opportunities for interventions to reduce social vulnerability to climate change effects. Since vulnerability reduction is a key component to successful adaptation strategies these findings provide valuable insights for the current research.

Bohle et al. (1994) present a case study investigating vulnerability to climate change effects in Zimbabwe. Bohle et al. (1994) specifically explored social vulnerability in the context of food insecurity, this case study nonetheless infers lessons for reducing social vulnerability caused by climate change effects. Bohle et al. (1994) highlight the responses to vulnerability must reduce potentially harmful anxieties, increase the ability to cope with crisis, and strengthen processes of recovery, based on a meaningful understanding of the factors that cause vulnerability for groups in the present and the future. This case study also emphasises that the impact of future climate change is difficult to predict due to the complexity of social relations at play. Therefore, Bohle et al. (1994) promote the notion that efforts must focus on reducing current social vulnerability to climate change.

2.3.3 Vulnerability, Resilience and Sustainable Adaptation

Facilitating vulnerability reduction through adaptation responses is vital because climate change effects disproportionately burden the most vulnerable groups in society. Climate change is a source of “double inequity” between responsibility and capability to respond (Füssel, 2010). That is, those most affected by climate change are neither responsible nor capable to respond, whereas those who have the capacity are not showing responsibility to those who are vulnerable (Füssel, 2010). Adaptation actions are considered maladaptive if, in meeting the needs of one group, they increase the vulnerability of those most at risk (Barnett & O’Neill, 2010). It is important to note however, vulnerability reduction does not necessarily equate to long-term resilience to these climate change effects (Adger, 2006; Nelson et al., 2007). This is because focussing on reducing impacts (through reducing vulnerability) is not as effective when facing unknown impacts. Whereas focussing on increasing adaptive capacity allows for a resilient system to better deal with any potential future impacts (Nelson et al., 2007).

Resilience is defined as “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions” (Begum, Sarkar, Jaafar, & Pereira, 2014, p. 363). As explained previously, several key components in vulnerability are the stress that a system is exposed to, the level of sensitivity to this stress, and the adaptive capacity of the system or group. Hence, vulnerability

research and resilience research have shared interest in the stresses experienced by the social-ecological system, their response, and their capacity for adaptive action (Adger, 2006).

An approach that both reduces vulnerability and increases resilience is an example of “sustainable adaptation” to climate change effects. The definition of sustainable adaptation is widely contested, a broad definition explains the concept as “adaptation measures that also contribute towards social equity and environmental integrity, two pillars of sustainable development” (Brown, 2011, p. 22). Eriksen and O'brien (2007) carry out a comprehensive analysis of the links between poverty and vulnerability to climate change. This analysis concludes that in order to be considered sustainable adaptation, the intervention must focus on: (1) reducing risks to current well-being, (2) strengthening adaptive capacity of the poor, and (3) addressing the root causes of vulnerability among those financially disadvantaged. Eriksen and O'brien (2007) argue a sustainable adaptation measure may only focus on one of these interconnecting factors, as long as it does not negatively impact the other two it will still be defined as sustainable adaptation.

Current adaptation interventions are often not sustainable; they undermine long-term community resilience, and therefore may even lead to ‘maladaptation’. An example is the popular business-as-usual approach to climate change adaptation of ‘climate change screening’. This is an emerging approach that aims to integrate climate change into development planning (Brown, 2011). Climate change screening involves assessing current plans for their exposure to climate change risks, and then identifying measures to reduce these risks. This adaptation method stresses the importance of controlling change and the ultimate goal is the maintenance of business-as-usual. This managerial approach to adaptation emphasises effective management of existing institutional, technological and market-based risk reduction strategies such as disaster preparedness, irrigation and insurance. Most importantly, this approach does not even attempt to address the underlying process that cause groups to be vulnerable to climate change, which makes sustainable adaptation unlikely to be achieved (Brown, 2011).

Barnett and O'Neill (2010) unpick maladaptation, and in doing so present five pathways to maladaptation. Providing a simple method to analyse adaptation strategies for their potentially harmful impacts. The five ways to maladaptation are actions that:

- 1) increase emissions of greenhouse gases;
- 2) disproportionately burden the most vulnerable;
- 3) have high opportunity costs;
- 4) reduce incentives to adapt; and
- 5) create paths that limit the choices available for future generations.

Barnett and O'Neill (2010) moreover emphasise the critical problem hindering adaptation is the time disparity between the changes in climate and the changes in institutions. The longer-term impacts of adaptation responses are, therefore, hidden by the time disparity. Adger et al. (2005) articulated this problem by explaining that responses initiated by one group and deemed to be successful adaptation, will be judged by another group in other places and times as being unsuccessful. Barnett and O'Neill (2010) five pathways to maladaptation provides a screening tool to attempt to avoid this, and in doing so facilitate opportunities for sustainable adaptation.

As explained in the current section, sustainable adaptation encompasses vulnerability reduction and poverty alleviation. Also discussed above, resilience building is a component of sustainable adaptation to be further explored below. Although, there has been some criticism of resilience strategies, specifically that they are reinforcing business-as-usual responses. The development of transformation in adaptation strategies has occurred as a result. These concepts will be further explored in the following sections.

2.4 Resilience and Adaptation

The concept of resilience emerged long before its application to the climate change problem. It was initially developed in the context of ecology, specifically in the development of ecological systems. It has since been applied to the interconnecting systems of environment and society (Adger, Brown, & Waters, 2011), leading to the unit of analysis of the 'social-ecological system'. The social-ecological system is the interactions between human action and environmental system effects. Human society is (and always has been) impacted by the climate system, through experiencing the changing bio-geochemical cycles and adapting to the consequences of these changes. These social-ecological interactions between climate and

society function on varying temporal, spatial, and political scales (Adger et al., 2011). The concept of social-ecological systems, indicate alternative forms of management and governance are required that move way from policies aiming to control these changes in systems, and towards managing the capacity of the social-ecological systems to cope with, adapt to, and shape themselves towards change (Folke, 2006).

This resilience approach suggests that social and ecological systems cannot be considered in absence of each other. This is because a community may be able to cope with change from a social perspective, for example through increasing agricultural subsidies for farms who need to upgrade their irrigation technology. However, an accurate evaluation of overall resilience must also account for the sustainability of these adaptation techniques from an ecology perspective, in this example given here the ecological impacts of increasing farming and groundwater pumping would need to be considered (Nelson et al., 2007).

Research has also aimed to explore the interactions between social-ecological systems and the links between other frameworks used in climate change research such as the concept of vulnerability. As explained earlier, the resilience approach highlights the need to plan for change, and to understand change as a core component of a system. It is important to understand that resilience involves more than simply the ability to absorb shocks and stressors. It also encompasses the ability to take these stresses and turn them into opportunities, enhancing the ability to evolve during periods of disturbance (Adger et al., 2011). To explore these concepts further, resilience can be split into three key components: the capacity to buffer against change, the ability to self-organise, and the ability to build capacity to learn and adapt.

These three key components of resilience are mirrored in research exploring adaptation and vulnerability to climate change. The influential factors that contribute to adaptive capacity to cope with climate change have been examined by a group of studies that explore adaptive capacity at varying scales. These studies found similar patterns and influential factors at the levels of nations, communities and sectors of the economy. Important to note, these studies found that adaptive capacity is influenced not only by economic development and technology, but also social factors, for example human capital, social capital and governance structures (Nelson et al., 2007).

Uncertainty is a significant obstacle to overcome in formulating responses to climate change effects (Dessai, Hulme, Lempert, & Pielke Jr, 2009). Resilience theory aims to target uncertainty, through emphasising how systems move to alternative, yet stable, states of being. This shift to alternative states is initially triggered by small changes. The uncertainty in climate futures emphasises how attempting to control the natural world by incorporating perfect predictions and foresight into decision making will never be achieved (Dessai et al., 2009). Therefore, decisions regarding adaptation actions should be understood as robust to the present situation and value systems, and also open to potential future circumstances. Resilience and stability are not the same thing, there may be trade-off between managing for stability and managing for adaptability for change. These trade-offs have significant moral factors to be considered, such as, choosing to adapt rather than prevent current effects often has significant negative consequences for those vulnerable sectors of society (Nelson & Anderies, 2009).

As discussed previously systems are subjected to disturbances, therefore adaptation needs to account for not only the ability to respond but also the ability to take advantage of opportunities that system changes bring. System disturbances are often thought of as negative. However, they open up a space to consider innovative development. Smit and Wandel (2006), Gallopín (2006) and Nelson et al. (2007) all advocate adaptation strategies must include process that encourage communities to not only survive but also flourish and improve their quality of life. Therefore, planning for resilience building requires directing community action in a way that provides flexibility during times of disturbance and change that allows a path to be taken that provides a range of opportunities.

Adaptive capacity is a central component in resilience theory, it involves the availability of resources for systems to adapt and learn. Climate change is already and will continue to significantly impact social-ecological systems. In attempt to minimise the potential injustice of these impacts imposed on community-and-individual well-being, resilience theory indicates a critical understanding of the drivers of change and the capabilities that each system has to deal with change. Through the following sub-sections some of the key elements of resilience theory will be unpacked, specifically the adaptive capacity and critiques of resilience theory.

2.4.1 Adaptive Capacity

Adaptive Capacity is the ability of a system to adapt to climate change, this could include the means to moderate potential damages, act on opportunities, or cope with adverse effects (Parry et al., 2007; Smit & Pilifosova, 2003b). Adaptive capacity refers to both coping capacity (the ability to accept the impacts and ensure system recovery to pre-impact state, without changing the system's exposure or vulnerability to future impacts) and the ability to adapt (changing the system's exposure or vulnerability to reduce future impacts). Both coping capacity and ability to adapt are sensitive to many factors, such as socio-economic change, this means they are dynamic both spatially and temporally (Adger, 2006; Eriksen & Kelly, 2007; Turner et al., 2003; Yohe & Tol, 2002). Furthermore, adaptive capacity at the household, community, regional, and national scales are interlinked and influence each other.

Adger (2003) illustrated that adaptive capacity is both place and culture-specific and therefore can only be effectively evaluated through place and culture specific research. Moser and Ekstrom (2010) also underlined the multiple structural elements that interlink to become the broader context within which adaptation decision making exists. The identification of the multiple structural elements (e.g. the actors, the governance regime in which they operate, and the characteristics of the system exposed to the risks of climate change) can be analysed in order to identify the adaptation barriers.

2.4.2 Critiques of Resilience Theory

Critiques of resilience theory state that issues of power and significant social relations are minimised within the literature (Leach, 2008). Agreeing with these claims, Hornborg (2009) indicated that policies aiming to facilitate resilience building do not consider the imbalance in power between actors and are therefore are not able to disrupt the status quo. These criticisms strengthen structuralist explanations of the process in which states "see" some issues, while making others invisible (Adger et al., 2011). For instance, Walker, Holling, Carpenter, and Kinzig (2004) advocate for widespread change of the functioning of global institutions, to move toward greater cohesiveness and coordination between these institutions to help create and maintain a global-scale social contract. To contrast this, Leichenko and O'Brien (2008) argue that to sustainably build resilience, then society must move towards smaller scale local autonomy and action. The principles of a resilience theory for social-ecological system are in

place in policy, and practice in adaptation strategies. However, as explained here, resilience as a goal for these policies is a contested area (Adger et al., 2011).

Although it is not without its critiques the theory of resilience, and its generic goal of facilitating ability to change, represents an alternative paradigm to growth (Adger et al., 2011). Policies with the objective to promote resilience should frame change and variability as intrinsic and inevitable system characteristics. In addition, these policies value equity, redistribution and lowering vulnerability as their goals. The policy implications of a resilience-based approach to climate change effects will have implications for agriculture, economic management, institutional design, and for how community well-being is understood and promoted.

2.5 Transformational Adaptation

Human-environment systems are continuously adapting to the earth's changing climate (Malik, Qin, & Smith, 2010). Adaptation to these climate variations have largely been implemented incrementally, to not disrupt the system entirely. However, for some communities, vulnerabilities and risks are so large that they require entire transformational (rather than incremental) adaptations (Kates, Travis, & Wilbanks, 2012).

Incremental adaptations to climate change are extensions of behaviours that already exist to deal with natural variations in climate and extreme weather events. Incremental adaptation is the dominate approach to dealing with climate effects, illustrated in findings from the listing of adaptations to climate change published by the US National Research Council's Panel on Adapting to the Impacts of Climate Change. These listings show that out of the 314 listed climate change adaptations across seven sectors, only 16 are not interventions that already occur in the United States (Wilbanks, Yohe, Mengelt, & Casola, 2010).

When the risks and vulnerabilities caused by the changing climate are so large that incremental adaptations will not be able to offset the negative impacts, transformational adaptations are required. There are three main types of transformational adaptations:

- adaptation implemented at a much larger scale or intensity;
- strategies that are innovative and new to the context; and

- those that shift locations.

Both transformational and incremental adaptation can be responsive (taking place following a serious climate change impact) or anticipatory (taking place in anticipation of threats). Transformational adaptations can be technological or behavioural. Behavioural adaptations are changes to how individuals and collectives make decisions and allocate resources to cope with climate change. They can also include fundamental changes to institutional processes, priorities and norms (Kates et al., 2012).

In some cases, the lines between what is defined as incremental and what is defined as transformation can be blurred (Kates et al., 2012). This is illustrated in the example of constructing seawalls. If they are larger than those traditionally built in the area and they change the coastal land-uses, they could be considered transformational. However, if all they do is protect existing land-uses then it would likely be considered incremental (Kates et al., 2012). Highlighting the difficulty to define some adaptation processes into only one category. These difficulties also arise as some adaptations are transformational for some scales, but not others. Conversely in the scenario of incremental adaptations that are sustained over such a length of time their cumulative effect is transformational in a community's adaptive capacity to undertake transformational change. Nonetheless, despite some examples being blurred, it is considered important to understand when climate change risks are large enough that adaptation strategies need to aim for transformational change, rather than simple incremental change (Kates et al., 2012).

There are two main conditions that lead to the need for transformational adaptation. One being, the scenario of large groups of vulnerable people within a population, region or resource system. Some regions are particularly vulnerable to climate change effects because of factors such as their physical setting, being a particularly vulnerable population, or a combination of these factors (Tompkins & Adger, 2005). As explained earlier vulnerabilities to climate change impacts are often caused by the combination of multiples stressors, combining the stressors of climate change and other existing vulnerabilities. Low-lying islands are vulnerable to even modest sea level rise, causing some to already beginning the process of planned retreat or migration. The combination of climate change effects and existing poverty can lead to severe levels of vulnerability (de Sherbinin et al., 2011). For situations where there are significant levels of vulnerability, incremental adaptations may be perceived as maladaptive in the long

term, and ultimately lead to causing the need for entire system transformations. This process is defined as the “risk spiral” in systems with both human and natural systems (Costanza et al., 2007). For example, incremental responses such as building a sea wall to protect areas of human coastal development, can have the effect of reducing frequent low-to moderate magnitude losses, and therefore increasing the resource value and short-term returns on investment. However, given the inability to engineer extreme climate events out of the system, the sea wall is eventually compromised and all human development which has been able to build within the hazard zone due to the apparent success of the engineered protection is devastatingly lost (Kates et al., 2012). Understanding how vulnerable populations contribute to the need for either incremental or transformational adaptation is required to ensure maladaptation is avoided.

The other main condition that necessitates transformational adaptation is extremely severe climate change effects. This condition can take three main forms: climate changes that are beyond the range of current predictions; local “hot spots” where global climate changes are magnified; or “tipping points” that lead to rapid climate change effects in particular regions (Kates et al., 2012). Over the last two decades there is a wealth of studies from the physical sciences exploring severe climate change, notably on extreme events, sea level rise and abrupt change. However, there is not as many studies investigating adaptation to extremely severe climate change. This topic in more recent years is becoming one of interest. Even having a conference in 2009, “4 Degrees and Beyond”, to facilitate the exploration of how social-ecological systems could respond to climate effects at the absolute upper threshold of current projections (New, Liverman, Schroder, & Anderson, 2011).

In theory, anticipatory transformational adaptation is a logical and necessary process in certain climate scenarios around the globe. In practice, however, anticipatory transformation adaptation is difficult to implement. There are a host of barriers that hinder successful implementation of transformational adaptation. The key barriers to achieving transformational change are uncertainties around climate change risks and adaptation benefits (Lempert & Collins, 2007), perceived high costs (Dietz, Hope, & Patmore, 2007), and institutional and behavioural barriers (Adger et al., 2007).

Both of the key drivers of transformational adaptation (high vulnerability and severe climate change) are uncertain and difficult to accurately predict. Not including case studies of extremely vulnerable places (e.g. very low-lying island nations), more frequent losses from extreme weather events are often attributed to a series of unfortunate events, rather than changes in climate. In addition, the benefits of truly innovative transformative adaptation are mostly unknown. These factors of uncertainty combine to form a barrier to transformational adaptation (Lempert & Collins, 2007).

Another barrier obstructing transformational adaptation is the perceived costs. Transformational adaptation by design, is often large-scale and therefore require large initial investments. The costs of transformational adaptations that are extensions of familiar adaptations can be estimated and more easily understood by the community. Whereas the costs of innovative transformational adaptation strategies are unknown and presumed to be high. The presumption of high costs acts as a barrier hindering the implementation of transformational adaptation (Kates et al., 2012).

Another example of factors that obstruct the implementation of transformational adaptation are institutional and behavioural barriers. These include legal, social and institutional conceptions of rights, longstanding policies, and behavioural norms. Many long-standing resource systems are rooted in a strong rights-based access to resources (e.g. water rights and mining rights) or traditional uses and privileges (e.g. use of common lands for livestock grazing). Private property rights grant strong control over a resource, and land restrictions (such as disallowing development in a flood zone) are difficult to implement due to strong community backlash. Common worldviews that rely on people self-identifying with their land make relocations a very difficult and complex option to consider (Adger et al., 2007; Kates et al., 2012).

There are also conditions that support the introduction of transformational information. These can be external such as dramatic events. For example major floods that highlight the obvious of vulnerabilities, and in doing so serving as a window of opportunity to gain support for major policy changes (Birkland, 2006). Additionally, there can be internal drivers such as effective adaptive institutions and the availability of understandable and socially acceptable options, combined with incentives, resources for action and effective leadership. If a community perceives that transformation is needed to avoid catastrophic disruption, there needs to be

options provided for their future that both local decision-makers and stakeholders can envision being a part of and living within. In addition, these need to be easily understandable, acceptable and affordable options (Kates et al., 2012).

Transformational adaptations will be necessary in the following years in many places across the world. In order to avoid dramatic loss and disruption, vulnerable communities need to consider anticipatory adaptation as a serious opportunity. Barriers that hinder the uptake of these transformational adaptation strategies are often intimidating. The barriers discussed above, include uncertainty and perceived high costs. Nonetheless, there are conditions that promote this sort of widespread change to systems leading to voluntary transformations, including major extreme events, availability of socially acceptable alternatives, incentives and effective leadership. The following section explores methods to carrying out Adaptation.

2.6 Approaches to Adaptation

Adapting to climate change effects involves a magnitude of decisions made and actions carried out by a wide host of agents, including individuals, firms, public bodies, international institutions, as well as local, regional and central government. There are many actions that contribute to carrying out adaptation and building adaptive capacity. These actions can include enhancing access to climate change information, building awareness of likely effects, facilitating community and individual well-being, protecting property or land uses, strengthening economic growth, and acting upon positive opportunities (Adger et al., 2005). This section examines some approaches to carrying out adaptation.

2.6.1 Conventional methods of adaptation

Other than the “do nothing” approach (which does not provide certainty or security for any actors involved) (Rouse et al., 2017b), there are three general methods for adaptation to climate change effects such as sea level rise at the coast. These are: protection, accommodation and retreat. These key methods to adaptation are further outlined in Table 21. These approaches to coastal adaptation are primarily embedded in rationalities regarding socio-economic factors, nonetheless they also have associated biophysical effects to be considered by decision makers (Rouse et al., 2017b)

Table 2.1: Advantages and disadvantages of coastal adaptation options (Source:(Rouse et al., 2017b)).

Methods	Advantages	Disadvantages
Do nothing	Low cost and low effort for present generation.	No future certainty for any of the actors; projected impacts would occur with consequences for people, property and infrastructure; ignores risks that are projected on to future generations.
Protect	Hard engineering approaches: immediate protection for high-value infrastructure; Soft engineering approaches: aligned with natural processes, allows for cyclic erosion.	Expensive; physical impacts on adjoining beach and consequent effects on communities values; based on assumptions of static risk/single number; leads to misperceptions of risk; direct coastal squeeze of ecosystems and amenity values.
Accommodate	Working more with natural geomorphic processes, allowing for periodic erosion or inundation; retrofitting will give immediate removal of current risk (e.g. raising bridge); seeks to minimise risks/consequences.	Moderate cost depending on retrofitting or relocation of assets//infrastructure; based on assumptions of static risk/single number; leads to misperceptions of risk; requires a change in expectations of use/service of infrastructure (e. g. basements may periodically flood); requires careful communication so that inundation or erosion events are seen as strategically allowed for; still some potential for coastal squeeze of ecosystems and amenity values .
Retreat	Allows for dynamic risk/range of potential futures, allows ecosystem resilience to be maintained; seeks to avoid risks.	Potentially expensive for councils due to relocation of infrastructure; compensation for private dwelling owners; impinge on private property rights and thus tend to cause intense community resistance; needs long timeframe to be implemented without major community disruption.

The adaptation method of protection is traditionally carried out in the form of hard engineered solutions and structures. Engineered approaches are the most common adaptation strategy

carried out across the globe, including in Aotearoa-New Zealand. In Aotearoa-New Zealand protection methods have generally been seawalls. However, the scale of these domestic solutions is considered small and ad-hoc when compared to those carried out internationally (Rouse et al., 2017b). In the past, engineered solutions have been designed and implemented based upon the assumption of a stable climate, this is no longer appropriate given the future climate predictions (Lawrence et al., 2015b; Manning, Lawrence, King, & Chapman, 2015a). These hard structures can lead to direct and indirect biophysical effects on beaches further along the coastline (including isolation from active dune fields, loss of high-tide beach, and increased erosion at the ends of the structure), as well as loss of natural form and character, public access and recreational values (Rouse et al., 2017b). A disadvantage of this method is that the defence structure can create a false sense of security amongst the public that their properties are adequately protected. Flow on effects can lead to intensifying development in these ‘safe areas’, and accordingly increasing value of the infrastructure at risk. Resulting in further pressure to strengthen the defence structures (Manning et al., 2015a). This ultimately leads to ‘serial engineering’.

Softer protection measures are overtime becoming more common, these methods include protection or restoration of natural systems such as sand dunes, or man groves to provide protection. In Aotearoa-New Zealand the management of natural systems such as sand dunes is common practice (e.g. in the Bay of Plenty and the Waikato region (Dahm, Jenks, & Bergin, 2005)). Numerous communities have established community dune-care groups to carry out dune plantings of native species and encouraging beach-goers to lessen their impacts upon these systems by walking on provided walkways (Rouse et al., 2017b). These activity groups also work to raise community awareness and encourage participation in local coastal management, planning and decision making (Dahm et al., 2005; Rouse et al., 2017b).

The adaptation approach of accommodation is centred around “working with nature”, where human activities and the built environment are altered to ensure resilience (Rouse et al., 2017b, p. 198). Examples include, raising bridges, altering the use of ground floor levels of buildings, or through utilising land-use planning to establish recreational grounds in flood prone areas. Consequently, allowing natural cycles in erosion and storm events to be accommodated.

Retreat is often considered a last resort strategy. It involves moving the built environment away from the coast. Retreat can be carried out to some extent or in incremental stages, with complete withdrawal only being considered when all other options are void (Reisinger, Lawrence, Hart, & Chapman, 2015a). Retreat can also be carried out to allow wetlands or marshes to migrate inland, or through developing shoreline setbacks in district plans (Rouse et al., 2017b). The shift from accommodation to retreat implies that recognition of the risk from coastal hazard zones will migrate inland in the near future. Although in theory the retreat strategy seems necessary in particular scenarios, implementing retreat policies is an extremely complex task. Local councils will have to communicate and argue their retreat 'line', account for private versus public good, and address compensation for affected households or businesses, potentially including the cost of foregone opportunities (Rouse et al., 2017b). Hayward (2008, p. 52) explained that although retreat is often favoured by planners as a "rational, cost effective, long term solution", communities are often strong in their opposition of the strategy. Consequently, there are few examples of coastal retreat carried out in Aotearoa- New Zealand.

Planning tools including National Policy Statements, District Plans and Legislation can be used to enable these adaptation approaches (defend, accommodate and retreat). This will be further discussed in Chapter 4 through the policy analysis. The advantages and disadvantages of each method helps to provide insight into what scenarios may lead to each adaptation option. A simple analysis of each of the coastal adaptation options are displayed above in Table 2.1.

2.6.2 Adaptive Pathways Approach

The methods to coastal adaptation discussed above have a focus on reducing risks. Reducing vulnerability and or increasing resilience within the at-risk communities is not explicitly incorporated within these methods. The concept of adaptive pathways provides a more comprehensive approach to coastal adaptation, and is becoming more prominent within planning policy (Barnett et al., 2014; Haasnoot, Kwakkel, Walker, & ter Maat, 2013).

Central to the development of the adaptive pathways concept is that adaptation decisions must respond to the changing environmental processes. The risks that necessitate the adaptation method are unlikely to be solved through a single action, therefore adaptation should be a process managed over time. Allowing institutions to view adaptation in this way enables initial actions that are robust to uncertainty and will ultimately enable resilience building and

vulnerability reduction. The more fluid view of adaptation has led to the idea of adaptation pathways as a way to guide adaptation decisions into an uncertain future (Barnett et al., 2014).

An adaptation pathway is a decision strategy that accounts for a vision exposed to climate risks by producing a sequence of manageable steps over time. Each of these steps is triggered by a change in environmental and/or social conditions. These triggers are called ‘adaptation tipping points’, they occur when previous adaptation techniques stop being effective and new techniques are required (Barnett et al., 2014).

Using adaptive pathways have many positive impacts on the adaptation process. For one it facilitates planners to incorporate adaptation over time into planning documents. Notably it encourages planners to explicitly think about the current actions that are necessary right now but to also keep future options open (Haasnoot et al., 2013). Through the use of adaptive pathways inevitable changes are incorporated into the process rather than being constantly included through ad hoc ways. Through monitoring the outcomes and undertaking corrective actions when required planners can attempt to keep the system working towards the original goals (Haasnoot et al., 2013).

Dynamic Adaptive Pathways Planning is the approach suggested by the Ministry for the Environment (MfE) in their guidance for local government to assess, plan and manage the increasing risks facing coastal communities (discussed in Section 4.2.4.5). MfE support this method for carrying out adaptation on the basis that accommodating future change at the outset, assists both longer-term sustainability and community resilience. The concept of adaptive pathways provides a holistic approach to coastal adaptation, incorporating both vulnerability reduction and resilience building into the core of the methodology to hopefully facilitate successful adaptation at Aotearoa-New Zealand’s coasts.

2.7 The complexity of “Successful Adaptation”

The question of: “What does successful adaptation look like?” is a question that has no simple scientific or political answers. Moser and Boykoff (2013) argue that rather than exploring one clear cut definition of successful adaptation researchers and practitioners should aim to uncover how to think about adaptation success. Importantly, the challenge of successful adaptation

should be rooted in the understanding that there are social, economic, political, technical, institutional, psychological and cultural dimensions to consider (Adger et al., 2005; Moser & Boykoff, 2013). The multi-dimensional nature of adaptation reinforces that there is not and will never be one answer to the problem of what constitutes successful adaptation.

Adger et al. (2005) also explored criteria for measuring the success of adaptation, notably they focussed on taking into account the effect of scale. Success usually by definition means to effectively meet objectives, however this understanding of success is not appropriate for defining successful adaptation. This is for two main reasons. Firstly, although an action may be successful in terms of meeting its original objectives, it may impose unforeseen effects at other spatial or temporal scales. In many scenarios what seems to be successful in the short-term often is less successful in the longer-term. A simple example of this is when the installation of domestic and industrial commercial air-conditioning was booming in western Europe following heat waves. In the short-term this was an effective adaptation action for the acting individuals; however, it relies on energy- and emissions- intensive technologies and therefore is not sustainable overtime and may not be considered successful in the long-term. The second reason as to why this basic standard for success is not appropriate is although an action may be effective for the actor carrying it out, it may produce negative impacts and spatial spill overs onto others. An example of this is for many coastal adaptation strategies to reduce erosion effects include engineered structures that increased erosion processes at both ends of the hard structure. Although it elevates climate effects behind the structure, it intensifies them around the structure. Placing increased climate risks on those around the actors implementing the adaptation strategy.

The definition of successful adaptation depends on the spatial and temporal scale and therefore, should not be evaluated based on the objectives of individual actors but should be judged against different criteria of these different scales (Adger et al., 2005). Adaptation to climate change according to Adger et al. (2005) can be assessed by evaluating the equitable, effective, efficient and legitimate actions that align with wider sustainability principles. Success notably depends on the capacity to adapt and the distribution of that capacity. Importantly, Adger et al. (2005) notes that this success criteria is currently contested and will continue to change over time.

Research aiming to provide an understanding of how to judge successful adaptation illustrates the extreme difficulty of the task. Some researchers have explored the concept of successful adaptation by investigating what is the opposite of “success” Moser and Boykoff (2013) in their discussion of human responses to environmental risk, categorise human management responses along a failure-to-success continuum (presented below in Table 2.2). Rather than having a simple “success or not” dichotomy they suggest a range of benchmarks which adaptative responses can be judged against.

Table 2.2: *The Failure-to-Success Continuum (Adapted and extended from Moser and Boykoff (2013)).*



Building Something Different or Better	“Responses that create a new and better situation altogether”.
Repair and Recovery	“Responses that ameliorate the situation despite multiple stresses”.
Stabilisation of a degrading situation	“Responses that halt negative trends (including the prevention of novel and additional insults or maladaptive practices) or that compensate for increasing stresses”.
Inadequate Response	“Responses that only partially address the causes or symptoms of degradation, situation continues to worsen, maybe more gradually”.
Maladaptation	“Responses that worsen the situation or transfer the challenge from one area, sector or social group to another”.

The approach of looking at the opposite of “success” is still being explored some years on from the development of the Failure-to-Success Continuum. With many researchers exploring maladaptation in attempt to gain further understandings from failed attempts to manage the risk of climate change. Barnett and O’Neill (2010) suggest five criteria that contribute to a response being understood as maladaptive, these being:

- If it leads to increases in emissions of greenhouse gases;
- If it disproportionately burdens those considered vulnerable within society;
- If it has high opportunity costs;
- If it reduces incentives to adapt further or carry out alternative adaptations;
- If it sets in place path dependency that limits future adaptation options.

How to define successful adaptation is ultimately still undetermined. Researchers have put forward different methods to inform decision makers carrying out adaptation actions in attempt to work towards successful adaptation (Adger et al., 2005; Barnett & O'Neill, 2010; Moser & Boykoff, 2013). There is a general understanding that the degree of success depends on the capacity to adapt and the distribution of that capacity (Adger et al., 2005). Taking into account social and biophysical systems, as well as vulnerability and resilience in the community's facing risk are considered important in the unknown formula of successful adaptation (Serrao-Neumann et al., 2015a). Ultimately, successful adaptation needs to be actions that are accepted by both the local authorities and the at-risk communities. A simple first-step towards achieving successful adaptation is ensuring those living with the impacts are doing so in a way they believe to be acceptable (Pearce et al., 2009). Meeting the criterion necessitates efficient and effective community engagement within deliberations regarding climate change adaptation. This will be further explored in the following sections.

2.8 Community Engagement

Public engagement in decision making is said to legitimise the entire planning process. However, when creating planned solutions to address complex problems such as climate change, carrying out effective engagement with the public is an extremely challenging task.

There has been a growing acknowledgement of the importance of public participation in the planning process over the last 20 years (Giddens, 2013; Serrao-Neumann et al., 2014). Famously, Patsy Healey (1997) argued the inclusion of collaborative approaches to planning improves levels of public participation, promotes collective debate, and importantly legitimises the actions of decision makers. However, these claims have faced many critiques amongst academics and practitioners alike (Conrad, Cassar, Christie, & Fazey, 2011; Fischer, 2006; Renn, 2006). Some even arguing the opposite, that greater public involvement in decision making does not ensure higher quality planning outcomes (Brody, 2003). Others such as McGuirk (2001) indicating that collaborative approaches are challenging as planning practice and decisions are embedded within political motives and are influenced by an uneven distribution of power between individual actors. Equity issues are entrenched within public participation processes (Klein & Huq, 2003). These equity issues emerge when dialogue

around decision and risk management options does not include input from key vulnerable groups. Although theories of public participation have faced criticisms it is still considered by many integral to carrying out just planning processes. Many theorists argue that it is only when participation is carried out in a tokenistic way that it becomes problematic (Lane, 2005).

Internationally and domestically public participation initiatives have been founded upon Arnstein’s participatory ladder (Head, 2011). Arnstein’s ladder (presented below in Figure 2.1) is a conceptualisation of public participation in planning. The ‘ladder’ has eight rungs or levels of participation, where each level represents the degree of power the public have in the planning outcomes (Arnstein, 1969). Using this tool public participation initiatives can be judged against a scale from degrees of tokenism to degrees of citizen power. Collaborative approaches such as those championed by Healey (1997) would be ranked high on the ladder as they involve “partnership”. In opposition to the ladder of participation, Head (2011) argued that the ladder approach is based upon a progressive level of public participation in decision making, that is unattainable where governments neither share nor delegate power with the public. Leading to the development of alternative tools to guide public participation processes such as the IAP2 framework.

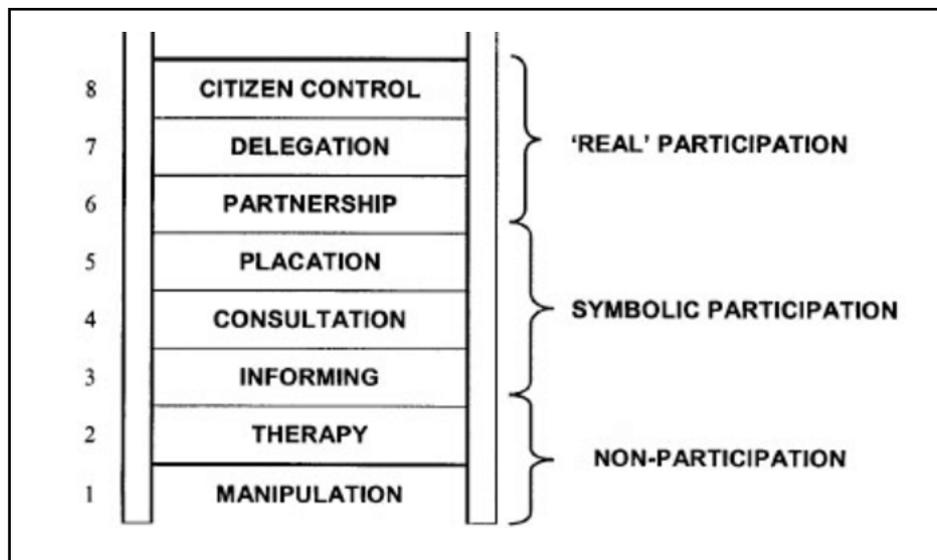


Figure 2.1: Arnstein's Ladder of Citizen Participation (1969)

The IAP2 framework was developed based upon practitioners’ experiences. Comparable to Arnstein’s Ladder it is also comprised of a hierarchy of levels (presented below in Figure 2.2). These levels include information, consultation, involvement, collaboration and empowerment. While these participatory levels are comparative to collaborative theories of decision making,

it has a “more contextual and situational approach rather than the progressive approach to public participation conveyed by Arnstein’s ladder” (Serrao-Neumann, Harman, Leitch, & Low Choy, 2015b, p. 1201). The IAP2 framework can be used as a tool to examine the enablers and barriers to deliberation in public participation with climate change adaptation plans, based on both the specific problem being addresses and the participation methods employed.

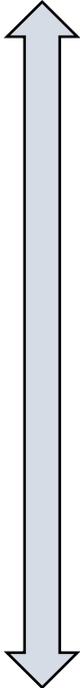
Empowerment	<i>Technique</i>	<p>Stronger participation</p>  <p>Weaker participation</p>
“Decisions are to be undertaken by the public”.	Delegate decisions and ballots.	
Collaboration		
“Partnerships with the public are established to develop ‘alternatives an identify preferred solutions’ in the decisions”.	Public committees and participatory decision-making.	
Involvement		
“The public is directly involved to ensure their ‘concerns and aspirations are consistently understood and considered’ throughout the process.”	Workshops and other participation formats that include deliberation.	
Consultation		
“Public feedback is sought ‘on analysis, alternatives and/or decisions’ related to issues in question”.	Public comments, surveys and meetings.	
Information		
“Balanced and objective information is provided to assist the public in understanding the problem, alternatives, opportunities and/or solutions”.	Information sheets, public exhibits and websites.	

Figure 2.2: Progressive scale of public participation based on the IAP2 framework.

Adapting to increasing sea-level rise will require a multitude of actors, from individuals, to households, communities, businesses, utility providers, as well as local and central government, to work together and make collective decisions about the future. There will be many hurdles to overcome in this process. Including, navigating different interests, expectations, values and worldviews, these differences are likely to lead to a lack of consensus between actors. To add to this, the impacts of climate change and the consequent planned responses will not be experienced the same by everyone. Hence, there is a general consensus that community engagement will be essential, and communities should play a significant part in decision-making. Frameworks such as the progressive scale of public participation based on the IAP2 framework help provide guidance of what each type of participation could entail, and how decisions can be made (MfE, 2017). However, there are many challenges faced when carrying out public engagement with climate change and its effects, which will be further explored in Section 2.9.

2.9 Community Engagement with Climate Change Effects

Calls for public participation in the creation of adaptive climate responses are overt and prolific within most major policy documents on climate change. Participation is explicitly included within Article 6 of the 1992 United Nations Framework Convention on Climate Change, which requires Parties to both encourage and facilitate public participation in addressing climate change effects and creating appropriate responses (Few et al., 2007). Given the popularity of public engagement in most spheres of environmental management, this widespread call for employment of this inclusionary approach in responding to uncertain climate futures is a logical step. Especially when it comes to climate change adaptation, which is likely to be organised and implemented at a local, rather than a global scale (Adger, 2001). Adaptation strategies are generally context-specific, the effects are experienced by a limited number of stakeholders, and therefore require local knowledge tailored to the specific place and risks at hand. It is for these reasons that an inclusionary approach to adaptation actions has not only ethical value, but practical value as well. This high value of local input is further reinforced by the Third Assessment Report of the Intergovernmental Panel on Climate Change, the conditions stated for enhancing adaptive capacity incorporating “active participation by concerned parties, especially to ensure that actions match local needs and resources” (Smit & Pilifosova, 2003a, p. 899).

In considering the place for public participation in climate adaptation, many researchers have underlined the importance of recognising the complex political and social dimensions of the decision-making processes required (Few et al., 2007; Keeney & McDaniels, 2001; Pielke, 1998), these dimensions remain significant even at a local scale. Few et al. (2007) stress the importance of recognising the complexities embedded within the process of public engagement in decision making, in order to not over-simplify the effectiveness, transparency and public reach of community engagement efforts. Notably, there are characteristics of the climate change issue itself that make these considerations specifically important to public participation in adaptation actions (Few et al., 2007).

As mentioned previously, there are complex issues associated with public engagement in decision making processes. Fostering an inclusion-based approach to climate change adaptation face the same issue, but potentially more intensified due to scientific uncertainty, and the intergenerational time-frames of most climate change effects and responses (Few et al., 2007). A transparent participatory process that enables the public to have genuine input and influence on fundamental decisions is called for, if its objective is to create overall priorities for the community or to incite broader discussions of climate change issues. It will also be effective in the decision processes for reactive adaptation, when climate impacts begin to have more tangible effects. However, Few et al. (2007) argue this type of participatory process is essentially incompatible with the creation of anticipatory adaptation. They claim that even if stakeholders are supportive of anticipatory methods, the outcomes of open discussion are unlikely to lead to agreement on a strategy to address long-term and uncertain effects without any immediate pressures. A process claiming to be participatory that does achieve this, according to Few et al. (2007), has a high likelihood under further scrutinization to be guilty of selective inclusion, co-option, and/or systematic exclusion of stakeholders.

One answer to these difficulties in engaging the public in climate change adaptation processes might be to withdraw from including the public at altogether. Certainly, some support the notion of restricting the inclusionary approach. Hillier (2003, p. 162) describes this ‘backlash’ to participatory decision making amongst planners who argue against a participation approach “so that they can make rational decisions untainted by emotions or popular opinion”. To rebut this approach, Few et al. (2007) propose rather than accepting defeat to these difficulties,

climate change adaptation processes need to create an honest and innovative approach that can be both democratic and generate benefits of societal adaptation.

When planning actions for anticipatory adaptation, it is crucial to not promote public participation as a “bottom-up” process in decision making, in order to avoid confusion and exclusion of stakeholder groups. According to Few et al. (2007) in most cases the fundamental decisions have already been made. Rather, an honest and informed approach to participation should specify the purpose, limits and expected outcomes of engagement while assuring that input will have a real impact on the formulation of policy. There is a growing number of researchers and practitioners that argue “blueprint approaches” to public participation are problematic as when dealing with complex environmental issues the level and nature of public involvement is not generalisable across all scenarios. Rather, they champion flexibility as the key characteristic of successful engagement processes. Using tailored approaches to different contexts, based on “sensitive selection or constructive combination of approaches” (Owens, Rayner, & Bina, 2004, p. 1950). For example, in some situations it may be appropriate and necessary to use expert-led discussion, with public input providing a “democratic check” on the value of the expert judgements (Renn, 2006).

Many theorists argue there is still a role for public engagement in strategic adaptation to climate change. Public engagement can act as a mechanism to guide how anticipatory adaptation is implemented in the local context. For participation to be meaningful it will require decision-makers to be trusting in the deliberative capabilities of stakeholders to propose plans that are effective and equitable. Creating such a process is not an easy task and using open-discussion and debate to form concrete decisions is also very difficult. Although, there are some clear messages from the literature to help guide such a process:

- Including the appropriate people from the outset. A legitimate participatory process includes all the relevant stakeholders. Effort must be invested to find out who is ‘important’ (both who is influential and who is affected) (Mikalsen & Jentoft, 2001). This requires significant time and energy in order to gain trust and maintain a dialogue with those who may instinctively act with caution towards the planning process (Few et al., 2007).
- Irrespective of the chosen approach to inclusion, legitimacy of the process demands engagement with stakeholders to be more than the bare minimum ‘consultative’

approach (holding meetings, presenting proposals and asking for comment). Stakeholders need to have a genuine opportunity to create, discuss and provide alternative options. Institutions must create a forum of deliberations that champions the principles of equity, trust and transparency (Few et al., 2007).

- Arguably active participation is best facilitated through working with small groups and utilising a variety of tools for engagement. For example, as discussed by Brown, Few, Tompkins, Tsimplis, and Sortti (2005) explorative workshops held in England, used a range of tools including facilitating open-discussions, smaller group discussions, ranking and re-ranking exercises, and group policy ‘mapping’ tools (Brown et al., 2005). These methods were designed to tackle issues of timeframes and scientific uncertainty surrounding climate change effects.
- Responsibility is placed on local authorities to facilitate capacity building within communities (Head, 2007; Smith & McDonough, 2001), for both capacities to engage, and adaptive capacity in the context of resilience. Local authorities can facilitate community capabilities best through engaging outside of the formal planning process. Building mutual strengths, trust and long-term relationships between those who are vulnerable to climate change effects and those with decision-making power.

2.9.1 Difficulties of public engagement with perceived ‘distant’ effects of climate change

A participatory approach climate change adaptation to sea level rise has two significant barriers to overcome. These being that the public tend to view climate change impacts related to sea level rise as both spatially and temporally distant from themselves. This psychological distancing hinders their willingness to prioritise engaging with the issue (Spence, Poortinga, & Pidgeon, 2012).

The public tend to perceive climate change impacts such as sea level rise, as more dangerous for distant locations. In addition, several studies have shown that personal risks of climate change tend to be viewed as lower than overall societal risks. These findings call for a bridging of this dissociation between local and global impacts of climate change in order to promote individual adaptive actions. Interestingly, a study carried out by Spence, Poortinga, Butler, and Pidgeon (2011b) illustrated that experiences of flooding (an event that could be attributed to climate change) is significantly related to the way in which the individuals perceive climate

change and the extent to which they are prepared to carry out adaptive actions. These findings suggest that discussing climate change in relation to local events and geography makes the issue more salient and will promote engagement with climate change planning, by making the perceived benefits of acting on climate change more tangible (Spence et al., 2012).

In addition to bridging the perceived spatial distance from climate change effects, bridging the temporal distance will also facilitate community engagement with adaptive actions. Most climate change discussions and debate are focussed on preparing, adapting and reducing impacts of future impacts, this is particularly problematic for enticing action. People are more likely to take greater risks in decisions that produce impacts that will be felt at a late date. Asking people to engage with climate change is therefore particularly unattractive, as it requires immediate actions for uncertain rewards in the distant future (Spence et al., 2012).

In order to shrink perceived temporal and spatial distance from climate change effects and therefore facilitating community engagement with adaptation planning, communications with the public should focus on the direct relevance to the community. Without closing off future adaptation options. Spence et al. (2012) argue discussion should focus on climate change risks specific relevance to the social group, locality, and lifetime. Making climate change effects feel more real, local, relevant, and immediate may help promote adaptive actions towards climate change effects.

2.10 Community Development for Adaptation

Many academics have argued to ensure sustainable adaptation, local authorities will need to adopt innovative approaches to community engagement for climate change effects (Serrao-Neumann et al., 2015a; Stephenson et al., 2019; Stephenson & Orchiston, 2018). In response, the Research Group, The Deep South National Science Challenge, through their Climate - Adaptive Communities project, have introduced a new approach to engagement and adaptation processes in Aotearoa-New Zealand. This approach is called ‘community development for adaptation’ (CD4A) (Stephenson et al., 2019).

Most council consultation processes have a specific end point, such as a decision on a district plan, or a resource consent. Additionally, a small number of generic tools are used to extract

information from the public, for example, public meetings, written submissions and public hearings (Stephenson & Orchiston, 2018). These tools will not be sufficient in adaptation to climate change effects (such as SLR) due to the nature of the problem. Climate Change is a long-term issue that will get gradually worse; therefore, decisions will need to be made over several points in time (as discussed in Section 2.6.2) (Haasnoot et al., 2013). Uncertainty in how the hazards will manifest in the future makes these decisions difficult. It is likely the community members most severely affected, will have less power and influence on adaptation decisions (Adger, 2006). If these vulnerable populations are not given a voice in adaptation conversation, it will result in inequitable outcomes (Adger, 2006).

Stephenson et al. (2019) explain attempting to engage with a community at a Dynamic Adaptive Pathway “trigger point”, without previous relationship building, or resilience building amongst the community, is unlikely to lead to satisfactory outcomes for all parties involved. Therefore, Stephenson et al. (2019) suggest local authorities should begin engaging with the community early, before they are severely impacted, to enable long-term and meaningful engagement. The focus of this engagement should be on facilitating communities to be ‘ready’ to engage. This ‘readiness’ is in terms of building their trust in government, general understanding of government processes, and how decisions may be made. This engagement will help communities understand and respond to future effects, build community resilience to deal with current and future impacts, and give them a voice in conversations regarding their future (Stephenson et al., 2019).

Stephenson et al. (2019) propose a ‘community development for adaptation approach’ (CD4A). The CD4A approach is centred on the idea of thinking about all of the needs and issues faced by the whole community, rather than just the needs relating to adaptation. It requires engaging with a large proportion of affected people, including those who are most difficult to reach (Stephenson et al., 2019). Additionally, it aims to carry out engagement with the community in a variety of ways where the public feel comfortable (e.g. meeting at the local community hall, the rugby clubrooms etc.) over many years. CD4A suggests engaging with the community using creative ways of visualising, presenting, and sharing ideas. More equitable solutions can be designed if all vulnerable people are included, this will require innovative processes (i.e. citizen assemblies, people’s panels, participatory budgeting, payment for representation for

those with fewer capabilities, developing resources for those with low written literacy) (Stephenson et al., 2019).

Community must be involved in planning their future, and in all key decision points along the adaptation pathway (Stephenson & Orchiston, 2018). Although some options suggested by community may seem to have a weak connection to adaptation, they are likely essential to build community resilience, and therefore should not be overlooked. CD4A calls for going further than traditional consultation with exposed communities, to involvement, collaboration and ultimately empowerment (Stephenson et al., 2019). CD4A can help both local authorities and community along the adaptation journey. Through providing an innovative approach to community involvement and participation within planning processes, that is better equipped to address issues related to engaging with climate change responses.

2.11 Conclusion

Chapter 2 has presented an overview of the key themes explored in climate adaptation and engagement literature. The topic of climate adaptation is a snowballing in both the literature and in planning practice. There are a multitude of factors that contribute to both the need for adaptation, and how to carry it out in practice. There is general consensus that ‘successful’ community engagement is necessary in implementing adaptation actions, however, what constitutes as successful is more difficult to determine. Some key themes to consider when exploring adaptive responses to sea level rise, and the roles of community and local authorities are summarised below:

Appropriate planning solutions for adapting to long-term changes such as sea-level rise will vary from place-to-place, there is no one-size-fits-all solution. For some communities finding an acceptable response has further complications due to greater risk, and notably greater vulnerability. Greater vulnerability lessens the communities’ adaptive capacity. Also, those who are vulnerable often have less power to influence the adaptive methods implemented. Adaptive actions that do not align with the needs and values of those who are living amongst the impacts, risk becoming examples of maladaptation.

Resilience and adaptive capacity must be facilitated to steer away from the possibilities of maladaptive actions. Theorists such as, Head (2007) and Smith and McDonough (2001) place the responsibility on the local authorities to build community's capabilities to have system flexibility, and thereby creating a culture that is resilient and open to trialling options.

Adaptation to these climate variations have largely been implemented incrementally to not disrupt the system entirely. However, in order to avoid dramatic loss and disruption, vulnerable communities need to consider anticipatory adaptation and as a serious opportunity (Kates et al., 2012).

For local authorities and decision makers to create and implement adaptation strategies that reduce vulnerability, build resilience, and possibly create transformational change, effective engagement is required. Through open deliberations with community a shared understanding can be achieved regarding how to facilitate better engagement and ultimately accomplish optimum planning outcomes.

3

Methodology

3.1 Introduction

Chapter 3 presents the methodology used in this thesis and justifies the research approach applied. First, the overall research approach is discussed, as well as why the lens of constructivist epistemology and political ecology is used. The research design is explained and covers how the research was conducted and the methods used to analyse the data. Following, both ethical and positionality considerations are discussed. Finally, the limitations of the research are addressed. Overall Chapter 3 explains the methodology of the research and how it is used to answer the research aims and objectives.

3.2 Research Approach

The research approach used is built upon the concepts of constructivist epistemology and political ecology principles, which have guided and informed the primary data collection in the form of key stakeholder interviews. Primary data collection ensures the data gathered is both context specific and directly relevant to the research aims (Kitchin & Tate, 2013). Secondary data is also used to establish the context of the research in literature and policy within both the global and domestic setting.

3.2.1 Constructivist Epistemology

Constructivist epistemology is used as a lens to explore the current research's aims and objectives. Constructivist epistemology was selected as it provides an understanding that realities are both socially constructed and subjective. Perceptions of the world and the systems within it are produced and reproduced through hegemonic discourses. Each individual constructs their knowledge and experience through their social interactions embedded within these shared discourses (Given, 2008). This research aims to explore steps towards how local authorities and small coastal communities can successfully and sustainably adapt to accelerating SLR associated with climate change. It is essential to view this research through a lens, which recognises that knowledge is socially constructed and largely impacted by power relationships, and how these factors interact to influence decision-making within the planning framework. Specifically, the differing worldviews and values held by the local authorities and the community members are likely to create differences in their understanding of what engagement with and actions towards adaptation should entail.

3.2.2 Political Ecology

In addition to this constructivist approach, political ecology provides a useful lens to inform this research further. Parallel to constructivism, political ecology highlights the social construction of our lived realities, explicitly emphasising how environmental decision-making is placed within this social construction of the political, economic, and social structure. Political ecology emphasises that environmental changes do not affect community members

homogeneously, nor are the cost and benefit of environmental changes shared equally (Blaikie & Brookfield, 1987).

Some political ecologists have argued that the management of our natural resources and ultimately environment is not judged by the actual occurrence of environmental degradation, but rather by the perception of the environmental conditions that are held by decision-makers and communities, and the competing interests between the two (Robbins, 2011). Political ecology uncovers that individuals in power influence how society perceives the effectiveness of environmental management, and those in positions of power can alter these perceptions to support their political agendas. Viewing this research through the lens of Political Ecology is particularly helpful as varying level of government largely influence adaptation actions carried out in Aotearoa-New Zealand.

3.3 Research Design

3.3.1 Case Study Research

Two case studies are used to provide a variety of contexts to collect data. The case study areas are Aramoana and Long Beach. It is essential to gain an understanding of the political, social, economic, and environmental make-up of these communities before data collection commences. Having understanding of the context is vital because these factors may influence the perceptions that participants hold towards adaptation options and the engagement process. Case studies have two fundamental uses, the first being to uncover influential social constructions. The second being, to integrate these constructions within contextual factors (Baxter, 2010). The case studies are used with a constructivist epistemology. They are used with an understanding that meaning is constructed through subject and object (Taylor, 2016). In other words, meaning is therefore constructed through each research participant and their respective environment. This constructivist epistemology lens allows a deeper meaning to be gained from the key informant interviews, as it reveals complex interactions that are situated within unique socio-cultural contexts (Taylor, 2016).

The communities of Long Beach and Aramoana have a small number of residents, therefore it was anticipated it may be difficult to obtain a large sample size of community participants for

this study, given the restricted research period required for the Master of Planning. Using two case studies, rather than one, allows for a higher number of participants to be obtained. Additionally, multiple case studies create strong and reliable results, and thus wider exploration of the research questions (Eisenhardt & Graebner, 2007).

The specific case studies were chosen as both of these communities have been highlighted by the Otago Regional Council (ORC) as being vulnerable to the effects of sea level rise (Otago Regional Council, 2012). Long Beach and Aramoana are both low-lying, with properties and infrastructure vulnerable to inundation during high perigeon spring or 'king' tides, which occur 3-4 times annually. Vulnerable infrastructure within these settlements is mostly limited to the electricity distribution network, roads, and telecommunications landlines. Residents within these areas rely on water-tank supply and septic tanks. The facilities could also be affected by sea inundation or high-water speeds (Otago Regional Council, 2012). In addition, these case study areas were selected as these smaller townships are a relatively unstudied area in the context of Dunedin, that provides an example of climate change impacts on coastal Aotearoa-New Zealand.

It is crucial to acknowledge Aramoana and Long Beach are two unique communities. However, the findings of this study have been generalised and discussed together. This generalisation is because the results collected from both communities are incredibly similar. Indicating they face similar barriers and enablers for adaptation planning to SLR. For this reason, the findings are often discussed in a generalised manner referring to both or "small coastal communities." However, if the research was undertaken using a larger sample size of informants, it is possible differences may have been able to be uncovered. Even though the findings from both Aramoana and Long Beach are presented together, this does not mean they do not have different experiences; rather this study did not find any. Providing an opportunity for future research, including a larger sample size to be able to make reliable comparisons between the communities. Nonetheless, the findings of this study are valuable in exploring how local authorities and small coastal communities can successfully and sustainably adapt to accelerating SLR associated with climate change. The below quote from a community informant suggests it reasonable to discuss these case studies together:

"Aramoana and Long Beach are closely related. We are unique, but when it comes to this kind of thing [adaptation planning and dealing with the Council] it is similar strokes for similar folks". (C3)

3.3.2 Semi-structured Interviews

Primary data was collected using semi-structured interviews with both professionals in the climate change adaptation field, and community members living in the case study areas. Semi-structured interviews are essentially guided conversations, where the interviewer extracts information from the participants through preparing a list of questions to ask over the course of the interview (Longhurst, 2003). This method allows for a thorough understanding to be gained of the participants experiences and views with some flexibility for the participants to go beyond the listed questions. The information is then used to help answer the research questions (Cresswell, 2003; Dunn, 2010). A semi-structured interview method was selected rather than a structured interview, as it provides a degree of flexibility for the participants to discuss topics, they believe are important, while still ensuring the broader research topic is maintained (Longhurst, 2003). Semi-structured interviews are more casual in nature, helping make the participant (notably community members) feel more comfortable and therefore offer more open responses than a formal structured interview would (Longhurst, 2003). Ultimately the semi-structured interview method was selected to give greater insight into the subjective perspective of the participants (Dunn, 2010; Peräkylä & Ruusuvoori, 2011), and to allow deeper understandings to be gained of the contextual causes of a situation (Rubin & Rubin, 1995).

3.3.2.1 Selection of Key Informants

Informants were selected on the basis of them either working as a practitioner involved in adaptation planning in Dunedin City, or living in the settlements of Aramoana and Long Beach.

Key informants comprised:

- The Lead for the DCC Corporate Policy Team.
- The Coastal Specialist and Strategic Planner at the DCC.
- The Senior Policy Planner for City Development at the DCC.
- A Consultant working in risk assessment, adaptation and resilience planning.
- The Emergency Management Officer for CDEM Otago.
- Community members of Aramoana (3 participants – C1, C2, C3)
- Community members of Long Beach (2 participants – C4, C5)

Ten separate interviews were conducted with each key informant. The participants were selected initially through job titles at the Dunedin City Council closely linked to coastal adaptation planning. The community members were first contacted through the community groups of the Aramoana League and the Long Beach Amenities Society, and then a snowballing method was employed to gather further community members. To ensure anonymity, the community participants will be referred to by codes (C1, C2, C3, C4, C5), and the practitioner informants will be referred to by their job title.

3.3.3 Data Analysis

The first stage of the data analysis process involved transcribing the participant interviews. Following this, the data was coded into themes. Coding is the process of “extracting concepts from raw data and developing them in terms of their properties and dimensions”. In doing so, “breaking data apart and delineating concepts to stand for blocks of raw data” (Corbin & Strauss, 2008, p. 195). The technique employed to organise the data was ‘open coding’. Open coding is the process of interpreting data without predetermined codes (Corbin & Strauss, 2008); the data instead is placed into conceptual categories following collection. Thereby, allowing for unexpected findings to be obtained that emerge during the interview process. The coded data was then organised in relation to the research question it was informing, creating the structure of the results and discussion sections.

3.3.4 Document Analysis

A document analysis was undertaken, this involved exploring current government documents, policies, and plans related to coastal hazard planning and climate adaptation. The documents were selected through searching online on both national and local government websites. Relevant sections of each document content were then analysed in terms of what they mean for adaptive responses to sea level rise. The document analysis is valuable for the current research as it provides a policy context, and in doing so indicates what is currently considered best practice in adaptation responses in Aotearoa-New Zealand.

3.4 Ethics and Positionality

When conducting research involving human participants, ethical considerations are essential. These ethical considerations must be reflected throughout all stages of the research process (Cresswell, 2003). Ethical consideration in research is conducted in a two-fold manner. Firstly, “procedural ethics” must be upheld. Following, “ethics in practice” must be carried out (Guillemin & Gillam, 2004). Procedural ethics generally involves maintaining ethical standards by seeking approval from a relevant ethics committee (Guillemin & Gillam, 2004). Ethics and practice, is however, the everyday ethical issues that arise when carrying out research (Guillemin & Gillam, 2004).

3.4.1 Ethical Considerations

The semi-structured interview method used to collect the primary data in the current research involved direct interactions between participant and researcher. These social interactions are embedded within a context that cannot be separated from societal norms, expectations, and power structures that influence these interactions (Dowling, 2010). It was vital that this issue was considered when conducting the social research. There were two significant risks of harm to be considered. The first was potentially damaging relationships through sensitive information discussed within the interviews being leaked. The second being potentially distressing the residents, as climate change is an emotionally charged topic, especially for the participants as their households and wider community are at risk to its effects. In order to mitigate these risks, caution was taken when analysing and presenting the findings to ensure that comments by participants were shown in context and the way that was intended by the participant. Furthermore, all participants are referred to by pseudonyms to keep participants comments anonymous. To mitigate potential distress elicited through discussions on climate change, information was provided to participants that included exactly what their input would entail. Therefore, only individuals who were informed, willing, and comfortable to discuss adaptation to climate change effects in their communities participated.

Overall, to ensure that the current research complies with procedural ethics a University of Otago Ethics B Application was lodged and accepted. The Ethics B Application outlined a description of the methodology, the research aims and questions and potential issues that may

arise throughout the course of the research process. Additionally, all participants were provided an information sheet detailing the research prior to confirming their participation. Thereby, ensuring participants were able to provide informed consent regarding their involvement in the research. Written consent was obtained prior to any interviews, and participants were made aware of their right to withdraw from the study at any time. Ethics in practice were carried out by adhering to the University of Otago Code of Conduct, as well as the New Zealand Planning Institute Code of Ethics throughout the entirety of the research process.

3.4.2 Positionality

Positionality was considered throughout the duration of the research process. Whether consciously or not, the researcher's positionality is an integral part of any study as it influences the research approach, relationship with the participants, and the interpretation of the findings (Panelli, 2004; Rose, 1997).

My position in how I approach the current research is inherently influenced by factors such as, that I am a young postgraduate student and a Pākehā woman. Although I was raised within 8 kilometres from both of my case study areas, I myself do not live within either community I am conducting research in; therefore, I am an 'outsider' to the case study. The fact that I am an outsider is important to acknowledge, as although 'outsider research' can contribute to furthering understanding of the community engaged in the research, it is unlikely I can articulate the community views as well as a direct community member could (Bridges, 2001). It is acknowledged that myself, the researcher, may be different from the participants in terms of factors such as age, gender, and level of education. These differences were recognised through ensuring all participants were given high levels of respect in all interactions, and the researchers did not hold themselves in a way that might insinuate different levels of 'power'. Although, as Rose (1997) explains, the researcher holds a privileged position as they have the power to decide what questions are asked and how the discussions are interpreted and presented. In attempt to mitigate this, care was given to ensure leading questions were not asked and that the participants felt comfortable throughout the data collection process. In addition, I to the best of my ability, ensured that the participant perspectives were accurately portrayed and used extended quotes. All participants were asked if they requested the results to review prior to publishing, although only one accepted this offer.

3.5 Limitations

A significant limitation of the current research is the number of participants. A larger sample size would have allowed more robust findings to be obtained. This was particularly the case for the number of community members included in the research; however, given the timeframe and scope of the present research the small sample size of the key informants allowed an in-depth account to be obtained on their personal views on adaptation in Dunedin. Chapter 8 provides future research opportunities that address this limitation. The community members insights, although they were derived from a small subset of a representative population, nonetheless provide in-depth and valuable perspectives that can be applicable to other cases of adaptation to climate change effects.

Another significant limitation of the current research was that there were no key informants obtained from local iwi. For Māori, the coast was traditionally a place to live and source food. Additionally, it was fundamental to their travel and communication. Therefore, Tangata Whenua has a significant interest in activities on the coast (Environment Guide, 2018a). Although iwi interest is beyond the scope of the current research, further study into the adaptation planning in Dunedin from an iwi perspective is vital to gain a full understanding moving forward with adaptation actions.

It is essential to note there were no key informants from the Otago Regional Council (ORC). Although their perspectives and experiences with adaptation in Dunedin City is crucial for the current research, unfortunately, no participants could be obtained. The ORC's views would have provided a fuller understanding of the local authority's experiences with adaptation to sea level rise. Therefore, their absence may influence the research findings. Consequently, opportunities for future research, specifically exploring the ORC's involvement and perspectives on adaptation in small coastal communities of Dunedin City.

3.6 Conclusion

By building upon constructivism and political ecology principles, the research methods discussed within this chapter ensured a sufficient range and quality of data was collected. The combination of semi-structured interviews, document analysis, and literature review ensured that the results were cross-verified and thus of a high standard. Ethics and positionality were maintained throughout the research process. Although there were limitations in the current research, these were mitigated with adequate sensitivity and acknowledgment. The methodology presented here guided the research to provide the comprehensive results of the following chapters.

4

Policy and Planning Context

4.1 Introduction

In Aotearoa-New Zealand, the key legislative framework for managing the natural environment is the Resource Management Act 1991 (RMA). Mandates for regional and territorial authorities are placed through both the RMA and the Local Government Act 2002 (LGA). National guidance is also provided through environmental standards and policy statements. The management of natural resources and hazards is largely delegated to local government, with functions and responsibilities of local government including: managing development and hazards in the natural and built environment through policies, plans and consents, as well as providing essential services such as water supply, civil defence and waste management (Reisinger, Wratt, Allan, & Larsen, 2011). The hierarchical structure of the RMA requires actions carried out by local government to be consistent with any higher order policies (i.e.

district plans policies must be consistent with regional policies, which must be in line with national policy statements and standards). Therefore, as long as actions are consistent with mandated activities and higher-level policy, local authorities can create policies and plans tailored to their local needs (Reisinger et al., 2011). In the case of climate change adaptation in coastal communities, the varying responsibilities of national, regional and local actors under different legalisation leads to gaps and overlaps in the management of the coastal environment. Some academics argue these gaps act as barriers to climate change adaptation (Lawrence et al., 2015).

Chapter 3 provides a backdrop to understand coastal adaptation responses to climate change effects (notably sea-level rise) in Aotearoa-New Zealand. The current chapter presents the legislative and policy context for dealing with climate change effects at the differing levels of government. Section 4.2 discusses the national level responses to climate change effects, including the RMA 1991, the New Zealand Coastal Policy Statement, and central government guidance. Following, Section 4.3 explores the regional council responses, through examining the Otago Regional Council plans and policies. Section 4.4 then presents the territorial authority responses, including the DCC District Plan and their civil defence duties. Finally, Section 4.5 discusses local responses (beyond those legislated by the RMA) to climate change effects, including SLR. The information presented in Chapter 4, will be particularly informative within Chapter 5, addressing Research Question 1: *What adaptive responses to sea-level rise are occurring in the coastal communities of Aramoana and Long Beach?*

4.2 National Level Responses

4.2.1 Central government and climate change adaptation

Previously, Aotearoa-New Zealand has emphasised efforts to mitigate climate change effects; however, the country has recently widened its focus to include adaptation and methods to cope with these effects (Reisinger et al., 2011). At a central government level, this shift was emphasised in 2001, with a Parliamentary Select Committee inquiry into the role of local government to domestic climate change objectives (Reisinger et al., 2011). At this time, workshops held by the MfE uncovered significant barriers to implementing adaptation actions. These barriers included, ineffective science communication and therefore limited community

awareness; the difficulty of utilising uncertain climate predictions into local government decisions; lack of assurance and guidance regarding the mandate, priorities, and options to respond to climate change effects (Reisinger et al., 2011).

Central government acts as key funding stream for research building upon New Zealanders' understanding of climate-related effects and what could be expected for different sectors of society. However, central government's agencies' understanding of how climate change will impact their responsibilities and operations are less clear. Additionally, actions carried out by central government agencies have typically been of a reactive nature, and a part of natural hazard response after climate-related impacts have been experienced (CCTWG, 2017).

4.2.2 The Resource Management Act (1991)

The RMA is Aotearoa-New Zealand's core legalisation that outlines how the environment should be managed. Created in 1991 it aimed to allow for a more coordinated, streamlined, and comprehensive approach to environmental management. The RMA is centred on the principles of sustainable management, and therefore involves considering the effects of resource management decisions both now and into the future (Ministry for the Environment, 2018). The RMA is tasked with managing air, soil, fresh water and coastal marine areas. The RMA in addition regulates land use and the provision of infrastructure which are essential aspects of Aotearoa-New Zealand's planning system. To manage these aspects of the environment, the RMA gives regional and territorial authorities the ability to create resource management policies and plans. When a local authority is considering a resource consent application (i.e. permission given by a local authority to an applicant to carry out an activity) their decision is subject to the rules, policies, and objectives of these plans. As explained earlier these plans must give effect to the higher-order planning tools, therefore they must be consistent with national policy statements, and the principles of the RMA (Ministry for the Environment, 2018). These varying roles are critical to adaptation as they provide information, and legal and policy frameworks for local actors (Rouse et al., 2017b).

The national policy role for climate change, especially for adaptation, is aligned with the MfE's functions under the RMA, specifically the 2004 amendment to the RMA which requires decisions-makers to have particular regard to the effects of climate change (Reisinger et al., 2011). The 2004 amendment included changes to Part 2 (Purpose and Principles), Section 7,

Other matters to have particular regard to:

(i) The effects of climate change.

Following, in 2017 as part of the Resource Legislation Amendment Act, *Section 6 Matters of National Importance* directed:

All persons exercising functions and powers under the Act... shall recognise and provide for:

(h) the management of significant risks from natural hazards.

The definition of natural hazards in the RMA is, “Any atmospheric or earth or water related occurrence (including earth quake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire or flooding) the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment” (RMA, 1991). Therefore, the 2017 amendment inserts climate change effects as a matter of national importance, and therefore decision makers must “recognise and provide for” this matter.

These amendments to Part 2 (Purpose and Principles) of the RMA, mean that local authorities should consider the effects of climate change in plans, policies and therefore resource consent decisions. The amendments to Part 2 of the RMA and therefore the inclusion of climate change into the purpose and principles of the Act is a step in the right direction for adaptation efforts in Aotearoa-New Zealand. Yet, the mandate is wide-ranging and there isn’t specific direction in the RMA for who is responsible to carry out what in terms of adaptation actions.

According to Warnock (2015) the blurred lines between roles is due to the overlap of roles and responsibilities for natural hazards under the RMA. In the RMA (1991), Section 30(1)(c)(iv) states:

Every regional council shall have the following functions for the purpose of giving effect to this Act in its region:

(c) the control of the use of land for the purpose of –

(iv) the avoidance or mitigation of natural hazards.

The blurring of responsibilities becomes obvious when the above exert from Section 30 is compared to Section 31(1)(b)(i), which states:

Every territorial authority shall have the following functions for the purpose of giving effect to this Act in its district:

(b) the control of any actual or potential effects of the use, development, or protection of land, including for the purpose of –

(i) the avoidance or mitigation of natural hazards.

The overlapping functions of the regional and territorial councils has caused confusion in the past. *Canterbury Regional Council v Banks Peninsula District Court [1995]* addressed this relationship between the relative functions of these authorities under the RMA (Warnock, 2015). In particular there was conflict due to the Regional's Council's desire to prevent development in the Waimakariri floodplain. The District Council however, wished to preserve its full discretion as to where land use development occurred in the district. The court ruled that the councils have overlapping powers, and both could employ measures to avoid the effects of hazards (Warnock, 2015). Once again, the district plan cannot be inconsistent with the higher order instruments. Essentially, the court reaffirmed the overlapping roles and responsibilities and indicated that it is situation dependent when it comes to which council may deal with the natural hazard risk. This case confirmed that both territorial and regional councils can control land use development (Warnock, 2015). Upholding the blurring of roles and responsibilities. It is therefore essential, that the councils have a close unifying approach to hazard management. Although following this case there has been further disputes between local authorities regarding hazard management approaches (Box 4.1). There are alternative tools which help authorities determine how to work together in the development of future adaptation strategies, discussed later in this chapter.

Box 4.1: *Otago Regional Council v Dunedin City Council 2010 NZEnvC*

The Case

Otago Regional Council v Dunedin City Council was an environment court case which further complicates considerations for local authorities when making controls for hazards. A couple obtained a land use consent from the Dunedin City Council (DCC) to build a house on stilts in a flood-prone area, near-by the Karitane Estuary and close to sea level. The Otago Regional Council (ORC) then appealed this decision to the Environment Court, on the basis of issues relating to the natural hazard risk and the resident's safety from flooding (Warnock, 2015).

The Outcome

The Environment Court ruling was that the proposal was not contradicting any relevant plans, and the resource applicant is able to assume the risk of the site. Ultimately in the case of flooding the DCC would be not be liable. The appeal was dismissed on the condition that the owners have assumed risk of the property, assuring any future owners of the house would not have grounds to find the DCC liable for negligence. In addition, a deed was required with the ORC stating that the owners would not seek any flood protection works. In agreeing to assume the risks, the couple volunteered a condition to the covenant that required a boat to be kept on a derrick on their house to escape from floodwaters in an emergency event (Warnock, 2015).



Photo sourced: 1 <https://www.odt.co.nz/lifestyle/home-garden/house-tenacity-built>

Key learnings from Otago Regional Council v Dunedin City Council 2010 NZEnvC:

- **There is a principle of voluntary assumption of risk of the landowner.**
- **Contentious - as the Otago Regional Policy Statement requires a precautionary approach to avoiding or mitigating the effects of climate change.**
- **This ruling creates further issues for the local authorities to consider when dealing with the effects of climate change.**

The RMA (1991) is built around the principles of sustainable management, therefore it considers the effects of resource management decisions now and into the future (MfE, 2018a). The 2004 amendments to include the consideration of the effects of climate change into the purpose and principles of the Act reflect the concept of sustainable management. This was a significant step forward in terms of acknowledging the threat of climate change. The shared roles and responsibilities between regional and territorial authorities, makes sense in principle, however, in practice it has led to confusion and uncertainty on who should response to climate change hazards such as SLR.

4.2.3 Central Government Policies – The NZCPS

The New Zealand Coastal Policy Statement 1994 (NZCPS) was the first national level tool under the RMA, that required councils to “recognise the possibility of a rise in sea level”. The NZCPS promotes strategic planning, long term (at least 100 years) assessment of risks and focuses on providing a range of options when it comes to coastal management. The updated NZCPS 2010 has objectives and policies that aim to manage the natural and physical process, amenity and recreational values, and coastal hazards of the coastal environment. It aims to so in a way that enables people and communities to provide for their economic, social and cultural well-being, with appropriate delivery of the Treaty of Waitangi Principles. When it comes to climate change, the NZCPS 2010 “requires that areas potentially or at high risk of being affected by coastal hazards are identified and assessed, including the cumulative effects of SLR and climate change, ‘taking into account national guidance and best available information on the effects of climate change’ (NZCPS, Policy 24)”(Rouse et al., 2017b, p. 186). The NZCPS also specifies that “at least 100 years” is used as the appropriate timeframe in planning documents and tools. All national guidance should be aligned with the NZCPS.

Due to the hierarchical nature of the RMA, both regional and district plans must give effect to the NZCPS, therefore, these climate considerations will be included in all lower-level planning tools. However, the timing of plan reviews means there is often a time-lag before this actually happens (Britton, 2010; Lawrence et al., 2015a). Interestingly, planning timeframes vary between legislative frameworks. The “at least 100 year” timeframe required by the NZCPS is

not used in the 50-year design life requirements of the Building Act (with no requirement to include climate change), despite the permanent nature of buildings and other infrastructure.

In Aotearoa-New Zealand the NZCPS (in addition to a national framework for adapting to climate change, discussed below) work together to provide national direction for coastal adaptation activities. It is important to highlight that there is no national policy instrument to direct climate change adaptation activity yet. However, proposed reforms to the RMA and a possible national policy statement in regard to natural hazards may fill this gap to some extent. Overall, while the NZCPS 2010 provides some direction, further national policy is likely required to overcome political, technical, and social barriers to adaptation (Rouse et al., 2017b).

4.2.4 Central Government Guidance

The RMA allows for the creation of national instruments (such as the NZCPS discussed above) and national environmental standards. However, neither have been developed with regard to the management of climate change effects. In 2014, a national framework for adapting to climate change was created, however, there are obvious limitations of this document. Where MfE has been more active over time is in the development of guidance manuals to help direct local government to adapt and manage the increasing climate change effects, this guidance is built upon a foundation of a risk-based analysis. The national guidance documents discussed here have been found to be useful for not only those working within local government, but also engineers, planners and environmental consultants (Reisinger et al., 2011).

4.2.4.1 Climate Change Effects and Impacts Assessment Guidance (2004)

In May 2004 the MfE published a detailed guidance manual titled, Climate Change Effects and Impacts Assessment. The document provides guidance on the sequential risk assessment approach, including extensive regional information, specifically climate change projections. This broad guidance was later supplemented with a more specific guidance document, titled Coastal Hazards and Climate Change, discussed below.

4.2.4.2 Coastal Hazards and Climate Change (2008)

The guidance on coastal hazards and climate change (Ministry for the Environment, 2008) and its accompanying summary document is widely used by local councils in Aotearoa-New Zealand (Reisinger, Lawrence, Hart, & Chapman, 2015b). It has been applied and referred to in the development of SLR values adopted in planning documents. The guidance on coastal hazards and climate change (Ministry for the Environment, 2008) was developed using the previous Fourth Assessment Report of the IPCC (released in 2007) and is now being updated to incorporate the Fifth Assessment Round reports as well as newly refined approaches to adaptation.

The coastal hazards and climate change guidance document (Ministry for the Environment, 2008), suggests local authorities should plan for levels for SLR at 0.5 metres generally, and 0.8 metres where the potential impacts are considered major. In addition, it sets out the foundation for considering an at least 100-year timeframe, by recommending that a rise of 10mm per year is considered after 2100 for long-lived assets. The 2008 document recognises a fluid and changing sea level, therefore explaining that a static approach cannot be used for coastal management anymore (Manning, Lawrence, King, & Chapman, 2015b). However, local councils have difficulty applying evolving parameters within planning practices as councils are pushed by expectations of certainty in predictions, by both the legal system and the community (Lawrence et al., 2015a; Manning et al., 2015b).

4.2.4.3 The New Zealand Framework for Adapting to Climate Change (2014)

In 2014, a national framework for adapting to climate change was created (Ministry for the Environment, 2014). The document aims to foster a broader understanding of New Zealand's framework for adapting to climate change and details four areas: information, responsibilities, investment and action. This two-page document includes descriptions of what climate change effects are already occurring in Aotearoa-New Zealand and likely effects to occur in the near and far future, as well as detailing where further information on climate change adaptation can be accessed. It includes a break-down of the roles of central and local government, and the key legalisation context. Central government's responsibility in the framework is to "set the direction so that New Zealander's national infrastructure, people, environment and economy

are more resilient to the impacts of climate change”. Legislation and policy, provide direction and support for local government and communities, funding research and preparing for major hazards. Local government’s responsibility in the framework is using such legislation, policy and guidance to consider the risks of their region and respond appropriately. The primary limitation of this document is that it simply outlines high-level responsibilities and lightly touches on potential climate change adaptation options.

4.2.4.4 Climate Change Adaptation Technical Working Group (2016)

To help Aotearoa-New Zealand better prepare to adapt to the effects of climate change, in November 2016, the Government asked a group of technical experts across both public and private sectors to provide advice on how Aotearoa-New Zealand can adapt to climate change effects (Ministry for the Environment, 2018). The group was named the Climate Change Adaptation Technical Working Group (CCATWG).

The Stocktake report is the first report prepared by the CCATWG. It essentially outlines the expected impacts of climate change on Aotearoa-New Zealand, over both medium- and long-term timeframes. It also summarises existing work carried out on adaptation and identifies where New Zealand’s current approach is lacking. The second report produced by the CCATWG was the Recommendations report, it provides recommendations for future actions of Aotearoa-New Zealand that need to be taken to simultaneously build resilience to climate change effects and grow the economy sustainably (Ministry for the Environment, 2018).

The creation of this technical working group for the issue of climate change adaptation indicates that the issue is recognised by central government as an urgent concern. However, the second report published by the CCATWG, the Recommendations Report is awaiting response from government. The Recommendation report could have an impact on the legislation of adaptation roles for specific actors over the next few years (Ministry for the Environment, 2018).

4.2.4.5 Coastal Hazards and Climate Change – Preparing for Coastal Change (2017)

The Ministry for the Environment’s 2008 guidance of Coastal Hazards and Climate Change (discussed in section 4.2.4.2) was superseded in 2017 by a revised document. The updated coastal hazards and climate change guidance for local government (Ministry for the Environment, 2017a) is a major revision of its predecessor. It updates scientific understanding and predictions, as well as the legal framework dealing with climate change effects. It also introduces new material on hazard, risk and vulnerability assessments. The document takes a different approach to previous editions, it places community engagement at the core of decision-making processes for planning for climate change in coastal communities (see Figure 4.1).

The 2017 guidance uses an approach called *Dynamic Adaptive Pathways Planning*. As indicated by its name, it identifies ways forward (pathways) in the face of uncertainty, while being responsive to change when necessary (dynamic) (Ministry for the Environment, 2017b). This approach can be used to explore how a range of responses to climate change are tested against possible future scenarios. Pathways are then mapped that will effectively manage, reduce or avoid risk. Then a plan is developed, with short-term actions and long-term actions, and it identifies ‘trigger points’ where the decisions and plans should be revised. Ultimately allowing flexibility for change is the need arises- such as new information becomes available (Ministry for the Environment, 2017b).

The *Dynamic Adaptive Pathways Planning* approach, differs from previous guidance significantly for two reasons. Firstly, for the emphasis places on engagement, and secondly by accommodating future change from the outset, it evades locking in investments that could make future changes difficult and expensive. Therefore, facilitating longer-term sustainability and community resilience (Ministry for the Environment, 2017b).

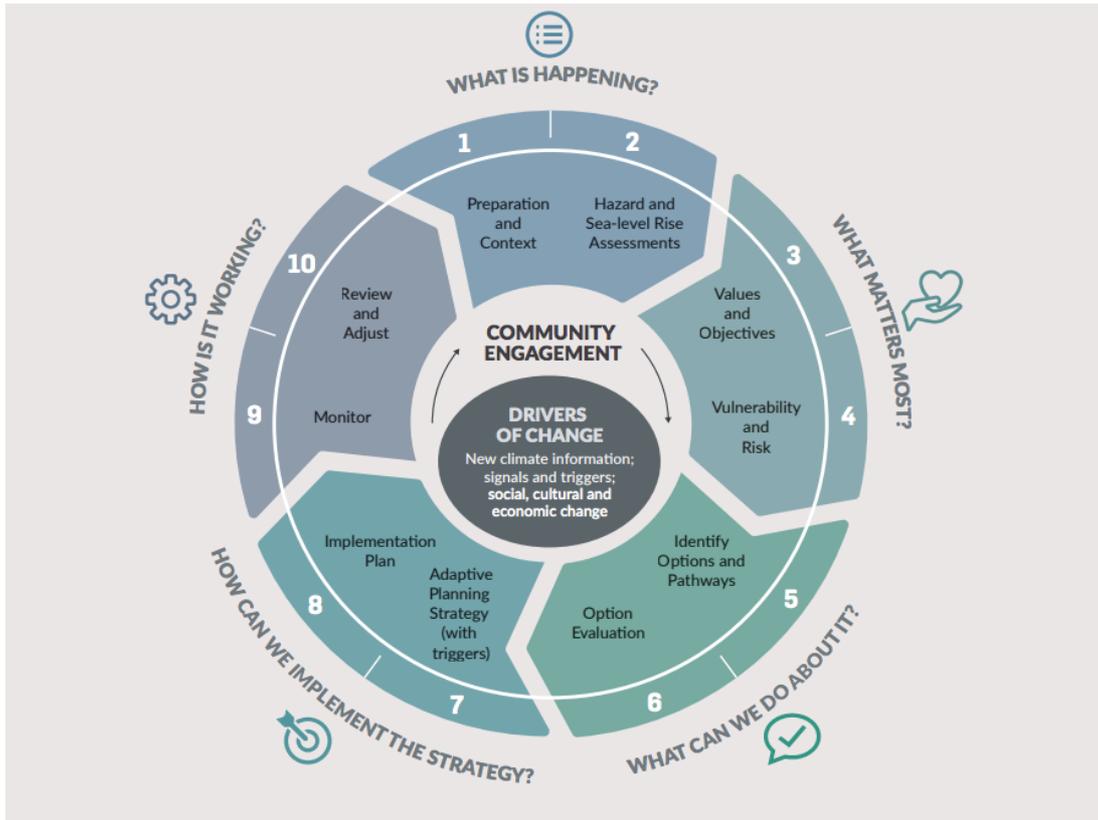


Figure 4.1: The 10-Step Decision Cycle, Grouped around Five Questions (source: (Ministry for the Environment, 2017b)).

Although the information in this publication has no official status and does not alter the laws discussed in this chapter it provides evidence-based advice for local government grappling with climate change adaptation in the coastal environment. Box 4.2 below provides an example where this national level guidance has been successfully applied in a real-world context to long-term planning for climate change effects in Coastal Aotearoa- New Zealand.

Box 4.2: Clifton to Tangoio Coastal Hazards Strategy - Successful Application of MfE Guidance

The *Clifton to Tangoio Coastal Hazards Strategy 2120* provides an example of MfE's 2017 *Coastal Hazards and Climate Change Guidance for Local Government* in action. A key outcome being it transformed conversations with communities about planning for and responding to coastal hazards. The strategy focused on the greatest stretch of coast in the Hawkes Bay region. This coastline is experiencing effects of climate change (erosion, inundation), and if nothing is done in response the estimated costs are in the hundreds of millions of dollars, as well as devastating social impacts.

The Process

The strategy was developed as a joint project between the Council's and iwi organisations of the area. Project Governance was held by a joint committee of the Councils, supported by a technical advisory group, environmental consultants and researchers. The Strategy is presented below with 4 key stages:

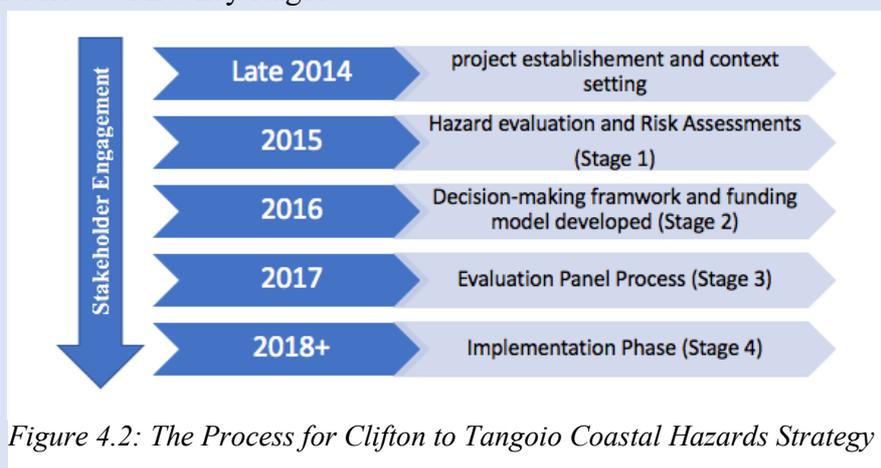


Figure 4.2: The Process for Clifton to Tangoio Coastal Hazards Strategy

The process is a simplified version of the 10-step decision cycle outlined by MfE guidance. The overall goal is to develop a 100-year plan for the coastline (the timeframe used reflected the NZCPS).

Community Engagement

MfE guidance places heavy emphasis on community engagement. The process used here has active community engagement throughout each stage. Including sharing the draft outcome from the technical evaluation in Stage 1. However, engagement mostly came into play from Stage 3 with the formation of two community-based assessment panels (including: Tangata whenua; coastal communities; DoC; business interests; recreational interests). These panels were tasked through a series of interactive workshops to understand what the hazard assessment work was presenting, and to develop recommended responses to those hazards. This stage took over a year to complete. Ultimately it was a community driven process, although community were provided with technical advice and guidance and the process was structured as facilitated, the content of the report came from community and was signed-off by all panel members. Currently council is considering these recommendations, going into Stage 4 (step-8 in the MfE guidance).

Box 4.2 Continued: *Clifton to Tangoio Coastal Hazards Strategy - Successful Application of MfE Guidance*

Adaptive Pathways

The *Clifton to Tangoio Coastal Hazards Strategy* used Adaptive Pathways as a major tool to unlock coastal hazards planning. A simplified version of this approach was applied to the strategy for use of the community panels. This approach was combined with Multi-Criteria Decision Analysis, in order to develop and compare multiple pathways for each coastal area. The overall result was a 100-year adaptive pathway for each unit, each with short, medium and long term options.

The adaptive nature of the pathways allows each step to be implemented earlier or later in response to the real-world conditions. Medium- or long-term responses could be put forward or deferred depending on how climate change progresses and how effective each action is.

For example, if the selected short-term response is still effective after 20 years, then the community should keep going with it. If it starts being ineffective after 15 years, then switch to the next action early. Importantly, the pathways are flexible enough to switch to an entirely new option if conditions require it.

Decision-points to switch between actions are determined by “triggers”. Crucial to note is although these decision-points remain future issues for the Hawkes Bay area, in this process pathways were successfully defined without signal and triggers at the time.

Final Product (at present)

Six pathways were developed for each unit. The responses ranged from “soft” to “hard” solutions. The panels finalised their preferred options, and an overall report of the community recommendations were provided to the Council decision-makers.

Key learnings from the Clifton to Tangoio Coastal Hazards Strategy:

- Take time and plan carefully.
- Pathways approach was essential – it allowed conversations to move beyond strongly held opinions on what should be done in the present, towards more long-term thinking.
- Bring community into the tent, while preserving decision making to council.
- Stage 4 (implementation) will always be difficult.

Overall, there is ambiguity when it comes to adaptation roles and responsibilities as well as specific strategies for carrying out adaptation, from central government guidance. Yet, there is a range of statutory obligations to prepare and plan for hazards and consider climate change effects for both regional and territorial authorities under the RMA and LGA.

4.3 Regional Council Responses

4.3.1 Otago Regional Council Plans and Policy

Regional Policy Statements (RPS) are required under the RMA 1991. Due to the planning hierarchy, district and regional councils must give effect to the RPS in district or regional plans, and when making decisions on resource consents. The RPS also paves a pathway for future management of the region's natural and physical sources. In addition, it provides the foundation for the regional and district plans.

The proposed RPS for Otago is partially operative. Meaning that some of the operative RPS provisions are revoked, while others remain in force until the review is finalised. Local authorities must have regard to both the operative RPS and the proposed RPS. However, for the purposes of this research only the proposed RPS will be explored as although not final, it is the strategy that will be used following the publication of this thesis. The proposed RPS for Otago provides an overview of the resource management issues facing Otago and sets policies and methods to manage Otago's natural and physical resources.

The proposed RPS for Otago is divided into five outcomes, these being:

1. Resource management in Otago is integrated
2. Kāi Tahu values, and interests are recognised and kaitiakitaka is expressed
3. Otago has high quality natural resources and ecosystems
4. Communities in Otago are resilient, safe and healthy
5. People are able to use and enjoy our natural and built environment

For the purposes of this research, the fourth objective listed here is of particular relevance. Under *Objective 4 Communities in Otago are resilient, safe and healthy*, the concept of adaptation is intertwined within the RPS. Objective 4 acknowledges that Otago is at risk to shocks and changes climate change, and therefore we must ensure:

“communities develop in a way which helps to prepare for, respond, recover, and adapt to disruptions will help make communities resilient”.

Objective 4.2 in the RPS for Otago directly refers to adaptation:

Objective 4.2 Otago’s communities are prepared for and able to adapt to the effects of climate change.

To achieve these objectives, and ultimately the outcome of *communities in Otago are resilient, safe and healthy*, the following policies should be adhered to:

Policy 4.2.1 Ensure Otago’s people and communities are able to adapt to, or mitigate the effects of sea level rise, over no less than 100 years, by using:

Sea Level Rise

- a) A sea level rise of at least 1 metre by 2115, relative to 1990 mean sea level (Otago Metric Datum); and
- b) Adding an additional 10mm per year beyond 2115, or the most up-to-date national or regional guidance on likely sea level rise.

Policy 4.2.2 Ensure Otago’s people and communities are able to mitigate and adapt to the effects of climate change, over no less than 100 years, by all of the following:

Climate Change

- a) Taking into account the effects of climate change, including by using the best relevant climate change data;
- b) Applying a precautionary approach when assessing and managing the effects of climate change where there is scientific uncertainty and potentially significant or irreversible effects;
- c) Encouraging activities that assist to reduce or mitigate the effects of climate change.
- d) Encouraging system resilience.

Objective 4.2, Policy 4.2.1 and Policy 4.2.2 can be achieved through the following methods outlined in the RPS:

- Method 2:** Regional, City and District Council Relationships
- Method 3:** Regional Plans
- Method 4:** City and District Plans

Method 5:	Research, Monitoring and Reporting
Method 6:	Non-RMA Strategies and Plans
Method 7:	Education and Information
Method 9:	Advocacy and Facilitation

Another relevant section of the proposed RPS for Otago, Policy 4.1.10, is presented below:

Policy 4.1.10	Give preference to risk management approaches that
Mitigating natural hazards	reduce the need for hard protection structures or similar engineering interventions, and provide for hard protection structures only when all of the following apply:
	<ul style="list-style-type: none"> a) Those measures are essential to reduce risk to a level the community is able to tolerate; b) There are no reasonable alternatives that result in reducing the risk exposure; c) It would not result in an increase in risk to people and communities, including displacement of risk off-site; d) The adverse effects can be adequately managed; e) The mitigation is viable in the reasonably foreseeable long term.

Policy 4.1.10 demonstrates the global shift from hard engineered solutions towards more soft-engineered approaches that accommodate the environments natural processes (Rouse et al., 2017b). Hard engineered solutions are more permanent and therefore, after construction, it is difficult to change the response method at a later date. Therefore, this Policy 4.1.10 infers the ORC may be implementing the *Dynamic Adaptive Pathways Planning* approach recommended by the MfE national guidance.

4.3.1.1 Regional Plan: Coast for Otago

Regional coastal plans are required under Section 64 of the RMA 1991, with the purpose of assisting a regional council to promote the sustainable management of resources in the coastal marine area. Otago's Regional Coast Plan provides policies and methods (including rules) for the integrated and sustainable management of Otago's coast. The ORC explicitly recognises

climate change effects, notably SLR in its Regional Plan: Coast for Otago through a number of issues, policies and objectives, a selection of these are presented below (Table 4.1):

Table 4.1: A Number of Issues and Policies in the Coast for Otago Plan addressing SLR

Issue 8.2.6	Structures in the coastal marine area may be adversely affected by possible sea level rise and other natural hazards.
Policy 8.4.7	To encourage new structures within the coastal marine area to provide an additional 0.3 metres of freeboard or be designed so as to be able to incorporate an additional 0.3 metres of freeboard at a later date, in order to take account of the possibility of sea level rise.
Policy 9.4.9	To encourage new reclamations within the coastal marine area to provide an additional 0.3 metres of freeboard or be designed so as to be able to incorporate an additional 0.3 metres of freeboard at a later date, in order to take account of the possibility of sea level rise.
Policy 14.4.3	Where a resource consent is required under this Plan, to ensure that adequate provision is made in the design of any structure, reclamation, or other physical feature, to recognise the possibility of sea level rise and other natural hazards which may damage that structure, reclamation or feature.

The Otago Regional Policy Statement, and the Regional Plan: Coast for Otago, both address the hazards of climate change effects (including SLR). The concepts of resilience and adaptation are both explicitly included in the Otago Regional Policy Statement. Additionally, the Regional Plan: Coast for Otago, reflects the global shift in preference from hard to soft solutions for coastal hazards. Indicating the regional level responses are aligned with the international literature on planned adaptation to SLR. Chapter 5, through exploring the key informant views on adaptive responses to SLR in Aramoana and Long Beach, will provide insight into these planning tools' perceived effectiveness.

4.4 Territorial Authorities (District and City Council) Responses

Territorial authorities' responsibilities include: ensuring sustainable district well-being, the provision of local infrastructure (water, sewerage, stormwater, roads), ensuring environmental safety and health (district emergency management and civil defence preparedness, building control etc.), and controlling the effects of land use (including natural hazards) (Local Councils, n.d). To effectively fulfil these wide-ranging responsibilities territorial authorities are diverse institutions, with staff that are experts in many fields. Akin to regional councils, territorial authorities also have a responsibility under the Local Government Act (2002) and the RMA 1991 to avoid or mitigate natural hazards and is reflected in their District Plans. Additionally, territorial authorities have the added role of supporting community development. Community development can be a strong facilitator of adaptation responses to climate change effects. These local responses are discussed further in Section 4.5.

4.4.1 Dunedin City Council District Plan

District Plans contain objectives, policies and rules to manage effects of land use activities on the environment. Currently decision makers in Dunedin must have regard to two plans, the Dunedin City District Plan (2006) which is the current operative district plan. As well as the proposed 2GP decisions version (November 2018). Both plans are to be considered as the District Plan is currently under review.

As part of the current review of its District Plan, the DCC is reviewing the ways in which land uses are managed, so that the effects of natural hazards, including the effects of climate change, can be avoided or adequately mitigated. The Otago Regional Council (ORC) supports this process (and the DCC) through providing natural hazard information, knowledge, and expert opinion through a collaborative approach, in order to effectively inform the review (Goldsmith, 2014). Table 4.2 below provides a summary of tools available to territorial authorities for avoiding or mitigating coastal risk in their district plans, as well as indicating the level of control these tools impose. These controls listed in Table 4.2 must be balanced with the needs of the public as required by the RMA 1991.

Table 4.2: Tools for avoiding or mitigating coastal hazards (sourced from Quality Planning, 2018)

Tool	Use and links to RMA plans	Level of control
Mapping where coastal erosion will occur in the future (hazard zones).	“Used as an information tool that informs RMA provisions. The maps can either be part of a District Plan rule, or may dictate when plan provisions for managing coastal erosion may apply. It can also be used to inform LIMs and PIMs”.	<ul style="list-style-type: none"> • Low, when used purely as an information tool • High, when linked to Plan Rules.
Plan provisions that direct sensitive development away from areas of high risk to coastal hazards	“Zoning land for less vulnerable land uses, such as ‘open space recreational use’, conservation, or hazard management. Such zoning may be linked to areas identified as being at most risk in mapping and scenarios. Provisions will generally exclude land uses such as commercial, residential or industrial uses”.	High
Rules that restrict the type of development that may occur	“Often associated with hazard overlays linked to particular plan objectives, policies and rules. These work in a similar way to zoning, but do not replace the underlying zone. Plan rules restrict the type of development allowed to occur to those that are less vulnerable to hazards (e.g. recreational activities)”.	Moderate to High
Development standards for activities located in coastal zones	<p>“Activities located in areas identified by zoning, overlays or other hazard mapping may be required to comply with objectives, policies and rules specifying:</p> <ul style="list-style-type: none"> • Minimum floor or ground levels necessary to avoid a prescribed flood scenario (e.g. a 1% AEP event). • A requirement that buildings have ‘sacrificial basements’ or ground levels (areas under buildings that can be used for such things as garaging, but that are designed to ensure areas of the building vulnerable to flood damage are clear of anticipated water levels)”. 	Low to moderate

The Operative District Plan (2006) acknowledges that predicted sea level may affect low-lying coastal areas, however, it notes the effects of sea level rise are not expected to be felt during the term of the 2006 plan. The Operative District Plan's (2006) maps do not identify the extent or location of any hazards; instead the maps make references to a 'Hazards' Register' that sits outside of the Plan. The Hazards Register is used by DCC staff when issuing Land Information Memorandums (LIMs) and Project Information Memorandums (PIMS), which identify whether an activity or a structure is located on a hazard-prone location (Goldsmith, 2014). The management of natural-hazard risk under the 2GP has a different approach. The DCC is proposing to use the best available information regarding Dunedin's natural risks to create the following overlay zones on the District Maps:

- 'flood-hazard overlay zone', including areas at risk from the effects of flooding, ponding areas and alluvial fans.
- 'coastal-hazard overlay zone', including tsunami, storm surge, erosion and sea level rise.
- 'land-based hazard overlay zone', which included unstable areas such as landslides.

This approach was consulted on as an option with the public during both the DCC's '2GP Issues and Options Consultation Phase' from November 2012 to March 2013, and the 'Preferred Options Consultation Phase' in August 2013. The objectives of the Otago RPS (Section 4.3.1) to natural hazards is reflected in the mapping and describing of natural hazards in the 2GP. The planning response included in the 2GP is based on a series of principles, consistent with the RPS and based on the RMA functions of local government in relation to the natural hazards. The principles are grouped into two main themes, 'People and Communities' and 'The management approach to natural hazards', outlined below:

Table 4.3: DCC 2GP Planning Principles for Natural Hazards.

<p>People and Communities</p>	<p>Principle 1: Protection of people Prevent death or injury from natural hazards, ensure public health.</p> <p>Principle 2: Create liveable communities Create communities in which people can live, work and use the land without undue stress or fear of natural hazards.</p> <p>Principle 3: Create a resilient built environment Create and maintain a built environment, including infrastructure and lifelines, which takes into account the risks from natural hazards so that it can operate effectively while still being affordable.</p>
<p>Management Approach</p>	<p>Principle 4: Utilise an adaptive management approach An adaptive risk-management approach will be required to allow for improvements in the understanding of hazards and the effects of natural climate variability. By adopting a broadscale, adaptive approach over the longer term, the risk associated with different hazards will reduce over time. The ability to respond to changes in the nature and extent of risk, ease transitions, and provide the level of safety desired by the community is essential.</p> <p>Principle 5: Take residual risk into account It is important to address the entire risk spectrum when managing the effects of natural hazards. This principle recognises that whatever event is planned for, there will be a larger, major event. The risk from these major events also needs to be recognised and managed.</p> <p>Principle 6: Some risks are intolerable</p> <p>Principle 7: Avoid exacerbation of natural hazards New development and hazard-management measures will not exacerbate the risks or effects of natural hazards elsewhere. This applies at all scales, from localised ‘property to property’ effects, through to the community or catchment scale.</p> <p>Principle 8: Increase understanding and community awareness Understanding the underlying natural systems and processes that operate in the Dunedin City District is crucial to managing risk and ensuring community safety. Increasing community awareness is essential to assist people in taking natural-hazard risks into account when undertaking development.</p>

Various types of natural hazards are mapped on the DCC 2GP Planning Maps (see Figure 4.3), of particular relevance to this research are the coastal hazards mapped as the ‘DCC Coastal hazard and overlay zone’, the subcategories for this hazard include:

- Inundation due to elevated sea level (storm surge),
- Inundation due to tsunami,
- Coastal erosion,
- The possible effect of additional sea-level rise on coastal hazards.

Each natural hazard layer has an associated supplementary technical report that identifies the map areas that have similar vulnerability to natural hazards. Where possible, these natural hazards have been discussed in terms of their effect on people and assets (i.e. how these hazards might affect public safety, buildings, and infrastructure such as roading).

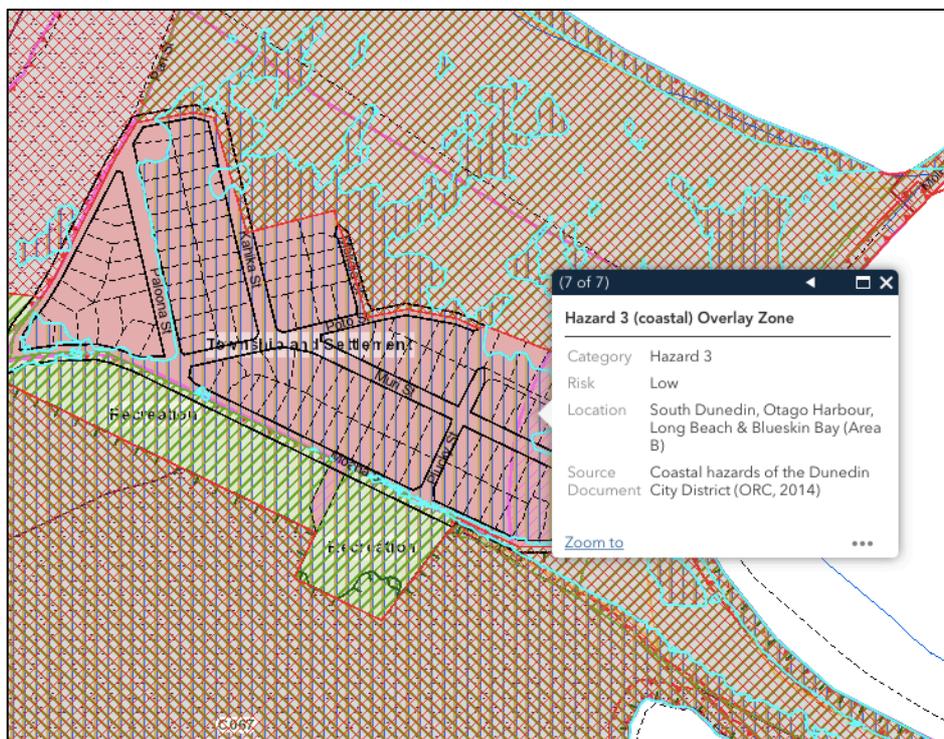


Figure 4.3: Example of hazard overlay in DCC 2GP Map (Aramoana).

Both settlements of Aramoana and Long Beach are within Hazard 3 (coastal) Overlay Zone. The level of risk (in accordance with the guidance on defining risk in the DCC 2GP) is low, that is the likelihood of hazard occurring is ‘extremely unlikely’, however the consequences of hazard are ‘major’. Below in Table 4.4 some of the policies, rules, notes, and guidance triggered by these settlements occurring in a hazard 3 (coastal) overlay zone are presented:

Table 4.4: Policies, rules, notes and guidance triggered by the hazard 3 (coastal) overlay zone.

Policy 11.2.1.8	In the Hazard 3 (coastal) Overlay Zone, require new buildings containing residential activity on the ground floor to be relocatable, unless site constraints mean this is not practicable.
Rule 11.3.3 Relocatable Buildings	<ol style="list-style-type: none"> 1. In the hazard 3 (coastal) overlay zone, new buildings containing residential activity on the ground floor must be relocatable. 2. Activities that contravene this performance standard are restricted discretionary activities.
Note 11.3.3.A General advice	<ol style="list-style-type: none"> 1. Relocatable buildings may not avoid all risks from natural hazards, particularly in the long term. 2. Development in hazard prone areas, including in the identified hazard overlay zones, are at an owner’s risk and the DCC does not accept any liability in regard to development and risk from natural hazards.
Rule 11.5.2 Assessment of all restricted discretionary activities	<p><i>Activity</i></p> <ol style="list-style-type: none"> 1. All restricted discretionary activities <p><i>Matters of discretions</i></p> <ol style="list-style-type: none"> a. <i>Risk from natural hazards</i> <p><i>General assessment guidance</i></p> <ol style="list-style-type: none"> i. In assessing the risk from natural hazards, Council will consider: <ol style="list-style-type: none"> 1. Existing hazards assessment reports on the DCC’s Hazard Information Management System; 2. The Otago Regional Council’s Otago Natural Hazards Database; 3. Any new hazard assessment or engineers’ reports provided as part of the application; 4. Site or area specific factors, including the elevation of the site or the topography and geology of the area; 5. Risk to activities proposed on a site, as well as risk that is created, transferred, or exacerbated on other sites; 6. Cumulative effects of natural hazards, including from multiple hazards with different risks; and 7. How the risk from natural hazards may worsen over time due to climate change ii. N/a iii. In assessing risk, Council will also consider the policies of the NZCPS 2010 in terms of acceptable levels of risk. iv. In assessing the appropriate of mitigation measures (other than those prescribed in performance standards):

<p>Rule 11.5.2 Assessment of all restricted discretionary activities [continued]</p>	<ol style="list-style-type: none"> 1. Consideration will be given to its potential effectiveness, in the short to long term; 2. Preference will be given to non-structural solutions, over engineering or structural solutions, where practicable; 3. Mitigation measures that rely on significant capital investment or requirements for ongoing maintenance by the DCC or ORC will generally not be seen as appropriate; and 4. Any mitigation measure that may result in more than negligible adverse effects on biodiversity values, more than minor effects on access to the coast, or significant effects on amenity or natural coastal sedimentation processes, will generally not be seen as appropriate. <p><i>Potential circumstances that may support a consent application include:</i></p> <ol style="list-style-type: none"> v. The risk from natural hazards will be no more than low when assessed against the guidance provided in Table 11.1.2A. vi. N/a vii. Measures are proposed (including legal instruments), that will avoid DCC or the community from being subject to claims for protection, compensation, reinstatement, or rectification of buildings or structures intended for natural hazards sensitive activities, or natural hazards potentially sensitive activities, undertaken in hazard overlay zones. viii. The availability of clear, practicable and safe evacuation routes and/or alternative means of maintaining access during a natural hazard event that will be equally available to future owners, occupiers, or operators.
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4.4.1 Civil Defence Duties of Local Authorities

In addition to controls implemented through the RMA (1991), local governments respond to SLR through legislated emergency management. Under the *Civil Defence Emergency Management Act (2002), Section 64(1) Duties of Local Authorities*, set out that:

A local authority must plan and provide for civil defence emergency management within its district.

The overarching strategy to build resilience is through a risk management approach and the four 'R's of:

- Risk Reduction
- Readiness
- Response
- Recovery

The first two 'R's (risk reduction and readiness) are implemented through council tools (e.g., district plans and policies, hazard overlays etc.), whereas response and recovery are achieved through the DCC and Civil Defence Emergency Management Otago (CDEM, 2018). CDEM supports Dunedin City response and preparation for emergencies, and to activate in emergencies, with a specific role of working with communities, community development and community planning. These actions are intertwined with community development aspect of preparations for climate change effects, discussed in the next section of this chapter.

The DCC has employed various tools to avoid or mitigate coastal hazards. Through the DCC 2GP, the territorial authority has created specific coastal hazard mapping, provisions that direct sensitive development away from high risk areas, rules that restrict development at the coast, and standards for activities located in the coastal zone. Additionally, again through the DCC 2GP, the DCC responds to the risk of SLR through legislated emergency management planning within the City. CDEM Otago and the DCC work collaboratively to carry out emergency management in the wider Dunedin City. Chapter 5, through exploring the key informant views on adaptive responses to SLR in Aramoana and Long Beach, will provide insight into the perceived effectiveness of the DCC's efforts in small coastal communities.

4.5 Local Adaptation Responses Beyond the RMA

It is essential the regional and district councils work together to adapt and mitigate against coastal hazards (e.g., coastal inundation, flooding, coastal erosion etc.) how authorities might do so has been extensively discussed in previous sections. Council have an additional role in the response to climate effects, which is responding when these effects reach an emergency status. When it comes to emergency management, the first to respond often isn't the local

authorities, rather it is the community experiencing the hazard themselves. The Civil Defence officers and the Dunedin City Council (DCC) community development team work together to promote and enable the communities of Dunedin to be aware of, and resilient to hazards they may face (CDEM, 2018). This objective is met through actions such as:

- Emergency planning with a wide range of community agencies,
- Training emergency management personnel,
- Public education on emergency preparedness,
- Providing facilities and equipment for emergency response, and
- Co-ordinating the response to and recovery from emergency events.

Emergency planning carried out by the private sector, educational institutes and by households will minimise the level of support that will be required by Civil Defence Emergency Management during and after an emergency (CDEM, 2018). Facilitating emergency planning and public education on emergency preparedness, therefore, supports the community's resilience in responding to and recovering from hazard events. In order to enable community resilience in this form the civil defence education programme aims to:

- Promote and support emergency planning in the public and commercial sectors.
- Build community hazard and risk awareness.
- Respond to requests for information and planning assistance.

Dunedin Civil Defence Emergency Management encourages emergency preparedness and response planning at a household level by working with community groups, agencies in the public safety sector (e.g. NZ Fire Service, NZ Police, ACC) and Neighbourhood Support to build the community's knowledge of:

- Hazards in the community, and the consequences of these hazards.
- Mitigation measures to reduce the risks of the hazards.
- Preparedness and responses measure in an emergency event.

Dunedin City Council Community Boards play a major part in promoting public education programmes and events for their communities. The community emergency plans include annual emergency-centred events, which are supported by Dunedin City Civil Emergency Management staff (CDEM, 2018).

4.5.1 Aramoana and Long Beach Community Emergency Plans

Both the communities of Aramoana and Long Beach have developed their own community emergency plans. These plans are tailored to the specific hazards the community is at risk to experiencing. The Community Guide to Emergencies Aramoana, was developed by an active community group operating in Aramoana, the Aramoana League, with support from Emergency Management Otago. The Community Guide to Emergencies Long Beach – Pūrākanui was developed with the community organisations of the Pūrākanui Amenities Society, and the Long Beach Amenities Society. These plans are distributed to community members during local events, meetings, and into households' letterboxes (CDEM, 2018).

These emergency plans are three-page documents that covers vital information needed in a hazard event. Including tips to get ready for an emergency, and how to stay informed (radio frequencies, smart phone applications, web pages, social media accounts, and the DCC contact information). In order to facilitate the 'know your neighbours' approach (the idea that the first to respond are your neighbours) promoted by CDEM it has spaces for the individual to fill in people in their communities contact information. The plan also identifies the types of hazards in the specific community and details of what to do to prepare for the specific hazards. Detailed hazard maps for the communities are included, that clearly present evacuation points, and routes, roads/bridges/fords that are likely to be of of action during an emergency, and evacuation zones (CDEM, 2018).

Local authorities, CDEM, and community members work together to prepare for future hazard events (e.g., coastal inundation, flooding, erosion) and to build greater resilience within the communities at risk. These 'on-the-ground' actions are essential to compliment the legislative approaches to adaptation to climate change effects, such as SLR. While tools such as Regional Policy Statements, District Plans and zoning and hazards maps discussed in the previous sections are necessary in attempts to avoid or mitigate future vulnerability to SLR, their assistance to those living with the hazard right now are limited. Community development and preparation is a form of adaptation to empower these at-risk communities. As discussed in Chapter 2 (literature review) building community resilience is essential for the success of any future adaptation measures.

4.6 Conclusion

This chapter has provided the planning and legislative context of coastal adaptation responses to climate change effects (notably sea-level rise) in Aotearoa-New Zealand. At the national level, there has been many attempts to address climate change, its effects, and how adaptation could be implemented. Despite the fact there has been significant effort and progress in the national level legislation and guidance, there is nothing that mandates local government to actually implement any adaptation actions. Dunedin City is already seeing the impacts of the rising global climate, and consequently there has been significant efforts from both local councils to reduce these impacts, communicate information and empower communities. Nonetheless, because of the lack of explicit direction from national level government, there is confusion of the roles and responsibilities of regional and territorial authorities. With the help of CDEM, the DCC is carrying out rigorous community support for the immediate response to hazards events. It seems the pathway forward is looking at how to support these communities to adapt, avoid and mitigate against these hazards themselves, to assist both councils and communities in the adaptation process. Chapter 5, through exploring the key informant's views on adaptive responses, will provide insight into the perceived effectiveness of the differing levels of government's responses to SLR discussed in the present chapter.

5

Adaptive Responses in Long Beach and Aramoana

5.1 Introduction

Chapter 5 will explore the findings of this study relating to adaptive responses to sea level rise (SLR) already in action. Drawing from the comprehensive policy and planning context (Chapter 4), the aim of Chapter 5 is to reveal what adaptive responses are being carried out in the coastal communities of Aramoana and Long Beach, and the views and experiences of key informants regarding these responses. In order to do so, the key informants views on the national level responses will be explored in Section 5.2. Following, the key informants' experiences and attitudes towards local government responses will be discussed in Section 5.3. Finally, in Section 5.4 key informants' involvement and views on local responses in the

communities of Aramoana and Long Beach will be presented. Chapter 5 adds an additional contextual layer to better understand the adaptive responses currently being implemented. The information presented here, combined with the previous chapter, will directly address Research Question 1: *What are the different views on different level adaptive responses to SLR in Aramoana and Long Beach?*

5.2 Views on National Level Responses to SLR

The findings pertaining to the key informant opinions of the national level government responses to SLR revealed important insight into the effectiveness of these high-level planning responses and guidance.

All key informants working for the district council independently mentioned there is lack of national direction and clarity when it comes to responding to climate change effects (presented in Table 1 below). The key informants working within local government described the lack of direction both in terms of uncertainty of how to implement guidance, as well the blurring of roles and responsibilities causing uncertainty of who should implement the guidance. Both of these issues will be discussed below respectively.

5.2.1 Uncertainty of how to respond to SLR

A number of informants made comments suggesting there is a general uncertainty on how the local authorities should respond to climate change effects (i.e. Corporate Policy Team Lead (DCC), City Development Senior Policy Planner (DCC), Coastal Specialist and Strategic Planner (DCC)). They all specified there is guidance from a national level, however several highlighted there is a need for “more tools and more teeth”, to be able to put the guidance into real-world actions (see Table 5.1). The comments presented in Table 5.1 indicate there is a general desire for more clear-cut national-led guidance and specific tools for implementing adaptation actions.

Table 5.1: Local Government Informants' Comments on National Guidance and Direction

<p>Corporate Policy Team Lead (DCC)</p>	<p>“We have put in a submission to government on that bill just asking for more tools and more teeth, because to be honest it’s interesting hearing what government’s key plans are, they’ve got a push around risk assessment now which I don’t disagree with. But we have work to do that require real guidance on very specific and very gnarly issue. At the moment I would say a lot of that just isn’t there”.</p> <p>“I think one of the risks is because of the lack of action to date from at the national level”.</p>
<p>City Development Senior Policy Planner (DCC)</p>	<p>“There’s been national guidance in recent times about processes to work out adaptation. Is that enough guidance? In New Zealand as we get inundated by the sea and as things change, there is uncertainty as to who pays. Is it no different to natural disaster such as the Christchurch earth quakes for instance, and what sort of process they took there? There is great uncertainty around management of infrastructure as well. There is sort of long legal opinions about whether we can discontinue servicing property over time and what our legal obligations are, but it’s not wildly clear. And so while in a general sense everyone agrees that sea level rise and climate change is going to have these impacts upon particularly our low lying areas and while there is some guidance there is a lot of uncertainty on what Council’s role is”.</p>
<p>Coastal Specialist and Strategic Planner (DCC)</p>	<p>“Central government is currently and has been working on a framework for helping councils or local government adapt. There is the coastal hazards and climate change guidance from 2017, from the Ministry for the Environment. But how council applies that to different groups, and areas is kind of the hard thing that we don’t know yet”.</p>

Conversely, one informant praised the effectiveness of the Ministry for the Environment national guidance for *Coastal Hazards and Climate Change – Preparing for Coastal Change (2017)*. The Consultant in Risk Assessment, Adaptation and Resilience Planning, explained:

“You’ve got to start somewhere, it’s a good framework. We’re finding that here. It’s a process that you have to trust, and then the specifics come from that process. It’s absolutely a step in the right direction”. (Consultant in Risk Assessment, Adaptation and Resilience Planning)

This comment by the Consultant in Risk Assessment, Adaptation and Resilience Planning, indicates there is significant value in the national guidance for *Coastal Hazards and Climate Change – Preparing for Coastal Change (2017)*. The consultant explains that it is essential to give power to local government for adaptation decisions as these should be based on the individual context. In addition, the consultant suggests the details of what adaptation method to employ will be revealed through the implementation of the procedure set out within the national guidance.

The findings have indicated mixed opinions held by the key informants regarding the national guidance's ability to assist on how to respond to SLR. However, there is general consensus that national-level government create overwhelming uncertainty on who is responsible in responding to SLR effects, this is further discussed next.

5.2.2 Uncertainty of who should respond to SLR

As discussed in Chapter 4, amendments to Part 2 (Purpose and Principles) of the RMA (1991) have led to widespread confusion in the roles and responsibilities between regional and district councils due to the overlapping functions regarding natural hazards. The blurring of the roles and responsibilities of the local authorities was consistently recognised as barrier to carrying out adaptive responses (including the community engagement aspect of the process) by key informants.

The City Development Senior Policy Planner (DCC), expressed concern regarding the vagueness of responsibility when it comes to implementing long-term adaptation in communities vulnerable to climate change effects.

“It’s not abundantly clear who should be taking the lead or who should be responsible. The DCC is getting on and doing work with South Dunedin and some of these areas almost because the Regional Council and Central Government aren’t, we’re the ones who the community sees as being responsible. That responsibility doesn’t just sit with us, it sits with the Regional Council, and the Central Government as well. But the relationship isn’t documented in any sort of tri-party agreement or anything like that, we’re just doing the best that we can”. (City Development Senior Policy Planner(DCC))

Although not explicitly stated in reference to the amendments to the RMA (1991) community informants also conveyed frustration of the blurred roles within local authorities. Mostly due to the complications it adds to the engagement process.

“We talk with different people all the time, go over the same ideas, the same issues, solutions, but still there is no progress. Then we have to talk to DOC, the DCC, the ORC, and you struggle to get them altogether, so then you have to talk to them all separately, if they talk to us at all, and then all of sudden, that person leaves. And then you have to start again”. (C5)

The shared roles and responsibilities for hazards explicitly set out in the RMA (1991) requires the ORC and the DCC to unify their approaches to adaptation. However, the informants revealed that it seems to be complicating efforts to move forward with adaptation actions as the local authorities are trying to juggle the roles between them both. Additionally, the shared roles between the DCC and the ORC means community members have to contact multiple people from both organisations to discuss issues they are facing. This convoluted process for communication decreases the community’s satisfaction with the engagement process required in adaptation planning. Many key informants believed the barrier created by the blurred roles and responsibilities for the ORC and the DCC is resolvable through further national level guidance (i.e. Corporate Policy Team Lead (DCC), City Development Senior Policy Planner (DCC), Coastal Specialist and Strategic Planner (DCC), Consultant in Risk Assessment, Adaptation and Resilience Planning). Overall, the findings obtained from the key informants indicate the need to enable more effective local government responses (discussed in the next section) national level government needs to implement more substantial guidance.

5.3 Views on Local Government Responses to SLR

Regional and District councils both have responsibilities as part of their core services under the Local Government Act (2002) and the RMA (1991) to avoid or mitigate natural hazards. These responsibilities are in part fulfilled through the District Plan. These legislative responses carried out by the Dunedin City Council (DCC) are detailed in the previous chapter. The current chapter supplements the secondary findings in Chapter 4 with the informant’s views on local government responses. The DCC also has the role of supporting community development, which strongly contributes to a community’s adaptive capacity. Perceptions of these local

responses carried out in the communities of Aramoana and Long Beach is explored in Section 5.3.

5.3.1 Views on Dunedin City Council Responses and ‘the Right to Assume Risk’

The controls used by the DCC to avoid or mitigate hazards relating to SLR are essential for the local authorities to fulfil the requirements of managing the risks of hazards set out in the Local Government Act (2002) and the RMA (1991). Where this obligation becomes more complicated is the requirement to balance the control with the public needs, also required by the RMA (1991). A number of informants referred to the difficulty of this balancing act.

A number of informants felt the local authorities should not have the power to displace people from coastal areas. The perception that homeowners should be allowed to live in high-risk areas that are vulnerable to SLR was encapsulated by the statement of a community informant:

“We [the public] have got to be mindful if we buy a house on the coast, that’s our choice. I think it should be our choice to live here, I don’t think council should be saying you can’t live here, but don’t expect the council to help you too much”. (C1)

This view that homeowners should be allowed to assume their risk of hazards is aligned with the court ruling found in the Environment Court case, *Otago Regional Council v Dunedin City Council 2010 NZEnvC*, explained in Box 4.1 in Chapter 4. The perception of the ‘right to assume risk’, is seen as potentially damaging to planners navigating adaptation options to respond to SLR in the coastal communities of Aramoana and Long Beach. Some community members express frustration of being told where they should live, particularly based on scientific predictions. Whereas, others are totally excepting of process. The spectrum of community perceptions towards adaptation controls embedded within the District Plan was explained by the City Development Senior Policy Planner (DCC).

“We have had some heated consultations through the second generation plan to do with hazards, because often we are suggesting that they can’t do a lot of things they could do in the past. It’s a sensitive subject, if you’re suddenly living in a hazard area, it could affect your resale value of your property and your insurance, and all those sorts of things. But in other areas people will say, “well we know we live in a flood plain” or “we know we live by the sea, it’s no surprise to us what you’re doing, it seems sensible to me”. You can get a wide range of reactions and often it is around understanding the nature of

*the hazard and what the response is, and the fact that we're not hiding it".
(City Development Senior Policy Planner(DCC))*

It has been argued by academics in the legal studies field, that the case of *Otago Regional Council v Dunedin City Council 2010 NZEnvC* calls for stronger guidance from national government to local-level government. Accordingly, further guidance will assist council decision-making (and potentially reduce court intervention) where tools used to control hazards exacerbated by climate change do not neatly align with Environment Court decisions (Magallanes, James and Stuart 2017). However, it is important to note, the case examined in Box 4.1 took place prior to the New Zealand Coastal Policy Statement (2010) coming into force. Following this, councils are further enabled to better manage risks arising from climate change. Nonetheless, the findings of this research indicate the perception of the 'right to assume risk' remains within community and weighs in on councils' views facing the task of climate change adaptation. More effective community engagement could better explain risks associated with coastal development to the public and ultimately ease this tension (Rouse et al., 2017a).

5.3.2 Selective Response from Dunedin City Council

Chapter 4 (Section 4.4) shows there are some adaptation responses currently being implemented by the DCC in the communities of Aramoana and Long Beach. However, it was revealed through interviews with key informants working within local government that current adaptation efforts and resourcing are being injected into the South Dunedin community, rather than the other small coastal communities highlighted as vulnerable to the effects of SLR. Corporate Policy Team Lead (DCC) explains why this is occurring in the comment below:

"Our focus right now is South Dunedin because it's identified as our most vulnerable area, the large number of people living there and the real risk that it faces in terms of rising seas". (Corporate Policy Team Lead (DCC))

The Coastal Specialist and Strategic Planner (DCC) explains that although the DCC's focus is currently on South Dunedin, the overall lessons they learn from carrying out this coastal management strategy will inform future dealings with these other coastal communities vulnerable to SLR.

“At the moment [the DCC is] mainly focussed on South Dunedin and building community information and resilience to flood risk. But the Ocean Beach coastal hazards and community engagement work that I am leading, our intention is that this will help us build understanding for how we might support other communities in doing similar things”. (Coastal Specialist and Strategic Planner)

The focus on South Dunedin in adaptation conversation was also mentioned by the community informants. The community informants agreed with Council’s decision to direct resources towards the much larger community of South Dunedin. However, noting it is for this reason the council needs to enable the communities of Long Beach and Aramoana to mobilise themselves for action.

“We 100% agree South Dunedin needs to be priority. We are a small number of Dunedin. But they need to at least let us help ourselves”. (C3)

The statement *“But they need to at least let us help ourselves”* (C3), is referring to facilitating local responses to coastal hazards exacerbated by SLR. These types of actions are discussed in the following Section 5.4.

Overall, the wider context of SLR effects experienced in Dunedin City necessitates the selective response from the DCC to focus on the extremely vulnerable community of South Dunedin. However, due to the selective response the smaller coastal communities with less political power strongly desire the DCC to enable them to mobilise and prepare themselves for SLR. For these issues to be communicated between community and the local authority’s effective community engagement needs to occur. The role of community engagement in planned adaptation to SLR will be explored in Chapter 6.

5.4 Views of Local Adaptation Responses Beyond the RMA

As discussed in Section 4.4.1 community preparedness to navigate coastal hazards exacerbated by SLR minimises the resources required from Civil Defence Emergency Management (CDEM) Otago and the local authorities. Providing community development and preparedness therefore pays dividends through the community’s long-term resilience to SLR. Not only in terms of emergency response, but also mitigation and avoidance. There are some local level

actions to respond to coastal hazards already being implemented in the communities of Aramoana and Long Beach, these will be discussed below. Overall the key informants indicated higher levels of satisfaction with these processes compared to their legislated counterparts.

5.4.1 Views on CDEM Aspect of Responding to Sea Level Rise

Informant views suggest legislated local government responses to SLR are evidently limited. Whereas, all community informants expressed satisfaction with engagement and planning for emergency management carried out by CDEM Otago.

The emergency management officer for CDEM Otago expressed the important role of emergency preparedness for future responses to climate change.

“Our role is more about something bad has happened, or is about to happen, what do we need to do to fix it. It’s the immediate response, not necessarily the long term. So with climate change and sea level rise, the volatility and frequency of these events are going to occur more, people and communities will need to be more resilient than ever before”. (Emergency Management Officer (CDEM Otago))

As explained in Chapter 4 (Planning Policy and Context), the DCC and CDEM Otago work together to promote and enable the communities of Dunedin to be aware of, and resilient to hazards they may face. Explained in Section 4.5.1, both the Aramoana and Long Beach communities have co-developed individual community emergency management plans with CDEM Otago. All community informants expressed satisfaction with the engagement process carried out by CDEM Otago. Some reasons for the success of CDEM Otago’s engagement process can be drawn from discussions from the community members themselves, and also from how the emergency management officer (CDEM Otago) describes the process.

The first significant aspect of CDEM Otago’s engagement process is that a “front-loading” approach was taken to create the emergency management plans (Carpenter & Brownill, 2008). That is community input was sought at the earliest possible stage and included throughout the entirety of the plan-making process.

“They[emergency management plans] were very much put together by the community itself, the community board was a Conduent, and the technical information was obviously from other sources. But a lot of it was from us”.
(C3).

Another significant aspect contributing to the success of CDEM Otago’s engagement process is the considerable human-resources available for the task. Having a full-time emergency management officer allows for significant interactions with community on emergency preparedness. The CDEM Otago’s Emergency Management Officer’s statement below details such interactions:

“Community meetings, I can go talking to schools or whatever, small groups. I’m certainly really happy to do that and encourage people to take me up on that one. Encouraging neighbourhood support for an agency around how do you connect, what you need to do there. But really it is about just trying to get people to make that connection and just do it themselves. If we can help them in that process I’m happy to do so. If there’s a small group it doesn’t matter how small, if there is a small group of people that want me to come out and talk to them about emergency preparedness I’ll do it. Because those people will go out and talk to other people afterwards and hopefully that will build that resilience in that community.” (Emergency Management Officer (CDEM Otago))

The ability of the Emergency Management Officer to engage with small groups regularly allows for more effective communication to the public, as well as relationships to be built between the officer and the individual community members. The availability of the emergency management team was felt by the community members.

‘The process [of creating emergency management plans] was easy. He [the emergency management officer] wanted to hear from us at a time that suits us. He gave us time to go over it ourselves, and to work with his help. It was a breeze’. (C1)

Not only did the community informants find the process of creating the emergency management plans enjoyable, they also felt the community is more prepared for an emergency event. Reflecting the community believes the plans are effective.

“Most of the locals are extremely proactive in working out solutions for themselves. They have the ability to be resilient in a civil defence emergency. You’re probably aware that the civil defence response pamphlets are being distributed. These will help us be even more efficient in the next extreme event”. (C2)

It is apparent that the emergency management side of SLR response has been more rewarding process for the community informants compared to legislated responses through the District Plan process. The community views on both the process of creating the emergency management plans, and the effectiveness of the plans response to coastal risks are overwhelmingly positive. Whereas, a number of community informants expressed frustrations with the district plan responses and consultation process overall (discussed further in Chapter 6).

5.4.2 Community Responses to Sea Level Rise

Communities play a large role in responding to the effects of climate change. Emergency planning carried out by Civil Defence Emergency Management (CDEM) Otago minimises the level of support required in an emergency. Planning for situations where coastal hazards are severe builds the community's resilience in responding and recovering to these hazards. Community input is incorporated into District Plan responses and CDEM Otago Emergency Management Plans. In addition, a number of community members carry out responses at an individual or household level.

Some community members mobilise and prepare themselves around hazard events (e.g. flood, storm surge etc.). The Coastal Specialist and Strategic Planner (DCC) described some ways that people respond to coastal hazards on an individual level in the statement below.

“This could be going and staying with a friend somewhere if they know that their property is going to flood. If they see a big flood coming in, and they are in an area that historically their houses have flooded, they might move out for the week. This is a bit of a sad reality. I think it comes down to some of that information sharing, better awareness of the problem would be one aspect of resilience. Then there is also things like actual physical adaptation measures you can take other than avoidance. Maybe it's clearing out your gutters and things like that for floods and things like that and making sure your drains are clear, or sandbagging. All of these small stuff. But it depends on the nature of the problem”. (Coastal Specialist and Strategic Planner (DCC))

Some community members are also looking into implementing larger scale adaptation measures themselves, touched on by the Corporate Policy Team Lead (DCC):

“In Aramoana there has been a conversation about flooding, I know there has been that conversation about people putting in their own pumps, things like this.” (Corporate Policy Team Lead (DCC))

Grass-roots community adaptive actions to SLR are valuable in responding to climate change (Few et al., 2007). However, some informants highlighted some internal difficulties local authorities face when trying to facilitate voluntary community action. Asking community members to carry out their own adaptive responses, or to even be involved with the engagement processes for government interventions is costly, in terms of the individual’s money and time. This view was expressed by the Corporate Policy Team Lead (DCC) in the comment below:

“We don’t know how to support a community member who is clearly the leader but can’t just do that on their own, you know 80 hour weeks with no pay. I think it’s about trying to work out how we can really support communities. We’ve raised it, the productivity commission have been doing an enquiry into local government funding and financing, and we’ve definitely raised it with them. But it’s not easy” (Corporate Policy Team Lead (DCC))

Community informants however, explained although it is burdensome and time-consuming, they want to be involved in the strategic planning of their community. Numerous informants from the communities of Aramoana and Long Beach highlighted a strength of their community in the face of climate change is their attitude to “get stuck in and get things done” (C3). The community members hold the view that their resilience at a local level will ultimately allow them to successfully adapt to the changing environment. This is illustrated in the below comment from a community informant:

“I think you’ll find most small coastal villages like ours are adaptable because they’re on their own a lot of the times, and the people who aren’t resilient will move on. I think it’s a mind-set thing. The people who have the capability for doing things to benefit themselves will just do it, and the others will just go move somewhere else if they aren’t comfortable with what’s happening with the environment”. (C2)

5.5 Conclusion

Chapter 5, together with the previous chapter (planning and policy context) have directly addressed Research Question 1: *What are the different views on different level adaptive responses to SLR in Aramoana and Long Beach?*

Firstly, Section 5.2 discussed the key informants' perceptions and experiences with the national-level responses to SLR. Review of Chapter 4 (planning and policy context) reveals that central government has attempted to address the effects of climate change since the early 2000s. These attempts have been strengthened overtime, however, there are no explicit mandates for local government to implement any adaptation measures as of yet. Section 5.2.1 specifically focused on the perception that national level responses to SLR leave uncertainty as to how to respond to SLR. All key informants working within planning and adaptation at the DCC referred to a need for further national guidance on how to respond to SLR. Conversely one key informant (the consultant working in risk assessment, adaptation and resilience) praised the available national guidance for coastal hazards, suggesting the details of how to respond are uncovered through more in-depth engagement required through the Dynamic Adaptive Pathways Approach. Section 5.2.2 specifically explored the perception that national level responses to SLR leave uncertainty as to who should respond. The blurring of roles and responsibilities between the ORC and the DCC for managing hazards, was consistently cited as a barrier to carrying out effective adaptation. Unclear responsibilities were viewed as resolvable with further guidance from national-level government. Overall, the findings obtained from the key informants indicate the need to enable more effective local government responses, national level government needs to implement more substantial guidance.

Secondly, Section 5.3 discussed the key informants' perceptions and experiences with local government responses to SLR. Review of Chapter 4 (policy and planning context) revealed since the development of the NZCPS local governments have implemented controls through the District Plan to address factors such as SLR. Additionally, there has been an influx in efforts to engage with the communities of Dunedin on the possibility of adaptation actions. However, the current chapter reveals the informants have mixed opinions of these responses to SLR. Section 5.3.1 specifically explored the community uncertainty towards DCC hazard responses. Highlighting the balancing act between public desires and controls to avoid or mitigate hazards related to SLR. The findings indicated the belief that the public have the "right to assume risk" and live within at-risk areas remains within community. This belief weighs in on council's views facing the task of climate change adaptation. The findings suggest more effective community engagement could better explain the risks associated with coastal development to ease this tension. Section 5.3.2 specifically discussed the key informants' views on the selective response to SLR being implemented by the DCC. The findings uncovered the DCC is currently

injecting its resources into the community of South Dunedin that is extremely vulnerable to effects of SLR. This strategy was supported by all key informants in this research. However, the community informants expressed desire to facilitate ground-level responses to coastal hazards exacerbated by SLR to enable them to carry-out adaptive responses themselves.

Thirdly, Section 5.4 discussed the key informants' perceptions and experiences with local responses to SLR that are not legislated by the RMA 1991. Section 5.4.1 focussed on informant views regarding CDEM aspect of responding to SLR. CDEM took a "front-loading" approach to developing their responses to coastal hazards, this involved seeking community input from the earliest stage possible. Community informants felt this local emergency management aspect of planning for coastal hazards was both effective, and the consultation process was enjoyable. Providing valuable insights into processes that produce uncertainty, and processes that produce confidence in community members. Section 5.4.2 explored community level responses to SLR. Explaining some community members mobilise and prepare themselves for hazard events. Some informants expressed discomfort with the pressure that expectations of local community-led action can bring. To counter this, there was a clear view within the community that local action is not only necessary but actually desired from a community level. Specifically highlighting the desire to act themselves as a strength of their communities.

Overall, Chapter 5 has revealed there are a variety of adaptive responses being carried out in the small coastal communities of Aramoana and Long Beach. These responses are being implemented from a range of organisations, including: national-level government, local-level government, the civil defence, community level, and the individual level. There are mixed views on the effectiveness of government responses to SLR. However, there was general consensus that the local-level adaptation planning carried out by CDEM Otago was positively viewed by community informants. Moving forward more measures need to be implemented to avoid and mitigate these hazards. Chapter 5 has reinforced that the first step in this process is an effective engagement process between the local authorities and community, this will be further discussed next in Chapter 6.

6

Community Engagement in Long Beach and Aramoana

6.1 Introduction

Chapter 6 will explain the results of this study pertaining to the role of community engagement in planned adaptation to sea level rise (SLR). Section 6.2 explores the key informant's professional opinions on the formal statutory engagement process in adaptive responses to

SLR. As well as the community members views and experiences, using the legislated engagement process. Section 6.3 discusses the significance of non-statutory engagement carried out within the subject communities. Section 6.4 presents the barriers to effective engagement in Long Beach and Aramoana. Finally, Section 6.5 discusses community's attitudes to coastal hazards in Aramoana and Long Beach, highlighting the role engagement can play in public education. The information presented here will directly answer Research Question 2: *What is the role of community engagement in planned adaptation to SLR, and what are the primary barriers to engagement in Long Beach and Aramoana?*

6.2 Formal Statutory Engagement Process within Planning for Sea Level Rise

Section 6.2 discusses the formal statutory engagement processes at play. As shown in Chapter 4 (Policy and Planning Context) the Ministry for Environment through the Resource Management Act 1991 (RMA), has incorporated clear consultation processes into its legislation. District and Regional planning processes allow the public certain rights of participation, including the right to submit, present to a hearings committee, and appeal a decision to the Environment Court (Environment Guide, 2018b). Public participation allowed for by the RMA is a formalised process that provides a channel for the public to inform decision makers of their opinions and concerns, these comments can then be taken into deliberation. District plan making and changes have a significant influence on issues related to SLR as the plans include tools such as zoning and hazard overlays that impose specific policies and rules relating to areas prone to coastal hazards (including SLR). Effective Regional and District Plans can therefore alleviate the negative impacts of SLR.

There is an often cited dual-purpose for creating statutory obligations to carry out consultation on Regional and District plans and policies. The first being to ensure these planning tools embody the values and desires of the people who occupy the environment they aim to protect. The second being, that even if public contributions to the planning documents does not lead to a better environmental outcome, it leads to more widely accepted decisions, a level of interference that does not cause mass distress, and improves trust and overall relationships with local authorities (Whitmarch & O'Neill, 2011).

Key Informants from the community emphasised some key barriers to engaging with these formal statutory processes (presented in Table 6.1). The barriers were: uncertainty in timeframes for hazard planning; loss of interest; and perceived relevance to themselves. Despite these barriers, both the Aramoana and Long Beach communities did have some engagement with these formalised planning processes. As referred to in Table 6.1, both the DCC and the ORC attended a community meeting in the hall at the Aramoana Domain, open to the all residents in the settlement. This was to relay technical information that went into the decision-making process for the changes to the District Plan, primarily in relation to coastal hazards. In addition, the local authorities helped explain the submission process (C1). The meeting was received well by the community, with community informants stating that the graphics explaining the science were clear and effective (C1, C2). Following, the Aramoana League and the Long Beach Amenity Society, with support and guidance from the West Harbour Community Board each made a submission on the proposed DCC Second Generation District Plan (2GP).

Table 6.1: Community Informants' Barriers to Engaging with the DCC2GP Process.

<p>Uncertainty in timeframes for hazard planning</p>	<p><i>Well I remember their presentation [for the 2GP hazard overlays] and the likes was good...we had the DCC and the ORC there. Yeah but there was just no timetable saying, this was going to happen and when. And I think that is the hard part about getting involved. (C1)</i></p> <p><i>They said they were going to do this new hazard overlay, and what could happen in the future, but no one was putting a timeframe on it, I didn't think it could be that important yet, so it didn't need my input yet. (C2)</i></p>
<p>Loss of interest</p>	<p><i>I started to lose interest in the end. It was a bit big (C1).</i></p> <p><i>It was too convoluted, and it all became a bit too much. I don't even know what the outcome of the process was. (C1)</i></p> <p><i>It was [a] relatively simple task. But I knew the community group was doing something on behalf [of the community] and it was a lot of filling out, so I didn't do it myself. (C4)</i></p>
<p>Perceived relevance to themselves</p>	<p><i>People only submit if they think it is stuff that effects them. A lot of people don't see sea level rise as effecting them, especially if they're old they don't think they will see the effects, so it doesn't affect them personally. (C3)</i></p>

Engaging the public with tools addressing the long term risks of climate change, such as SLR is difficult due to the complexity of the issue and necessary responses (Few et al., 2007; Keeney & McDaniels, 2001). Some of the key informants working as planning practitioners explained that it is difficult for anyone to comprehend these challenges (i.e. City Development Senior Policy Planner (DCC); Coastal Specialist and Strategic Planner (DCC); Corporate Policy Team Lead (DCC); Consultant in Risk Assessment, Adaptation and Resilience Planning). The nature of climate change risks, as discussed throughout this research is complex. Planners working for the local authorities have to create tools based on uncertain climate predictions, and somehow protect properties and infrastructure. This convoluted process is strenuous for experts, and therefore clearly onerous on the public to gain a comprehensive understanding to be able to effectively engage. The City Development Senior Policy Planner (DCC) in the below statement encompassed a lot of these points:

“For the District Plan we just consult everybody, if they organise themselves that is. If they don’t well that’s the choice of the community. The most difficult attempts at consultation is when people haven’t understood what’s going on. We have had some heated discussions through the second generation plan to do with hazards... it’s a sensitive subject if you’re suddenly living in a hazard area, but the thing is they always were, but they only care about it when it begins to affect resale value and insurance. Until then they don’t care, and rightly so if they can’t put food on the table this week why would they care about the planning for an uncertain future?” (City Development Senior Policy Planner (DCC))

The first sentence of the above excerpt from an interview with the City Development Senior Policy Planner (DCC), highlighted exactly where the legislated consultation processes fall short, stating, the DCC will consult with the public if they organise themselves. Then further along they discuss exactly why only consulting with those who are self-organised is problematic. As those who are lower-socio economic status are unlikely to be able prioritise self-organising to engage with the planning process, if they have more pressing issues of day-to-day life to deal with. The findings here support literature arguing a major issue with the concept of engagement in planning altogether is that the system has embedded power and structural inequalities (Klein & Huq, 2003). Underrepresentation of groups in society (based on class, ethnicity, gender, physical ability etc.), reinforce structural inequalities as the same

groups are missing from participation time and time again, and therefore their influence on their environment is limited (Brownill & Parker, 2010; Shipley & Utz, 2012).

The findings highlight multiple layers of barriers to effective engagement with the formalised legislated forms of engagement. Firstly, the barriers highlighted by community members (uncertainty in timeframes for hazard planning, loss of interest, and perceived relevance to themselves) illustrate participation through the RMA is not engaging for the community members in Aramoana and Long Beach. Secondly, the practitioner key informants explained that engagement through the formalised planning process regarding SLR effects is challenging due to the convoluted science of climate change. Finally, the understanding that those not able to self-organise are often ignored from the legislated engagement process alone indicates that this process is not sufficient. The culmination of these barriers infers that, although necessary, the effectiveness of the statutory consultation process for planning for climate change effects is constrained.

For communities to become resilient in the face of SLR, community engagement needs to have a significant role in planned adaptation (Few et al., 2007). The findings from the current research indicate the existing formal engagement processes are unlikely to be effective for the communities of Aramoana and Long Beach. Although they faced significant barriers, both the Aramoana and Long Beach communities did have some engagement with these formalised planning processes. Showing their commitment and willingness to be involved in planning for their collective environmental future. Findings from the literature review suggest an extensive engagement with the public that enables meaningful input in decision-making while mobilising the community themselves will allow them to become resilient as a community (Few et al., 2007; Nelson et al., 2007; Stephenson & Orchiston, 2018). The findings presented in this chapter suggest innovative forms of engagement that go beyond the one-off legislated consultation are required. The following section will explore other forms of engagement that are carried out beyond the participation legislated by the RMA.

6.3 Non-Statutory Engagement within Planning for Sea Level Rise

Community engagement regarding adaptation to increasing SLR needs to be an ongoing process, rather than a one-off consultation (Few et al., 2007) facilitated by the legislative RMA

process. The Consultant in Risk Assessment, Adaptation and Resilience Planning, revealed how engagement in the context of climate change is much more than a consultative process, they explained:

“I think it’s about working as hard as possible to co-create an aspirational vision of a possible future. So it’s not contested, the community understand the need for change, they are prepared for that, they’ve got time to make decisions about their change in their livelihoods. But also that they capitalise off their opportunities it’s not always all bad. There are things you can do with change to co-benefit”. (Consultant in Risk Assessment, Adaptation and Resilience Planning)

The above explanation of engagement frames the concept in a way that reflects resilience principles. Quality engagement in this view needs to aid the community to not only respond to changes and hazards, but to take advantage of opportunities that these system changes bring (Gallopín, 2006; Nelson et al., 2007; Smit & Wandel, 2006). Another key component of resilience theory which is touched on in the above excerpt, is adaptive capacity and the availability of resources for systems to adapt and learn. Resilience theory indicates to minimise injustices imposed upon community, the capability of that system to deal with change must be examined (Adger, 2003; Parry et al., 2007). Together these key components are weaved together to form the above explanation of engagement. Through a resilience-based lens engagement is essentially the process of reflecting on a community’s capacity to adapt, and through a two-way conversation mobilising the residents in a way to increase their ability to respond to stressors and furthermore capitalise from them.

A community’s adaptive capacity is two-fold. It refers to both their coping capacity (the ability to accept the impacts and ensure system recovery to pre-impact state, without changing the system’s exposure or vulnerability to future impacts) and their ability to adapt (changing the system’s exposure or vulnerability to reduce future impacts) (Adger, 2006). As expressed by findings in Chapter 5, the communities of Aramoana and Long Beach both have good coping capacity. Contrastingly, there is a need for effective engagement to facilitate their ability to adapt.

Both of these mechanisms of adaptive capacity are influenced by social factors such as human capital, social capital and governance structures (Nelson et al., 2007). One key informant, the

Emergency Management Officer (CDEM Otago), explained this in depth when discussing the philosophy behind the Civil Defence *Know Your Neighbours* campaign:

“In an emergency who are going to get you through? The first responders isn’t going to be the fire department or police or ambulance, it’s going to be your next door neighbours” (Emergency Management Officer (CDEM Otago))

In the above excerpt they are explaining how social connectedness improves coping capacity. They go on to discuss this concept in more depth below:

“If there is no internet after an emergency, no phones, you’re going to need to talk to people, connect with people around you to find out are they okay? are you okay? what help have you got? If there is no power for a few days it could be that you’ve got food in the fridge but no means to cook it, the next door neighbour has a BBQ but no gas, and the next-door neighbour to them has a gas bottle but no BBQ. Suddenly you’ve got a community meal, with shared food, which does more than just feed people it’s the connectedness, it’s emotional resilience too”. (Emergency Management Officer (CDEM Otago))

The Emergency Management Officer (CDEM Otago) then explains how this same connectedness already being facilitated by the DCC community development team in conjunction with Civil Defence Otago, can also benefit the community’s ability to adapt:

“When it comes to adaptation, again it’s about having those conversations together, so ‘how do we do this?’, rather than personally mulling over ‘I don’t know what is going to happen and I don’t know how I’m going to deal with this’. Having conversations with other people helps you to come up with a plan, how do we deal with this together. (Emergency Management Officer (CDEM Otago))

The natural next question is, how can local authorities enhance these community’s connectedness, and therefore enhance their adaptive capacity?

Emergency Management Otago in alliance with the DCC Community Development team are already working to build social capital within the communities of Long Beach and Aramoana. They are working with community organisations to build their collective capacity to respond to hazard events. Multiple methods have been implemented in order to enhance resilience.

These methods include carrying out community working groups that together create ‘phone trees’ of all the permanent residents within the townships, in order to allow the residents to self-activate in an emergency event. The Emergency Management Officer (CDEM Otago) has also worked with both the Aramoana League and the Long Beach Amenities Society to collaboratively develop localised emergency management plans that include hazard maps with details such as evacuation zones and routes. Community meetings have also been facilitated by Civil Defence to discuss collective community resources, such as access to generators and trucks, and which community members hold first aid-certificates, to enable the community to remain self-resilient if they were to be cut-off from Dunedin City in an emergency. In these workshops’ education is also provided to the public on hazards specific to their area, how to respond to them, and how these events are likely to occur more frequently with climate change. The act alone of carrying out these community-wide events to discuss local hazards and emergency response builds the resident’s social bonds (Nelson et al., 2007). The Emergency Management Officer (CDEM Otago) hypothesis that community connectedness will have positive impacts on future ability to adapt aligns with resilience literature exploring factors that improve adaptive capacity (Nelson et al., 2007).

A barrier to carrying out effective community engagement regarding adaptation options (discussed in further detail below in Section 6.4) is the lack of resourcing. Lack of resourcing can be partially alleviated by facilitating social connectedness amongst the community. This concept was discussed by the Emergency Management Officer (CDEM Otago) also:

“Neither we [Civil Defence Otago] or the DCC have sufficient resources to reach every single person living within a vulnerable area. However, we hope that through encouraging people to reach out to their neighbours, even if we only have direct contact with half of them, and they then spread the word further, it becomes pretty decent coverage”. (Emergency Management Officer (CDEM Otago))

Overall, building social capital and connectedness has positive outcomes for multiple facets of community engagement and adaptation. High levels of social capital build adaptive capacity (both in terms of coping capacity and ability to adapt). Currently, the DCC and CDEM Otago are working together to facilitate social capital in Long Beach and Aramoana. Importantly, continuing to build connectedness in these small settlements could partially alleviate a central barrier further discussed below, lack of resourcing. Therefore, any future adaptation planning

in Long Beach and Aramoana should deliberately incorporate further social capital building to enhance community resilience.

6.4 Barriers to Effective Engagement

The DCC and Civil Defence are already conducting town-meetings and workshops to discuss emergency to coastal hazards that are likely to worsen with rising sea levels. Both community informants and council staff indicated they would like for these meetings to shift towards looking at future adaptation methods to facilitate community resilience. Therefore, alleviating the pressures these hazard events cause. However, there are numerous barriers to carrying out effective communication between the local authorities and community members. These being:

- Lack of resourcing;
- The nature of the climate change issue;
- Participant burn-out; and
- Lack of two-way conversations.

6.4.1 Lack of resourcing

The first central barrier to carrying out effective engagement is a lack of resourcing. Participants from both the local authorities and the community groups expressed desire to carry-out an engagement programme, and some even has ideas of how to engage more effectively and develop more effective policies (discussed further in section Chapter 7). However, they all acknowledged the constraint of lack of time and money.

Key informants expressed a lack of ability for council staff to carry out climate change response actions effectively. There has been a recent shift in priorities, however, until recently the council was not equipped to deal with the problem of climate change. This was explained by the Corporate Policy Team Lead (DCC):

“We have been operating a bit like a de facto climate change unit for some years now. Climate change like many other things that come into council, doesn’t have an easy home in our structure. So we do both the mitigation and adaptation lead work, and we work across the council’s activities to deliver that” (Corporate Policy Team Lead (DCC))

Some key informants suggested the DCC needs more information (which is lacking due to insufficient resourcing), to ensure certainty in the climate science predictions as well as the possible council responses.

“So the biggest barrier at the moment is, well there’s a few, but inadequate information. We don’t have a lot of information about say the geology of these areas or how ground water works there or how quickly the coast might be eroding or what our options are really. We haven’t got an options assessment like using playing fields as detention ponds or whatever it might be. So information about what’s actually going on and options for responding really need to occur before we start talking to these communities”. (City Development Senior Policy Planner (DCC))

However, other informants held a contrasting view, that these conversations need to be had now, and these uncertainties should be incorporated into their adaptive plans through a ‘pathways approach’ (Corporate Policy Team Lead (DCC); Coastal Specialist and Strategic Planner (DCC); Consultant in Risk Assessment, Adaptation and Resilience Planning). This view of a collaboration between local authorities and communities that takes account of uncertainties aligns with the national guidance *Coastal Hazards and Climate Change – Preparing for Coastal Change* (2017).

6.4.2 The nature of the climate change issue

Another key barrier identified through the key informants was the nature of the climate challenge. The climate challenge is enormously complex, grappling with factors such as uncertain predictions, long timeframes and the need for innovative solutions is considered overwhelming for many of the participants. Key informants from local authorities highlighted this is a perception issue, and the task of responding to climate change is a necessary feat. People “checking out” because dealing with the issue is perceived as being too hard acts as a barrier to making positive steps forward. One informant explained there is a dissonance between acceptance of the climate science and the active resistance towards planning adaptation solutions (Coastal Specialist and Strategic Planner (DCC)). Although the fact that the climate is changing is a commonly accepted truth, local authorities and communities remain resistant to respond simply based on the perception of the task at hand (Coastal Specialist and Strategic Planner (DCC); City Development Senior Policy Planner (DCC)).

Embedded within this barrier of the nature of the issue, is the risk of instilling fear in the public. Due to the enormity of the effects climate change, and the financial and social costs of most adaptation options, local authorities can be cautious to begin this conversation due to the risk of causing stress and fear in those they engage with (Coetzee, 2002; Eriksen & O'brien, 2007).

“We need to talk more about it , but it involves hearing quite sensitive information with land owners about potential risk to their properties and things like that. So we have to be very cautious in those cases”. (Coastal Specialist and Strategic Planner (DCC))

One potential solution was highlighted by the Coastal Specialist and Strategic Planner (DCC). They suggested emphasising to community that they are not alone in the issue of responding to climate hazards. By spreading this feeling of unity, the enormity of the task becomes less daunting and potentially easier to begin carrying out positive actions.

“Some people get quite scared or even defensive about it because they think the world is out to get them and they’re not getting any help to tackle the problems. I think it’s important to say that people all around NZ are suffering similar effects, especially lots of coastal communities”. (Coastal Specialist and Strategic Planner (DCC))

Both ‘lack of resources’, and ‘the nature of the issue’ were considered to be resolvable through central government action. Increasing financial support for councils and directly to communities, prioritising climate change adaptation, developing effective adaptation policies, and clarifying the roles and responsibilities for actors, were all cited by key informants working in planning and coastal adaptation as actions that needed to come from national level government (Consultant in Risk Assessment, Adaptation and Resilience Planning; Corporate Policy Team Lead (DCC); City Development Senior Policy Planner (DCC); Coastal Specialist and Strategic Planner (DCC)).

6.4.3 Participant burnout

Another key barrier to engagement identified by the key informants was “participant burnout”. While community groups are organised and active, the volunteerism on which these groups depend can be considered excessive, therefore the same residents are often over relied on. Leading to the groups and individuals to be so fatigued it reduces their capacity to engage with the issues their communities face (Sander-Regier, McLeman, Brklacich, & Woodrow, 2009).

This issue was brought up by council staff and community members, both of these views will be discussed respectively. Participant burn-out was described by the Coastal Specialist and Strategic Planner (DCC) when talking about engaging with other vulnerable communities in Dunedin. They stated:

“When we want to engage with the community more actively some people get frustrated when we come and talk to them because they have seen it all before. They might say ‘you came to us 10 years ago and talked about this stuff’. But that wasn’t me, it was a different council staff member. But I think it’s important to be upfront, recognise where you got up to last time and just be open about the fact that the information is evolving all the time when it comes to climate change” (Coastal Specialist and Strategic Planner (DCC))

Participant burnout was also expressed as a barrier by several long-term residents in these communities. Multiple informants strengthened what the Coastal Specialist and Strategic Planner (DCC) said above regarding resistance to engage when the contact person from the local authority changes roles. Burnout is exacerbated when the community has to go through the drawn out engagement process with multiple staff from several branches of the local authorities. This was summarised well by C4:

“What I’m finding at the moment is the people that you are dealing with are changing a hell of a lot. You will finally get rapport with someone then a few months or so down the track, whatever, nope he’s gone and someone else is coming in. On some of the topics we talk with them about we get 4 or 5 different people, and yeah they are all good but it’s hard. We want more continuity”. (C4)

They further highlighted participant burnout and ‘lack of continuity’ is exacerbated by the blurring of roles and responsibilities of local and regional council, as they have to talk to both organisations about the same issues. This effects people’s capacity to engage

“We talk with different people all the time, go over the same ideas, the same issues, solutions, but still there is no progress. Then we have to talk to DOC, the DCC, the ORC, and you struggle to get them altogether, so then you have to talk to them all separately, if they talk to us at all, and then all of sudden, that person leaves. And then you have to start again. So yeah continuity is something we really struggle with”. (C4)

The findings presented here indicate community members within Aramoana and Long Beach are experiencing “participant burnout”. The experiences of participant burnout deter community members from seeking further engagement opportunities with local authorities to

discuss potential planned adaptation. A contributing factor leading to participant burnout could be the blurring of roles and responsibilities between the ORC and the DCC. To facilitate effective community engagement the barrier of participant burnout will need to be addressed.

6.4.4 Lack of a two-way conversation

Another difficulty with carrying out effective communication in engagement is the feeling of disillusionment amongst community regarding their interactions with local authorities. This issue was independently mentioned by every community member participating in the research. This disillusionment was felt in two main ways, one being the lack of communication from the Council's end, and the other being the lack of outcomes from previous engagement.

One community participant highlighted they have recently attempted to contact the Council regarding stormwater issues experienced in the Aramoana Village, however they are not getting any clear responses from council on opportunities to discuss adaptation options.

"I've emailed them and said look, we've got people with the knowledge and the gear, if you will let us work on the DCC ground. No word back, they said I'll talk to my mangers. It's been over a month and nothing". (C1)

However, other community members have explained that they get general responses from council, and sometimes they will listen to their issues and ideas for solutions towards hazards in the area. But no further action is carried out, contributing to participant burn-out as the community groups put in time and effort outside of their working lives to engage with council to then feel like then get no results, negatively affecting their future willingness to engage. This was summarised by C5:

"They listen to us, but no action. We got a supporting letter form the community board, someone from the council, put it in our annual plan, and then nothing happens. And then they wonder why there isn't good uptake with their ways of doing things, like with the 2GP". (C5)

Information exchange is not a one-way street. Effective engagement needs to be a two-way relationship between the local authorities and the community. The participants from Aramoana described a lot of their interactions with Council as staff simply emitting information, rather

than taking the time to hear the community perspective. This practice of two-way engagement is essential as there needs to be an understanding that community members have “local knowledge” that should be considered in their community development.

“The key challenges would be working with the authorities, or getting them to understand what we would like to see happen... Getting them to understand how easy it is to work with a village if we are all on the same line of thinking. I think that will be the main project to do, to have the community and the council thinking along the same lines” (C2)

This comment emphasises the desire from community to work collaboratively with the local authorities to effectively plan their future. This requires Council staff to be willing to meet the community in the middle, in terms of meeting their shared aspirations for adaptation. On the other hand, the Civil Defence Emergency Management is achieving this collaboration effectively in the creation of the localised community emergency management planning.

“They’ve had input as to what goes onto the [hazard] map as well. So for Aramoana for tsunami risk they’ve identified that the road itself is in a tsunami evacuation zone, it’s a long way to get to higher ground that way. But they’ve identified a quarry just on the out-skirts of the township which you could park at the bottom and go up the hill to a safe area at the top. That’s the community bringing that to attention, and the community have approached the land owner to make sure that they can do that in an emergency. Other routes would be a problem for the elderly, but the community option with some help they would get up there without a problem at all. That’s where the community comes into feeding back into this stuff”. (Emergency Management Officer (CDEM Otago))

This comment illustrates the value of community knowledge in a number of ways. The first being to identify hazards through the community member’s lived experiences in the area. Secondly through understanding their community make-up. They highlighted the initial evacuation route would be difficult for many residents due to mobility issues. Then through their place-based knowledge they offered a suitable solution of an alternative route that is more accessible. Finally, using their social capital they gained approval from the landowner to officially recognise this route in their emergency management plans. This series of events is a positive demonstration of how involving community from the outset and using local knowledge improves the outcomes for all parties involved.

The barriers to engagement (lack of resourcing, nature of the climate change issue, participant burnout, and lack of two-way conversation) uncovered in this research, provide valuable insight into current engagement processes. Both barriers of lack of resourcing and nature of the climate change issue are particularly challenging to navigate. The findings, however, suggest facilitating social capital, could partially alleviate the resourcing issue by mobilising community to help themselves. Additionally, both of these issues (lack of resourcing, nature of the climate change issue) were viewed as resolvable with further central government action. The latter two barriers to engagement (participant burnout and lack of two-way conversation) suggest empowering community members to carry out adaptation strategies for their own community. Ineffective engagement from the past has led to both no positive action, and weakened relationships between council staff and community members. Considering the limited resources available, it appears unlikely the barriers of participant burnout and lack of two-way conversation will be overcome in the near future. Indicating local authorities will need to adopt alternative approaches to engaging with communities exposed to SLR, that take into account these barriers. Empowering the community to mobilise themselves could be one way to partially alleviate some of these barriers.

6.5 Community Attitudes Towards Effects of Sea Level Rise

Chapter 2 (literature review) and Chapter 4 (policy analysis) have exemplified that adaptation to the effects of climate change is a buzz concept at political, policy, and academic scales. Conversely the findings of this research have illustrated the topic is not overtly discussed in the communities of Aramoana and Long Beach.

The findings from the community informants indicate there is still a portion of these communities that perceive effects of SLR (e.g. sea inundation, storm surge, erosion) as natural weather events not related to climate change. This is illustrated in Table 6.2 below:

Table 6.2: Comments from community on the connection between coastal hazards and SLR

C4	<i>“We haven’t been affected by sea level rise”.</i>
C4	<i>“Yeah we have [experienced coastal hazards], and maybe they are more regular. But no. The road has been closed but that’s from extreme weather events. Not from sea level rise. Because, I have asked the question to the port company, of what height change has been in the harbour and really it is minimal. When and if it comes it larger chunks it will be different times”.</i>
C5	<i>“But it [storm surge]did tear the asphalt up at one stage. But again, that was more weather than sea level rise”.</i>
C2	<i>“It’s not just sea level rise, it’s our storm events which mostly cause the issues. We get those extreme weather patterns now, which I don’t think we use to get... So we’ve got to adapt for them”.</i>

Findings presented in Table 2 indicate there is an attitude present among some within the community that the coastal hazards the townships experience (that will be exacerbated with SLR) are not necessarily linked to the climate crisis at all. Even though some commented these hazard events do seem to be more frequently occurring. This attitude towards the issue can lead to public support for bolstering emergency response strategies rather than adaptation strategies.

The Coastal Specialist and Strategic Planner (DCC) addressed this community attitude towards coastal hazards and climate change. They emphasised the importance of understanding the nature of the localised issue, noting:

“I think if people better understood the sorts of risks that they are subject to based on where they live then they might be more interested in doing something about it. I think some people at Aramoana might not believe in things like climate change, and I wouldn’t necessarily say that they have to, but something I do think is that people should be aware of is that things are changing, places are flooding more often, beaches are eroding and things like that. I don’t care what you attribute these things to, but it’s important to say “hey somethings changing and it’s important that we act to do something about it” (Coastal Specialist and Strategic Planner (DCC))

The Coastal Specialist and Strategic Planner (DCC) addresses several points in this statement. First, that a better understanding of the issue and thus, a re-framing of public attitudes would positively impact engagement between communities and local authorities regarding adaptation.

Nonetheless, they indicate local authorities do not necessarily need to halt all adaptation progress until attitudes are changed. As long as the community grasp the concept of the changing environment (regardless of whether it is attributed to climate change) and move towards positive action. This approach supports the use of the Ministry for the Environment's Dynamic Adaptive Pathways (discussed in Chapter 4).

The community informants indicated that there is an accepted risk of coastal hazards in these settlements. One informant argued although the council should support the community, residents should take partial responsibility to reduce the effects of SLR when they choose to live in a low-lying township, he stated:

“A lot of people have to help themselves, not just sit on their butt and say ‘what’s the council going to do about it?’. We’ve got to be mindful if we buy a house on the coast, that’s our choice. I think it should be our choice to live here, I don’t think council should be saying you can’t live here, but don’t expect the council to help you too much. There are things they should be doing, because we are all ratepayers. But if your house is a bit low lying and it can be jacked up, jack it up yourself”. (C2)

Additionally, some community members held the belief that if climate predictions are true there is not much hope for these communities to continue to exist. The lack of optimism regarding the implementation of adaptation solutions is partially due to the feelings of dissatisfaction with council action, and feelings of marginalisation due to size and lack of costly infrastructure.

“See at a metre, we will be sitting with our feet in the water at high tide. And then the road won’t exist at certain tides. I don’t think anyone would bother trying to fix it. So there is no preparation for that. And of course it’s just a sand spit anyway so you can’t surround it, you can’t bund it to say right we’ll have a big wall around it. No one is going to do that, so I don’t think there are adaptation options”. (C2)

C2 indicated the loss of hope for future adaptation options contributes to why this topic is not often overtly discussed within the community meetings. Following the above statement, when asked if people talk about Aramoana's future in the face of climate change he responded:

“Not really no. I think tsunami in-the-likes talks are more important, or flooding with big weather events. I think everyone is conscious about it. People are still buying and selling [houses] so it’s not putting off buyers at the moment any, but maybe potentially later”.(C2)

In contrast, some other community informants had the understanding that there are possible adaptation options to avoid the effects of SLR, however, these options are unlikely to be implemented due to financial restraints.

“But in the end what do you do. Any quick fix is limited. If it’s a pump system to get the water away, really that could cost millions. If the council won’t even help put forward money to fix the drainage system at the domain why would you ever believe they would do this? If the sea is coming in and you are trying to pump it out is that really the way to go anyway?” (C1)

Other community members had a slightly more optimistic attitude, suggesting ways to manoeuvre around the financial barriers in place, saying:

“Council need to let us [the Aramoana] community help ourselves...If we’ve got the availability of knowledge and the machinery needed to do things, then let’s have a collaborative go at it. Even under the instructions of council, we will do the work. They need to do more of this because council budgets are not going to allow, if we all said the council has to do this, the government would not have the money to do what is needed around coastal New Zealand”. (C2)

The above comments from community members reflect there is a range of attitudes regarding the possibility of carrying out adaptation actions in the future. Although, none were particularly positive of the chances of the local authorities effectively implementing successful measure to avoid coastal hazards. Engagement between local government and community can help to increase understanding of situation and possible actions moving forward (Few et al., 2007). This was demonstrated in another coastal community in New Zealand through the *Clifton to Tangoio Coastal Hazards Strategy 2120*.

The *Clifton to Tangoio Coastal Hazards Strategy 2120* is a case study of successful application of the Ministry for the Environment’s guidance. It effectively transformed conversations with communities about planning for and responding to coastal hazards. This was through enabling the co-development of adaptive pathways to respond to coastal hazards. Specifically, successfully developing these adaptive pathways even though the exact “trigger-points” are yet to be defined. This allowed conversations between local authorities and the public to move beyond strongly held opinions on whether these options will be needed and towards long-term preparation for if they are needed, to support future community resilience. The findings from the key informants suggest a long-term consultation process, such as carried out in the *Clifton*

to *Tangoio Coastal Hazards Strategy 2120* would enable effective delivery of a more satisfying engagement process and ultimately outcome.

6.6 Conclusion

Chapter 6 has provided the information to answer Research Question 2: *What is the role of community engagement in planned adaptation to SLR, and what are the primary barriers to engagement in Long Beach and Aramoana?*

To address Research Question 2, the role of engagement within planning tools created through the Resource Management Act 1991, was explored. Additionally, the barriers that hinder effective engagement within the legislated resource management process were identified.

Through the RMA there are specific processes that ensure the public are consulted with. However, these processes are limited and generally one-off, not allowing for relationships to be built or ongoing discussion to be had. In the context of both Aramoana and Long Beach, the most recent form of this legislated consultation has been through submissions on the Dunedin City Council Second Generation Plan. During the community consultation period, staff from both the ORC and the DCC did go to the communities to discuss the new coastal hazard overlays on both settlements. Although, conversations with community informants have revealed it appears there was a large section of the community who did not personally engage with the formal submission process. Demonstrating portions of the community fall through the cracks within these formal processes.

To further address Research Question 2, the forms of non-legislated engagement already occurring in the communities of Aramoana and Long Beach were discussed. Specifically focussing on the role non-legislative engagement plays in adaptation in these communities.

The second counterpart of community consultation, non-legislated engagement, is more about supporting the community with grass-roots responses. This form of engagement includes public education programmes, emergency preparation, and facilitating ground-level adaptation actions. In contrast to consultation mandated through the RMA (which often encourages one-off input from community), the non-legislated forms of engagement discussed in this chapter

enable on-going relationships to be built between the local authorities and the community. Two-way and long-spanning conversations enable both local authorities and community to have a full understanding of the enablers and barriers that exist for both parties when planning for adaptation to SLR. Ongoing and in-depth engagement should be carried out when developing future adaptation responses in these communities. There is a desire from both ends to be involved in this process. However, the findings discovered some barriers to achieving effective engagement in Aramoana and Long Beach (lack of resourcing, nature of the climate change issue, participant burnout, and lack of two-way conversation). Indicating local authorities will need to adopt alternative approaches to engaging with communities exposed to SLR, that take into an account these barriers. Empowering the community to mobilise themselves could be one way to partially alleviate some of these barriers. One community member summed up the need for mobilising the residents to work with council effectively, stating:

“There are a lot of communities willing to put a shovel in the ground themselves, and I think councils have got to benefit from that. Working together they can get a lot more done than deciding what is good for the village without consulting the village. That’s the main thing. If you encourage the people to work alongside council, a lot of things get done the right way the first time around at very low costs”. (C2)

Lastly, to further inform Research Question 2, the community’s attitudes towards SLR effects and responses were explored. The general lack of understanding of SLR effects reinforces the need for better community engagement to enable sustainable adaptation to occur. Community engagement could play a more significant role in public education of hazards and responses to increase general understanding of potential adaptation options for the future.

Overall, effective engagement is vital for successful adaptation to SLR. Legislated consultation through the RMA has its place for feedback regarding district plans and resource consent decisions. It is, however, limited for long-term transformative change required for adapting to SLR. More appropriate processes within planning responses to climate change effects will require engagement that builds resilience and capacity to adapt within these communities at risk.

7

Planning for Adaptation to SLR in Long Beach and Aramoana

7.1 Introduction

Chapter 7 will explore the findings of this research relating to Research Question 3: *How can local authorities enable adaptive responses to accelerated sea level rise (SLR)?* This is a complex question. Its difficulty justifies the masses of research devoted to understanding how to carry out “successful adaptation”. Section 7.2 discusses the community characteristics that enhance their ability to respond to SLR. Referred to within resilience literature as “system characteristics”, they are essentially components of the community make-up that have been reoccurring themes in the findings (i.e. social capital, self-organisation, system flexibility (culture open to change, capacity to learn), social memory and local knowledge). Section 7.3

then explores methods to facilitate the community characteristics. Following, Section 7.4 examines the key challenges for planned adaptation in the small coastal communities of Long Beach and Aramoana. Finally, Section 7.5 discusses the possibility of implementing a community-based adaptive response to SLR, in the context of the case studies areas.

7.2 Community Characteristics

A community's ability to respond, defined as "adaptive capacity" within the literature, is predicted on what is coined "system characteristics" (Nelson et al., 2007). Adaptive capacity refers to the preconditions required to enable effective adaptation to occur. System characteristics are essentially the set of available resources and ability of the system to respond to stressors. This section will explore the range "system characteristics" that have been reoccurring themes throughout the duration of the research process, including:

- Social Capital,
- Self-organisation,
- System Flexibility (culture open to change, capacity to learn),
- Social Memory and Local Knowledge.

These characteristics have been highlighted within the literature and cited in the key informant interviews as key factors that enhance a community's adaptive capacity.

7.2.1 Social Capital

Sustainable adaptation requires robust levels of 'social resilience'. Social capital is the norms and networks that allow people to act collectively (Adger, 2003). Eriksen et al. (2011) recognised that social capital enables knowledge sharing, spreading of risk and claims for reciprocity in times of crisis. This call for "social connectedness" was also reflected in the informant's views of adaptation.

The importance of social connectedness in a community's adaptive capacity was emphasised by the Emergency Management Officer (CDEM Otago) and their experiences working one-on-one with communities. The Emergency Management Officer (CDEM Otago) described the value of having social capital following an emergency event, they stated:

“When it comes to knowing your community, if we all know our neighbours around each other, there is a certain amount of resilience which comes with knowing who people are around you and that social connectedness. If there is no internet after an emergency, no phones, you’re going to need to talk to people, connect with people around you to find out are they okay, and what help have you got to respond to the immediate hazards”. (Emergency Management Officer (CDEM Otago))

The Emergency Management Officer (CDEM Otago) also highlights how good social capital in a community can help them prepare for hazard events to make for an efficient community response. They explain through knowing their neighbours and their available skills and resources, the community knows who they can go to for help in an emergency, therefore enhancing their collective resilience. The Emergency Management Officer (CDEM Otago) describes how the community of Aramoana has used their social capital to prepare for future coastal hazards.

“In Aramoana they’ve gone around the community and found out what resources are there. Who’s got a generator, who’s got a truck, who’s got a current first aid certificate, who’s a doctor. They’ve got doctors, surgeons, police, fire people all living down there, just as general members of the community who you wouldn’t know unless you asked them. But they’ve gone out to get to know that information. So they now know that John from down the road if they’re stuck here and the road’s cut off they’re a medical person. They’ve got an AED for down at Aramoana now. So they’re trying to look at how do we look out for our community in an emergency event, big and small”. (Emergency Management Officer (CDEM Otago))

The Emergency Management Officer (CDEM Otago) also reinforces that the benefits of social capital for responding to hazards will be transferable to enhance the community’s ability to carry out more transformative adaptive responses to SLR.

“When it comes to adaptation things again it’s about having those conversations together, so “how do we do this?”, rather than personally going through I don’t know what is going to happen and I don’t know how I’m going to deal with this. Having conversations with other people helps you to come up with a plan, how do we deal with this together. It means that you are supporting each other in that process. Which for some of these areas when it comes to sea level rise and climate change issues, there is stressful unknowns. So how do you deal with that? And dealing with it together is a lot easier”. (Emergency Management Officer (CDEM Otago))

Civil Defence Emergency Management Otago (CDEM Otago) and the Dunedin City Council (DCC) Community Development Team have been actively facilitating social capital through their engagement processes carried out when developing the emergency management plans (discussed in Section 6.3). Their focus has been on advice and support. Whereas the legislated engagement process (discussed in Chapter 4) carried out by the Council planners centres their engagement processes on information exchange and long-term strategic planning. These long-term planned responses can take a long time to have positive influences on a community's adaptive capacity.

One crucial theme from the community informant interviews, was the community beliefs that the small-town nature of these settlements is a positive asset due to their high levels of social capital. It was emphasised that Council should take advantage of the community strengths that exist due to the small size. It is important to use networks that are already in place, this was mentioned by both Council informants and community informants. It would be maladaptive to try and curate what naturally exists. The active community groups in Aramona and Long Beach (The Aramoana League and the Long Beach Amenities Society) both independently work to build their community's social capital through community-wide activities. This was mentioned by one community informant:

“At Christmas the League organises picnic day which is like a big kids day, and an old fashion fair, that kind of thing. We do movie nights in the hall. Community barbeques all of that. It is these social things that help us really get to know each other, it's what makes us unique.” (CI)

Literature has shown that events such as community festivals and shared feasts add to the viability and vitality of communities, and subsequently their resiliency, by enhancing their sense of self, place and community (Kulig, Edge, & Joyce, 2008). These events reinforce social bonds between the residents, which has been directly helpful when the communities have experienced hazard events in the past. Due to the transient nature of these communities with holiday-goers, the informants explained knowing who are permanent residents saves times when evacuating for tsunami evacuations. This was explained by an informant in the comment below:

“But of course with people coming and going, and also some of the properties are now air b'n'b, so transient, we don't want to go door knocking wasting our time if no one is there, we want to get out in a hurry ourselves.”

But we do know who on our street actually live here, so we can go straight to them if we need to head for the hills”. (C5)

A community member also highlighted how the small-town nature of Long Beach is an asset when it comes responding to an emergency event compared to larger vulnerable areas in Dunedin. They also indicated this resilience derived from their tight-knit community will transfer onto future adaptation actions.

“The thing that I think was different between these communities and South Dunedin, was that both of these communities just because of their make-up and nature are very resilient. Whereas, in South Dunedin a lot of people don’t know each other, there is a lot of elderly people there. So what happened here is that we have a community that is neighbours looking after neighbours. So that clicked in”. (C2)

Effective adaptation relies on social networks to connect and support individuals, families and organizations within the community and to link the wider community with the local authorities (Pfefferbaum, Van Horn, & Pfefferbaum, 2017). Social capital also has positive effects on other system characteristics that influence community’s adaptive capacity. One being a community’s ability to self-organize. This system characteristic will be discussed next.

7.2.2 Self-organisation

An important feature of how social capital works to enhance adaptive capacity to climate change effects is by enabling direct collective community action. Self-organisation activities are essential. Both when they are complementary to adaptive action by local authorities, or as a substitute for underperforming official initiatives. Being able to self-organise is crucial for two main reasons. The first being to motivate the public to be involved in coastal protection and planning processes. The second being to carry-out localised adaptive actions themselves (Petzold, 2017).

In the case study of these small communities of Aramoana and Long Beach they already have good self-organisation skills. Some examples being, they both have active community groups, which hold fortnightly meetings to discuss broad issues and upcoming community events. Both Aramoana and Long Beach submitted as a community on the DCC District Plan. This strong

level of organisation was beneficial as multiple community informants implied, they would not have been involved with the District Plan consultation if it had not been organised by the community groups (C1, C2, C3). This is a clear example of self-organisation enabling the wider community to participate in formal planning processes.

Adger, Paavola, Huq, and M.J (2006) explained that many strategies for adaptation exclusively reduce the vulnerability of sections of the community who are most able to mobilise collective action and those already with greater access to decision making processes. In other words, most adaptation does not reduce vulnerability of those most at risk in the community. The tendency for those who are self-organised to be included within planning processes was emphasised by a comment by the City Development Senior Policy Planner (DCC), they stated:

“For the District Plan we just consult everybody, if they organise themselves that is. If they don’t well that’s the choice of the community”. (City Development Senior Policy Planner (DCC))

The Corporate Policy Team Lead (DCC) strengthen this comment, when asked how they contact community groups, they said:

“Primarily it has been through existing networks. In South Dunedin for example, we’ve worked with the community to establish a community network. That now has its own momentum and is making leaps forward”. (Corporate Policy Team Lead (DCC))

These comments from DCC staff illustrate how self-organisation of community groups helps local authorities to carry out engagement processes. As well as mobilising community groups to carry out their own adaptation actions. Although, these examples also highlight how inequitable planning processes can be, as those who are less able to self-organise are marginalised from taking part in decision-making.

The social ties and ability to self-organise are strongly valued by the communities of Long Beach and Aramoana. The community respondents all independently identified the tight-knit and “get in and get it done” attitude of their community is especially valuable when responding to hazard events. One community informant when discussing how a large storm had blocked

off the Aramoana Road, said the road became cleared within a day due to the community organisation.

“Everyone pitches in if the road is out. As soon as we heard there had been a slip we were organising the more physical of us to head out and get it cleared. The others stayed back and helped out around the houses that were badly flooded”. (C5)

The system characteristic of self-organisation positively influences the community’s adaptive capacity, in terms of both ability to adapt through long-term planning processes, and their ability to carry out collective adaptive actions when responding to immediate hazards. This system characteristic is valued by the community members themselves and has co-benefits for the local authorities. Therefore, facilitating the mobilisation of these communities will enable future positive adaptation to climate change effects such as SLR.

7.2.3 Flexibility

Both adaptability and resiliency of a system require a path that allows for change. The decisions of the past will influence the range of adaptation options for the present, and the decisions made in the present will have implications for future management flexibility (Nelson et al., 2007). System flexibility is a characteristic mostly built by local authorities; however, community would benefit from this characteristic also. System flexibility includes culture open to change, capacity to learn, and overall ability to carry out transformational adaptation.

7.2.3.1 Culture open to change

The system characteristic of a community culture open to change is crucial for future adaptive actions in the communities of Aramoana and Long Beach. Adaptive management is built upon the concept that decisions should be a part of an iterative process, that is they should be constantly evaluated and strategies should evolve over time to meet the changing environmental and social parameters (Nelson et al., 2007). The theory is reflected in the Ministry for the Environment Dynamic Adaptive Pathways Planning. For the Dynamic Adaptive Pathways Planning approach to be accepted by community a culture open to change must be facilitated.

Resilience theory is founded on the concept of a system that doesn't only respond to stressors and return to equilibrium, rather a resilient system thrives with change. The legacy of poorly situated development from the past exemplifies why system change is necessary. The Coastal Specialist and Strategic Planner (DCC) explained there are developments around Dunedin City that are not especially resilient to our near climate futures. He said,

“Everyone always looks at what can we do to solve this problem [sea level rise], put up a sea wall to retreat back, but I think ideally all new development should be much more strategic in regard to where it is positioned. I know there are new houses going up in places I look at and I'm thinking – why are we allowing that to happen. So I think that sort of thing, legacy issues are a big one too”. (Coastal Specialist and Strategic Planner (DCC))

The findings indicate both Aramoana and Long Beach are somewhat open to change. Openness to change is illustrated in the below comment:

“We have that kiwi ingenuity bred into us. We are always keen to find an innovative solution. Maybe what needs to happen here doesn't even exist anywhere else yet. But we need to starting thinking about possibilities.” (C3)

The above comment demonstrates that some community members are open to alternative responses to SLR. Even though they did not offer any options, this comment suggests they would be open to considering innovate methods if they were proposed. Transformational adaptations need to not only be accommodating of key local stakeholders, but also driven by these groups (Heidkamp & Morrissey, 2018). The collective identity of “kiwi ingenuity” could be harnessed, to market the idea of change as a national pride symbol. Taking the negative situation of SLR effects and converting it into a chance to express the kiwi identity of a “get in and get it done” attitude (de Bruin, 2012).

Other community members inferred some hesitation to change. Although, it seemed to be caused by scepticism of transformational change as an realistic option for these communities, due to the lack of resources. When asked what future adaptation options could look like in Aramoana, one community member said:

“I don't think anyone would bother trying to fix it. So there is no preparation for that... I don't think there are adaptation options... it will stay this way until maybe one day they [the Council] make us move”. (C1)

The above comment does indicate some level of hesitation to change. Although, the statement “I don’t think anyone would bother trying to fix it”, highlights this view could be derived from lack of trust in the local authorities to invest in adaptation actions.

To facilitate system changes in the communities of Aramoana and Long Beach, the community needs to embrace these future changes and to use them to create future opportunities for the communities (Heidkamp & Morrissey, 2018; Nelson et al., 2007). If transformational adaptation is required, both community and local authorities must be open to change in order for it to be effectively implemented (Nelson et al., 2007).

System flexibility includes the feature of ‘capacity to learn’ (Nelson et al., 2007), this function of system flexibility was cited numerous times throughout the research process and therefore will be further unpacked in the Sub-section below.

7.2.3.2 Capacity to learn

Pelling, High, Dearing, and Smith (2008) defines ‘learning’ in the context of adaptation as, “a transformation in the potential for behavior of an actor in response to experience, as seen from the viewpoint of an observer” (Pelling et al., 2008, p. 870). Understanding learning in terms of changes to agency opens up scrutiny of the adaptive behaviors of multiple actors (e.g. individuals, formal and informal organizations etc.) provided they are capable of changing behavior in response to experience. Both adaptability and resiliency of a system require a path that allows for change. Implementing planning tools that incorporate responding to environmental change requires a shift from reactive planning and towards anticipatory planning. This ideological shift will require ‘learning’ from both community and local authorities. Thereby, capacity to learn is a characteristic that partially determines adaptive capacity.

In order to effectively respond to SLR, evidence-based policy is critical. The current research uncovered, to enhance these smaller coastal communities’ capacity to greater understand these science-based responses, trust between local authorities and the community is essential.

“But I think communities need trusted knowledge-brokers. Trust is critical. When you have people from within the community who understand the need to move on, and they already have that trust within the wider community, they can help you co-facilitate that process, that’s invaluable”. (Consultant in Risk Assessment, Adaptation and Resilience Planning)

The Consultant in Risk Assessment, Adaptation and Resilience Planning, in the comment above suggested local authorities can benefit from the active community members already present within the community at risk. As these people already have the wider community’s trust and are unlikely to have ulterior motives other than to benefit the community. Therefore, when trusted community members explain potential SLR effects and responses the wider public are more likely to consider this knowledge and transfer it into adaptive behaviors.

The Coastal Specialist and Strategic Planner (DCC) explained that understanding the science and nature of the problems that require adaptive action will encourage the public to be engaged with the planning process, he said:

“I think in some ways it comes back to information and knowing where you have problems. Because I think if people better understood the sorts of risks that they are subject to based on where they live then they might be more interested in doing something about it”. (Coastal Specialist and Strategic Planner (DCC))

The findings from the present study indicate that formal organisations such as the DCC need to gain back trust in their relationships with community in order to strengthen capacity for learning. In addition, informal actors such as trusted community members are also valuable in this process. Community members are already active in responding to hazard events. Therefore, utilising their reach within the community could enable further education to the wider community regarding adaptation options. It was also revealed that increasing capacity to learn within the residents will likely increase their willingness to act and engage with council regarding SLR response. Ultimately increasing the community’s adaptive capacity to SLR. Although the system characteristic of capacity for learning emphasises the value of scientific knowledge, this does not mean local knowledge should not be prioritised in decision making. The system characteristics of ‘social memory’ and ‘local knowledge’ were also emphasised in the research findings, these will be explored in the following section.

7.2.3 Social Memory and Local Knowledge

Different approaches to adaptation reflect differing approaches to knowledge and understanding of the local context. Consequently leading to different diagnoses of the problem and solutions. Eriksen et al. (2011) argue that the integration of local knowledge based on experience living in the at-risk area and ongoing observations of the natural environment is essential for adaptation to SLR.

The findings of the current research suggest there is a collective “social memory” of these community’s having “always been adaptable”, leading to a certain feeling of self-reliance and independence, but also in some sense stagnation when it comes to potential planning for transformational adaptation.

“Storms happen, the place turns into a mess, we clean it up. That’s how it has always gone, we get through every time”. (C1)

The above comment illustrates how some members of these small coastal communities are used to hazard events and the hazard response side of adaptation. Consequently, there seems to be no urgency to carry out long term transformational adaptation. Firstly, there is a collective “social memory” of community self-reliance to bounce-back following storms and other disturbances. Secondly, due to the long-term nature of SLR effects, there is a lack of urgency to carry out planned adaptation until the community hazard responses that have been carried out for decades are no longer effective. Contrastingly, another community informant felt this same “social memory” of the community always been adaptable in the past will transfer onto future larger-scale adaptation efforts responding to climate change effects including SLR (presented in the comment below).

“The mobilisation of communities always achieves results. We are capable of that down in Aramoana and Long Beach, we’ve done it all throughout West Harbour. In both helping each other out when the lower areas are flooded or other things... We had a massive Sycamore problem along the West Harbour, you can’t see them now because they have all been taken out. I went to council for action, nothing. So I formed another group called the West Harbour Beatification Trust, we mobilised, we protested and since then they have removed 10,000 sycamore trees and we’ve replanted. Mobilisation. If the community mobilises we can do it.”. (C3)

The above comment from the community member discusses a number of points. The first being the “social memory” of the community being resilient in the past in responding to hazard events and ultimately how they use this resilience to achieve results. They then go on to give an example where the community has used their ability to work as a collective to achieve results in other issues they face. Implying they could use the same techniques to work together to carry out larger-scale adaptation.

Intertwined within “social memory” is local knowledge. Local knowledge is the attitudes and pattern of behaviours specific to life in local environmental conditions. Local knowledge is important for adaptation at an individual level, but also for translating existing knowledge gained through experiences and social capital into action. Local knowledge includes knowledge regarding land management or shared practices of disaster recovery and prevention (Petzold, 2017).

Local knowledge should be integrated with other sources of knowledge in order to develop successful responses to climate change and empower local decision making. Local knowledge in disaster risk management is essential for reducing vulnerability and can be combined with policy efforts to address social equity issues. Any policy intervention to strengthen adaptation and reduce risk should recognise community participation in disaster prevention and response (Eriksen, Brown, & Kelly, 2005; Pelling & High, 2005; van Aalst, Cannon, & Burton, 2008; Wisner, Blaikie, Cannon, & Davis, 2004).

Through the work carried out by Civil Defence Emergency Management (CDEM) Otago and the DCC Community Development team, local knowledge has been effectively incorporated within the hazard response side of adaptation. This process of using local knowledge and the value of the community insights is described by the Emergency Management Officer (CDEM Otago):

“They’ve had input as to what goes onto the [hazard] map as well. So for Aramoana for tsunami risk they’ve identified that the road itself is in a tsunami evacuation zone, it’s a long way to get to higher ground that way. But they’ve identified a quarry just on the out-skirts of the township which you could park at the bottom and go up the hill to a safe area at the top. That’s the community bringing that to attention, and the community have

approached the land owner to make sure that they can do that in an emergency. Other routes would be a problem for the elderly, but the community option with some help they would get up there without a problem at all. That's where the community comes into feeding back into this stuff". (Emergency Management Officer (CDEM Otago))

The Emergency Management Officer (CDEM Otago), also described this process of incorporating community knowledge in Long Beach area. Both of these communities had valuable local insights into how the hazards manifest in the settlements.

"It will be simple things like in Long Beach that road [points at map] there near Osbourne, a member of the community response group, basically said "every time there is a king tide I look down that way and that road is inundated, so let's mark it as a road hazard". Same with that road around that side of the inlet, they said "well that can often if there is a hightide/storm surge, whatever that's going to be a problem, so let's mark it". So there's a wee causeway, we don't want people to cross there if there's an issue because it might be dangerous. So again getting that community feedback into the process is really important. Because I'd look at it and think, aw it's just a road. I wouldn't have known it was a hazard at all". (Emergency Management Officer (CDEM Otago))

The findings from this research have also identified local knowledge as valuable when designing ways to communicate information to the community. Knowledge on their neighbours and themselves allows community members to inform what types of communication will be effective in engaging the people who live in these vulnerable areas.

"They had one that about 40 pages long as a community resource. Going into the communities they said "we don't want it because no one is going to read it anyway. What we want is something simple that can reinforce a message". (Emergency Management Officer (CDEM Otago))

The above comment illustrates local knowledge can be used to not only determine what information is included, but also how relevant adaptation information is presented to the public. Increasing the likelihood that resources prepared by the local authorities will actually engage their target audience.

The present findings revealed some working within planning and adaptation feel there needs to be greater respect placed upon local knowledge and community views from the practitioners.

The Corporate Policy Team Lead (DCC) described how local perspectives need to be given respect and heard out, irrespective of whether the planners believe the opinion to be correct.

“I think also making sure that for us on the staff side that people don’t bring prejudices to the table, because I think that’s where it can really fall over. I get asked a lot about what I think about climate change deniers, as if I should hate them. But I always say everyone’s voice is valid and everyone plays a role. So I think if someone is sceptical it’s sometimes extremely useful for us because it helps us to see something through a different lens”. (Corporate Policy Team Lead (DCC))

The above comment highlights how different perspectives can add value to decision making, in terms of factors that may not be otherwise considered. Providing a “safe place” for community members to share their views and perspectives is essential, as some members of the public may feel intimidated when engaging with council staff. This is especially the case in forums that require comments from both community members and practitioners.

“So the challenge is allowing conversations to happen where you might have someone who is a long standing community member sitting at a table with a coastal geomorphologist and actually they both actually have incredibly valuable things to bring to the conversation. Enabling that and enabling people to feel their own power in that is quite critical. That is how I see engagement. How do you create that space to have people have real conversations and not feel like they should be quiet”. (Corporate Policy Team Lead (DCC))

These comments by the Corporate Policy Team Lead (DCC) draw attention to the power dynamics present amongst stakeholders involved in adaptation decision making. The idea expressed here that power differentials between governing elites and local communities can disrupt equitable knowledge-making is prominent in the sustainable adaptation literature (Armitage & Plummer, 2010; Butler et al., 2015). Butler et al. (2015) explain that stakeholder groups have unique constructions of reality, and ultimately local knowledge has the least perceived credibility compared to other actors. Therefore, power differentials must be anticipated and mitigated, if ignored this inequity could exacerbate the vulnerability of communities (Butler et al., 2015).

The current research calls for greater respect and inclusion of local knowledge in making adaptation decisions. Community informants have revealed local knowledge is successfully incorporated into the emergency response side of adaptation. Moving forward the use of local

knowledge needs to be translated into more long-term responses to effectively adapt to SLR effects.

7.3 How to Enhance these Community Characteristics

Adaptation research is mostly actor-based and centres around the reduction of vulnerabilities to specific risks. Resilience theory has its foundation within complex systems studies with a focus on adaptive capacity and ultimately the ability to deal with future uncertain change. Both of these approaches (adaptation and resilience) deal with similar system components of adaptation, i.e. its characteristics, processes, and outcomes. Focusing on system characteristics through a resilience-based approach to adaptation allows sources of resilience to be developed in order to create robustness in the face of uncertainty and to maintain the flexibility necessary to respond to uncertain futures. This focus on system characteristics is valuable when considering how to effectively plan for adaptation to unknown impacts, such as the case with SLR (Nelson et al., 2007).

The current research has highlighted potential ways to enhance the system characteristics identified in Section 7.2. This section will further explore the ways that these characteristics can be within the small coastal communities of Aramoana and Long Beach. The two central themes highlighted by the key informants were actions to deal with uncertainty, and actions that mobilise the community. These will be unpacked below.

7.3.1 Actions that deal with uncertainty

All key informants stated uncertainty of SLR effects as a barrier to carrying out adaptation actions in the small coastal communities of Aramoana and Long Beach. Specifically, all community informants indicated worries about carrying out transformational adaptation when it is not yet necessary. Many informants called for actions that will enable the community to deal with the uncertain manifestation of the effects of SLR.

It was revealed through the current research enabling actions that are robust in the face of uncertainty, will strengthen the system characteristic of ‘flexibility’ (discussed in section 7.2.4), and ultimately facilitate the collective community’s resiliency.

The key informant interviews identified some ways to facilitate actions that effectively deal with uncertainty. The first being, strengthening relationships at the individual person-to-person level (e.g., through the Civil Defence Emergency Management ‘*know your neighbours*’ campaign). The second being facilitating community connectedness (i.e. social capital), this could be through community events, and community meetings. These actions help the community feel bound together, and not alone in dealing with the uncertain future their community faces. Thirdly, strengthening the trust between the local authorities and the community. All community informants indicated to some degree levels of mistrust in the council staff, stemming from both feelings of neglect, or the lack of council action. The fourth way to deal with uncertainty highlighted by key informants was bolstering communication channels to enable conversations regarding adaptation to occur. Lack of knowledge regarding possible actions leads to further distress regarding the uncertainty of SLR effects. Related to this is the last action of providing further accessible and appropriate resources for the community. As previously discussed, if the community understand the nature of SLR effects, as well as the reasoning behind certain responses, they will feel much more comfortable with approaches that account for uncertainty.

All of these responses can be condensed into four main themes that will facilitate actions that deal with uncertainty and overall strengthen the system characteristics required to build adaptive capacity in these communities. These themes are fostering:

- Support,
- Relationships,
- Information exchange, and
- Communication.

Fostering these four factors will build upon system flexibility, self-organisation, and local knowledge. Overall, they will reduce levels of fear associate with the unknown effects to allow the community to take advantage of potential transformational change that may occur. Allowing for actions that deal with uncertainty will ultimately increase the community’s adaptive capacity and overall resilience to the effects of SLR. Additionally, it will enable conversations to be had that embrace uncertainty and have positive co-benefits for actions that mobilise the community. This theme of community mobilisation will be discussed in the following Section.

7.3.2 Actions that mobilise community

The communities of Aramoana and Long Beach provide interesting cases for future adaptive responses to SLR. Notably, when considering the factors of the small size of these communities, the lack of infrastructure present within them, and the wider context of climate effects experienced within Dunedin City. These small coastal communities therefore experience all the difficulties that any settlement would when planning for adaptation to SLR, as well as these additional layers of factors that influence the potential adaptive actions. These three factors all support facilitating community development and ultimately their mobilisation. Therefore building on the system characteristics explored in Section 7.2, and enhancing the community's adaptive capacity.

The key informants working within adaptation and planning, but less directly with the communities themselves, both discussed high-level planning tools that can be used to reduce vulnerability and enhance future community resiliency and adaptation actions within these communities (Corporate Policy Team Lead (DCC), City Development Senior Policy Planner (DCC)). Whereas, those informants working closely with community (Coastal Specialist and Strategic Planner (DCC); Consultant in Risk Assessment, Adaptation and Resilience Planning) as well as the community members themselves all emphasised ground level responses as priority for these specific communities. While high level theory that focusses on vulnerability reduction, increasing equity within the system through transformations and avoiding maladaptation were discussed. When focussing on the communities of Long Beach and Aramoana actions such as community support, and alternative soft approaches that can be largely facilitated by the community and that lead to enhanced adaptive capacity were emphasised.

The research uncovered actions that mobilise the communities of Long Beach and Aramoana would facilitate the system characteristics of 'social capital', 'self-organisation', 'local knowledge' and 'flexibility', increasing capacity to deal with environmental changes that will occur with SLR and ultimately facilitating adaptive capacity. The value of community development focused adaptation will be further discussed in Section 7.5.

This section has outlined how these system characteristics may be enhanced to facilitate adaptive capacity. Nonetheless, there are still challenges of adaptation that need to be considered.

7.4 Key Challenges for Planned Adaptation in Aramoana and Long Beach

There were two challenges for planning for adaptation to SLR in Aramoana and Long Beach consistently mentioned by key informants. These being lack of power, and the perceived relevance of SLR effects. These challenges will be discussed respectively below.

7.4.1 Lack of Power

Adaptive capacity is influenced by political power (Eriksen, Nightingale, & Eakin, 2015). All adaptation decisions ranging from individual livelihood strategies to policymakers carrying out formal planning processes, involve the prioritisation of some interests over others. These processes of selective prioritisation have positive and negative effects distributed socially and spatially (Eriksen et al., 2015).

The community informants perceived this lack of “power” within planning processes as a key challenge for carrying out adaptation actions in their communities. One community member stated:

“It doesn’t really matter what we want. It’s down to what they let us do, what they want really.” (C1)

Planning tools mandated by the RMA (1991) anticipating the effects of SLR (i.e. minimum floor heights, relocatable housing, coastal hazard overlays (explained in Chapter 4)) are not considered engaging from the community’s perspective. These long-term strategic planning approaches carried out by the local authorities can make the public feel disempowered, as they don’t feel like they play a role in the response development. Rather than focussing on increasing participation of vulnerable groups in adaptation planning processes designed by people in power, there needs to be a co-production of these processes with vulnerable groups (Manuel-Navarrete, 2013).

Facilitating these system characteristics (community connectedness, flexibility, capacity to learn etc.) have widespread benefits for the entire community, and do not rely solely on political will to carry out adaptation. Framed in this way adaptation provides a space to create positive change (Eriksen et al., 2015). This concept was supported by the Corporate Policy Team Lead (DCC):

“I see huge opportunity in the climate change space to address other issue that have been long term intractable issues that we haven’t really dealt with”. (Corporate Policy Team Lead (DCC))

The idea of using adaptation to redistribute power and equity imbalances was also discussed by community informants, one stated:

“I hope that by looking at it through this climate angle maybe issues like housing quality and poverty, and the lack of work will be looked at. So I guess what adaptation looks like for me is not maintaining a status quo but creating a better future”. (C3)

Literature exploring the politics of adaptation cannot yet produce prescriptive guidelines on how to carry out equitable outcomes in adaptation, nor does the literature provide clear indication of whether a population engaged in adaptation processes will distribute power and ultimately reach the desired transformative outcomes. Rather, the literature emphasises broadening adaptation activities from the practical and measurable outcomes based analysis, to include a focus on decision-making and implementation, and the complex social structures in which adaptations are occurring (system characteristics, and power dynamics). Overall with a goal of challenging existing power relations rather than reaffirming them (Eriksen et al., 2015). Adaptation possibilities provide a place for system transformations to be genuinely considered and therefore could potentially allow some change to current social and economic conditions present in society (Walker et al., 2004).

The current research highlighted ‘lack of power’ as a key challenge to carrying out adaptation actions in Aramoana and Long Beach. A number of informants suggested supporting a community-development based strategy would be beneficial for these small communities who lack political power in the wider city (Coastal Specialist and Strategic Planner (DCC); Consultant in Risk Assessment, Adaptation and Resilience Planning; Corporate Policy Team

Lead (DCC); C1; C3). Addressing SLR through adaptation could potentially allow system transformation and address some of these power imbalances, regardless of adaptation outcomes mobilising these communities will facilitate feelings of empowerment.

7.4.2 Perceived Relevance of Sea Level Rise Effects

The public are used to thinking of natural hazards as un-predictable one-off events, such as earthquakes and tsunamis. However with the changing climate, there are natural hazards such as sea level rise (SLR) occurring that are predictable, accelerating and a long-term threat to the physical and social form of communities (Taylor, Dessai, & Bruine de Bruin, 2014). Responses from the community informants revealed that due to these unique attributes of SLR compared to other hazards, it is difficult for the public to link together SLR and the hazards they are experiencing, and to comprehend the urgency of planning for adaptation to SLR when it seems less relevant at present. This was apparent when multiple community informants suggested they are experiencing more frequent coastal hazards such as erosion and storm surge, yet they stressed:

*“These events are just storms though, they aren’t because of sea level rise.
I’ve asked the Port and the rise in sea is minimal.” (C1)*

This perceived irrelevance between SLR and coastal hazards experienced in the communities of Long Beach and Aramoana calls for practitioners working in planning to find innovative ways to connect these issues together to enable the community to effectively engage with future adaptation actions future. The key informants did offer some suggestions on ways to enhance the perceived relevance and understanding of SLR effects and responses.

One key informant highlighted the importance of recent events in building community resilience and willingness to respond to natural hazards. When asked what facilitates resilience building, The Consultant in Risk Assessment, Adaptation and Resilience Planning replied:

“A recent event that they all learn from. Resilience declines with time as we lose memory of what we have just been through as a community”.
(Consultant in Risk Assessment, Adaptation and Resilience Planning)

They further explained:

“That’s what you have to teach along the coast of Thailand, where they suffered a big event and it killed people. They were more resilient for a few years, and now you need to keep reminding people through scenarios. Relating it back to something that has happened close to where they are tends to make it more real, and that’s really important. Make it real and be careful not to overstate things they can’t relate to”. (Consultant in Risk Assessment, Adaptation and Resilience Planning)

The effectiveness of a recent hazard event for building community resilience was also emphasised by the Emergency Management Officer (CDEM Otago), who stated:

“Sometimes a wake-up call is what’s needed. The tsunami warning of 2016 [in Dunedin] apart from being problematic at the time, created a lot of change, and created a lot of questions, people started to ask, what do we need to do to prepare ourselves? A lot of things like these maps were produced specifically for that purpose”. (Emergency Management Officer (CDEM Otago))

It is widely accepted within hazard literature that individuals who lack first-hand experience of hazards associated with climate change are less likely to be concerned with the issue, and less inclined to engage with adaptation planning (Spence, Poortinga, Butler, & Pidgeon, 2011a). These findings align with the suggestions from the key informants above who stressed the importance of referring back to coastal hazard events that the community have experienced in order to facilitate resilience and adaptive actions.

The individuals living within the communities of Long Beach and Aramoana are significantly attached to their homes and wider community. This was explained well by a community informant, who said:

“It’s not just somewhere you randomly decide to move to. Almost all of us have been holidaying here our whole lives, like me turn full-timers later in life. This place and the people here are a part of me”. (C1)

“Attachment to place” is a concept that explains the level of connection that residents have with their physical setting or community (Marshall, Park, Adger, Brown, & Howden, 2012). The comment above from C1 reflects the concept of attachment to place. The informant explained an intense connection with the physical place itself as well as the people and

networks that exist within it. Literature indicates strong attachment to place enhances the capacity of individuals to adapt to change in their region where their attachment acts to motivate individuals to identify novel solutions (Marshall et al., 2012). The strong attachment to place that these community members have, should be harnessed in order to engage them in planning for adaptation.

Utilising the attachment to place to increase perceived relevance of SLR was discussed by the Consultant in Risk Assessment, Adaptation and Resilience Planning. They explained in order to increase relevance:

“Take them on a visual journey, visualisation is really important. Landscapes architects and urban designers in this regard are really great. You know where we live in the world of technical reports, and scientific posters, they visualise things. That’s something I think is really important”.
(Consultant in Risk Assessment, Adaptation and Resilience Planning)

Visual aids displaying the potential SLR consequences and adaptive options will emotionally engage the community with the process, as they feel strongly attached to the setting, they will want input in the future physical environment. This concept was discussed in depth by another community member who suggested:

“You could have a simulator, that you can key in your address and it shows you what it will look like in 20, 30, 40, 100 years. That would be a good investment, “come and sit in the climate change simulator”. And it becomes tangible, they can see it. These people have spent their lives in Long Beach, they have massive connections to the land, seeing that will tug on heart strings, it will make it real, and it will make them want to discuss options that are better. Interactive engagement would be awesome. It would open people’s eyes”. (C3)

The small-town nature of these communities leads to less power in demanding adaptive actions. However, it does have positive factors associated, that if utilised could facilitate better engagement with the issue of SLR, facilitating resilience and overall increasing adaptive capacity, such as attachment to place and social capital. The unique context of these small coastal communities suggests although top-level planning process will be essential for long-term adaptation in these areas, a ground-level adaptation approach would be widely beneficial right now. This will be further explored in the following Section.

7.5 The Value of Community-based Adaptive Responses

Community-based adaptation is an approach that focuses on both adaptation and development while benefiting from local resources and ensuring effective implementation and outcomes for adaptation actions, from the perspective of those living with the hazard (Petzold, 2017).

Coastal communities will experience more physical, social and financial challenges with increasing SLR. Local government are calling for further national guidance for implementing planning and funding towards adaptation. However, community informants from the current research have emphasised local authorities need to act now to reduce potential suffering of those vulnerable to SLR effects, rather than waiting while the frameworks are being fine-tuned by government. Additionally, to foster successful future adaptation local authorities need to use innovative methods to engage with communities vulnerable to the effects of SLR.

Current guidance from the Ministry for the Environment promotes the use of Dynamic Adaptive Pathways Approach to coastal management (discussed in Chapter 4). This approach is aligned with values expressed in adaptation literature and is praised by the practitioners who were key informants to this research. However, the lengthily and detailed process required for the Dynamic Adaptive Pathways Approach is expensive, and multiple informants indicated lack of resources as a key barrier to carrying out adaptive actions in Long Beach and Aramoana.

When asked what do you see as realistic successful adaptive planning for these smaller communities over the next 5 years? The Coastal Specialist and Strategic Planner (DCC) replied,

“The council at the moment might be focussing on Ocean Beach, but to me or at least what I tell myself is that somewhere has to be first and we need to learn how to do this. If the priority is there at the moment then I will learn what I can there and if it goes well then we can hopefully implement it elsewhere. My personal view is that for Aramoana and Long Beach I would like to provide structure and support to the communities”. (Coastal Specialist and Strategic Planner (DCC))

The above statement from the Coastal Specialist and Strategic Planner (DCC) suggests support for a community-based response. Using a community-based adaptive framework, such as Stephenson et al. (2019) Community Development for Adaptation Approach, assists local

authorities to facilitate community readiness to be able to meaningfully participate at the critical decision (“trigger”) points. Importantly until then, a community-based approach will also provide guidance and tools for these smaller coastal communities who want to mobilise and work together to build resilience in the face of environmental change (Stephenson et al., 2019).

The DCC already have mechanisms in place to build community development, this was explained by the Coastal Specialist and Strategic Planner (DCC), who said:

“We have a community development team that works to build and strengthen community networks, particularly in South Dunedin, and those are networks that we share information with, hold public meetings with. Things like community hui”. (Coastal Specialist and Strategic Planner (DCC))

In order to encourage planned adaptation to SLR effects it is important to develop these community development strategies, to build community resilience, provide support and enhance their ability to participate in future planning. Vulnerability and inequity can be reduced through adaptation strategies that work to address socio-economic disparities and have on-going co-benefits such as improving the quality of housing, reducing dampness and strengthening social connectedness (Stephenson & Orchiston, 2018). Additionally, the current research has identified strengths of these “vulnerable” communities, such as local knowledge and strong community connectedness. Any future adaptation responses developed for these areas should draw from, support and build upon these strengths.

The current research has uncovered the desire from community to carry out ground-level adaptation responses. The current policy and wider context of Dunedin City suggests a lack of resources to be able to carry out large-scale transformative adaptation in Long Beach and Aramoana in the near future. In addition, it is unclear what form of adaptation is appropriate for these vulnerable areas. However, through both the literature and key informant interviews it has been emphasised that taking a community-based approach to adaptation in these small coastal settlements would build adaptive capacity, resilience and empower those living with the negative effects of SLR. Any future adaptive response should be tailored to build upon the strengths that already exist within these communities, and ultimately:

*“Empower communities to do what they need to do to empower themselves”.
(Emergency Management Officer (CDEM Otago))*

7.6 Conclusion

Chapter 7 has provided the information to answer Research Question 3: *How can local authorities enable adaptive responses to accelerated sea level rise (SLR)?*

Adaptation planning for SLR in these small coastal communities provides an opportunity to build the capacity of multiple stakeholders, and ultimately the planning system they are embedded within. The findings of the present study found that practitioners working within the adaptation space want more national level involvement in adaptation actions (discussed in Chapter 5). Whereas, community members call for a more grass-roots response to SLR effects, with facilitation from local authorities. Literature suggests, if integrated, the strengths of top-down and bottom-up planning could generate greater adaptive capacity and therefore resilience within the community and planning systems, than either may achieve alone (Butler et al., 2015).

The findings from the key informant interviews suggest that community level stakeholder involvement is limited, and the formal legislated processes by design do not promote enhancement of system characteristics, or power-sharing among stakeholders. These findings call for planning systems to facilitate community characteristics of social capital, self-organisation, system flexibility and local knowledge. These characteristics should be strengthened through facilitating social learning, greater knowledge exchange and ultimately power-sharing between local authorities and communities. Through a resilience lens it becomes clear, that the options for future adaptation need to consider not only the system's ability to respond, but also to take advantage of opportunities that these inevitable changes will bring (Nelson et al., 2007).

8

Conclusions

8.1 Introduction

Sea level rise (SLR) is one of the most significant long-term challenges of the 21st century. For coastal nations such as Aotearoa New Zealand, the impending threat of SLR and the long-term challenges it will bring will significantly impact the entire country (Ministry for the Environment, 2018). Consequently, a challenge for coastal policy and planning over the next decade will be to design and implement a framework that will prevent or lessen the social, environmental, emotional and financial costs to coastal communities threatened by accelerated SLR.

While there are national level responses to climate change effects, there has been a call for greater guidance and support for local government in carrying out responses to SLR. The local

authorities must balance mandated responses to climate change effects and the values and aspirations of the vulnerable communities at-risk. Understanding the underlying foundations of resilience theory, community engagement and sustainable adaptation is of the utmost importance for those implementing adaptive actions in order for them to be able to develop appropriate and effective solutions. While creating tools such as coastal hazard overlay zones within the District Plan, may help deter further development in areas vulnerable to the effects of SLR, it may do little to address conflicts deeply entrenched by social inequities, power imbalances and other forms of injustice (Stephenson & Orchiston, 2018). This is not to diminish the importance of long-term strategic planning. Rather, suggesting alternative approaches to planning for SLR in small coastal communities should be explored.

Before summarising the key findings of this research, it is essential to note that a number of limitations affected the data collection process and therefore the overall results. Time pressures for this research meant a smaller number of community informants than what was initially desired. A larger sample size of community informants and a greater representation of council professionals from both DCC and ORC would have provided a more complete understanding of the community context and experiences in adaptation. Nevertheless, due to the exploratory nature of this study and the case study areas of Aramoana and Long beach not been studied before, the research findings set a solid grounding for future explorations into adaptation responses to SLR in other small communities across New Zealand.

8.2 Key Findings

This thesis set out to explore how local authorities and small coastal communities can successfully and sustainably adapt to accelerating sea level rise (SLR) associated with climate change. In attempt to provide local government greater insight into the role of community in planning for adaptation in coastal Aotearoa-New Zealand.

Chapter Two provided a foundation for the research through exploring the existing literature on theories of sustainable adaptation, resilience and community engagement. Chapter Three discussed the qualitative methodology used for data collection. It also established the research approach built upon the concepts of constructivist epistemology and political ecology. Additionally, the limitations of the current study were discussed. Chapter Four provided a

backdrop to understand coastal adaptation responses to climate change effects (notably SLR) in Aotearoa-New Zealand. This chapter presented the legislative and policy context for dealing with climate change effects at the differing levels of government (central government, regional council, city council and community levels). The information presented in Chapter Four informed Chapter Five and Research Question 1.

Chapter Five addressed **Research Question 1**: *What are the different views on different level adaptive responses to SLR in Aramoana and Long Beach?* The chapter revealed the existence of mixed views among stakeholders on the adaptive responses currently being implemented in what level. There has been a common perception among all stakeholders that the central barrier to implementing effective adaptation is the blurred roles and responsibilities for Regional Council and Territorial Council. To address the barrier of uncertainty in roles and responsibilities, all practitioner informants argued for stronger and clearer national guidance for carrying out adaptation to climate change effects. Although, the author acknowledges other methods for addressing this barrier were uncovered during the research that can be considered, regardless of national-level actions. The four key shared views are presented below.

Firstly, on national-level government responses to climate change effects, was that roles and responsibilities are not clear for local authorities. Therefore, there is uncertainty on *who* should respond to SLR. The findings suggest to address this shared view, the DCC can build upon their existing roles that are viewed positively by community, such as community development in hazard response.

Furthermore, on national-level government responses to climate change effects, was that they do not inform council on *how* to respond to SLR. The findings suggest, having pre-determined options is not viewed positively by community. Local authorities should co-develop the solutions to enable creative options that address local needs and desires.

Another key shared view on local-level government responses to climate change effects was that local government responses shouldn't hinder individuals "right to assume risk" when residing within at-risk areas. The findings suggest that more effective community engagement could better explain the risks associated with coastal development to ease this tension.

Finally, on local-level government responses to climate change effects, due to severity of climate effects in other areas council resources are selectively injected into other communities. The findings suggest to overcome this barrier local authorities should support communities to self-organise and become resilient.

Chapter 6 addressed **Research Question 2:** *What is the role of community engagement in planned adaptation to SLR, and what are the primary barriers to engagement in Long Beach and Aramoana?* Chapter 6 revealed there are generally low levels of satisfaction with legislated community engagement with adaptation actions.

The findings revealed there are numerous barriers to carrying out effective communication between the local authorities and community members. These being:

- Lack of resourcing,
- The nature of the climate change issue,
- Participant burn-out, and
- Lack of two-way conversations.

The study revealed however, there is overall satisfaction with the hazard response aspect of adaptation to environmental change. The emergency management hazard response planning process heavily relies on a community development approach. The findings indicate this form of response is well received by the small coastal communities of Long Beach and Aramoana.

The findings suggest the role of community engagement in adaptation planning must expand to become a tool for:

- Providing information about climate change impacts and responses,
- Allowing a communication channel for community members to share their knowledge and experiences with each other and council,
- Achieving shared community aspirations.

Chapter 7 addressed **Research Question 3:** *How can local authorities enable adaptive responses to accelerated sea level rise (SLR)?* Three defining features were uncovered that influence the potential for responses to SLR in Aramoana and Long beach. These were the wider context of climate change effects experienced within Dunedin City, lack of infrastructure

present, and the small-town make up of these settlements. The aforementioned features create a unique context to develop future adaptation planning to SLR effects. A key barrier to implementing larger scale adaptation actions in these settlements cited by all key informants, was a lack of resourcing. This barrier when considering the three defining factors of the small coastal communities suggest focussing on facilitating system characteristics that build adaptive capacity and resilience would be an appropriate response, including:

- Social capital;
- Self-organisation;
- Flexibility;
- Social memory and Local knowledge.

Two key methods for enhancing these system characteristics were uncovered during the course of this research; facilitating actions that deal with uncertainty, and actions that mobilise the community. Additionally, two primary challenges for planned adaptation in Aramoana and Long Beach were highlighted: Lack of ‘power’, and the perceived relevance of SLR effects. All these factors considered indicate, implementing a community-based adaptation approach that focusses on both adaptation and development while benefiting from local resources and ensuring effective implementation and outcomes for adaptation actions.

Whether successful adaptation to SLR can be carried out is unknown. However, through a resilience lens it becomes clear that the options for future adaptation need to consider not only the system’s ability to respond, but also to take advantage of opportunities presented to community. Appropriate planning, including meaningful engagement, can assist with the conflicts that are grounded in fundamental disparities of power and justice ultimately, enhancing community resilience in the face of an uncertain future.

8.3 Implications for Planning

Aotearoa-New Zealand is already experiencing the effects of sea level rise (SLR). For coastal settlements, SLR and the increased intensity of storm events will result in bigger storm surges, higher mean sea level and erosion (Rouse et al., 2017b).

How to effectively and sustainably adapt to climate change effects (such as SLR) is not an issue unique to Aotearoa-New Zealand, but the coastal setting globally. Key aspects of this question include whose role is it to carry out adaptation, and how should these responsibilities be shared? People, organisations, and institutions in areas vulnerable to SLR need to be able to both respond effectively to immediate hazard effects (i.e. coastal inundation and erosion) and plan for and implement adaptation actions that will be effective in the long-term (Rouse et al., 2017b).

It is important to prepare communities for future change. The first step towards this is effective community engagement (Nelson et al., 2007). Understanding the role of community engagement in the future planning of the small coastal communities of Long Beach and Aramoana allows invaluable local knowledge to be intertwined within the implementation of planning tools. The planning tools (i.e. Regional Policy Statement, District Plan etc.) discussed in this thesis are designed with the aim of reaching optimum outcomes for the environment and community. Therefore, it is essential to understand the community views on these instruments in order to use them to carry out effective adaptation.

A significant overall finding of this thesis is the value of community-based adaptive response for these small coastal settlements. This approach was preferred by the planning practitioners and the community members themselves. The key informants gave valuable indications of how a ground-level approach will enhance system characteristics, and therefore adaptive capacity and resilience. These findings are important to understand ways towards implementing sustainable adaptation to SLR effects.

Significant findings have been obtained through community's views regarding SLR and the responses to its effects. Community informants felt cautious towards the uncertainty of climate change effects, and how they will impact their physical surroundings. They also had general attitudes that local authorities do not follow through with actions to benefit the community. Consequently, highlighting there needs to be better communication between local authorities and communities, as although there is uncertainty in climate change predictions, it is essential responses take into account this uncertainty (Nelson et al., 2007). This reinforces the value of the Dynamic Adaptive Pathways Approach published by the Ministry for the Environment. Overall, there needs to be careful consideration from local government on how they

communicate the risk of SLR and the options moving forward in order to enable community to partake in meaningful engagement with planning for adaptation.

Adapting to climate change effects will require more than prescriptive policy solutions. Decision-makers will need to account for democratic processes and power balances if they wish to foster genuine community resilience to the effects of SLR. This research contributes to further our understanding of the role of community engagement in managing the increasing hazard risks in coastal Aotearoa-New Zealand.

8.4 Future Research

These findings provide a foundation for further examination into perceptions of past, present and future adaptation to sea level rise (SLR) in Aotearoa- New Zealand.

The scope of this study was limited to the short research-period. Therefore, there are opportunities to go into further depth by obtaining a larger number of participants to allow for more reliable and in-depth results regarding community and local authorities views on adaptation and engagement in small coastal communities. Alternatively, the scope of the present study was also limited to SLR effects, there are further research opportunities to explore the views and understandings on adaptation to other climate change effects (i.e. ocean acidification, temperature change, drought, increased extreme weather events).

The scope of the study did not extend outside of the small communities of Aramoana and Long Beach and as such, a similar investigation carried out in larger settlements could produce markedly different standpoint of adaptation to SLR effects. However, the present findings provide valuable preliminary insight into the role of community in adaptation planning for SLR in small coastal communities. The findings are likely to be applicable to other small coastal settlements in Aotearoa-New Zealand, and therefore future exploration should be carried out to further inform local authorities and community on how to facilitate effective community engagement and adaptation planning to SLR.

8.5 Conclusion

Climate change is increasing the likelihood of coastal hazards, although we have time to prepare, we do not have time to hesitate (Stephenson & Orchiston, 2018). This research set out to explore how local authorities and small coastal communities can successfully and sustainably adapt to accelerating sea level rise (SLR) associated with climate change. The study has shown that at present, for the communities of Aramoana and Long Beach to successfully adapt to SLR they must first have the means to participate in effective engagement with local authorities. Additionally, the system characteristics of social capital, self-organisation, flexibility, social memory and local knowledge must be strengthened to enhance their capabilities to understand the issue at hand and overall build their adaptive capacity. Finally, local authorities must facilitate a community-based response in order to mobilise the residents and ultimately empower them to have a say in their future. Successful balance of community and environmental needs will provide a solid platform for sustainable adaptation planning to SLR effects in coastal Aotearoa-New Zealand.

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Appendices

Appendix A

Consent form for participants



PLANNING FOR SEA LEVEL RISE ADAPTATION IN COASTAL DUNEDIN CONSENT FORM - FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I know that:

1. My participation in the project is entirely voluntary;
2. I am free to withdraw from the project before October 1 of 2019 without any disadvantage;
3. Personal identifying information from audio recordings will be destroyed at the completion of the project but any raw data on which the results of the project depend will be retained in secure storage for at least five years;
4. This project involves an open-questioning technique. The general line of questioning focusses on adaptation and community engagement to sea level rise. The precise nature of the questions have not been determined in advance, but will depend on how the interview develops. If the line of questioning develops in such a way that I feel hesitant or uncomfortable, I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.
5. The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand), but every attempt will be made to preserve my anonymity, should I choose to remain anonymous.
6. I, as the participant: a) agree to being named in the research, OR;
b) would rather remain anonymous

I agree to take part in this project.

.....
(Signature of participant)

.....
(Date)

.....
(Printed Name)

.....
Name of person taking consent

This study has been approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph +643 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

Appendix B

Information sheet for participants



PLANNING FOR SEA LEVEL RISE ADAPTATION IN COASTAL DUNEDIN

INFORMATION SHEET - FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you, and we thank you for considering our request.

What is the Aim of the Project?

This project is being undertaken as part of the requirements for the University of Otago Master of Planning programme. This research aims to explore how positive adaptation to sea level rise can be enabled and encouraged, how community engagement can support adaptation, and to explore the different roles of local authorities and community.

What Type of Participants are being sought?

We would like to speak to key stakeholders in the Aramoana, Harwood and Long Beach communities who have insight into living in these communities, or those with knowledge on dealing with risks of sea level rise. This could include Council officials, residents and community group members.

You are being requested to participate, and we also ask whether you can recommend other potential participants. Through this research, we intend to document recommendations for facilitating community engagement with planned adaptation to long term climate change impacts.

Participation in the research is entirely voluntary. The collected information will only be used for academic purposes (e.g., research publications, undergraduate and postgraduate teaching). Participants' anonymity will always be maintained unless otherwise advised by an individual participant.

What will Participants be Asked to Do?

Should you agree to take part in this project, you will be asked to provide your views in an interview at a location and at a time that is convenient to you. The interview may take up to an hour. Since this interview is semi-structured it will be based more on a discussion of

relevant themes. You will be asked to reflect on several broad topics related to adaptation strategies, community engagement and sea level rise.

What Data or Information will be collected and how will it be handled?

Interviews will be audio recorded, and subsequently transcribed for use in our research. Only the supervisor and the student researcher undertaking the research will have access to the identifiable data. Aliases and pseudonyms will be used to protect your identity unless you prefer otherwise. On the Consent Form you will be given options regarding your anonymity. It is absolutely up to you which of these options you prefer.

The results of the thesis may be published and will be available in the University of Otago Library (Dunedin, New Zealand) by maintaining your anonymity. Direct quotations may be used to provide evidence supporting key points made in the report. Every effort will be made to ensure that individual identities are not revealed through these quotations, unless you have chosen to be identified.

The data collected will be securely stored, maintaining standard security protocol. Personal identifying information from audio recordings will be destroyed at the completion of the project but any raw data on which the results of the project depend will be retained in secure storage for at least five years. You have the right to withdraw part or all of the provided information before October 1 of 2019.

Upon your request, the results will be made available to you through email.

Can Participants Change their Mind and Withdraw from the Project?

If you are hesitant or uncomfortable about answering any question, you have the right to decline to answer. At any point of the interview if you decide not to take part in the project you can do so without any disadvantage to yourself of any kind. You have the right to withdraw part or all of the provided information before October 1 of 2019.

What if Participants have any Questions?

If you have any questions about our project, either now or in the future, please feel free to contact:

Brenna Sherson

Phone Number: 021 501 475

Email: shebr675@student.otago.ac.nz

Appendix C

Resident Interview Topic Guide

Resident key informants will be asked questions similar to:

Intro to Interview

- How long have you lived in Aramoana/Long Beach
- How have you been impacted by effects on climate change [such as coastal inundation]?

Engagement

- What kind of interactions have you had with local authorities regarding adaptation and risks due to climate change/sea level rise?
- Were you involved with the process of the 2gp?
- How do you feel about your involvement with the planning process?
- What are your ideal visions for your community? Where would you like to see it in 50- or 100-years' time?
- Are there any community boards in your area looking at climate change risks? What is their role? Have you had any involvement?
- What strengths are there within your community?

General

- What do you think makes communities more able to adapt/respond to long term environmental change?
- What do you think are the key challenges you and your community have in achieving goals related to adaptation and preparedness?

Appendix D

Local Authority Interview Topic Guide

Key informants from the local authority will be asked questions similar to:

- What is the role of different levels of government regarding adaptation to sea level rise?
- What is the [insert organisation] approach to climate adaptation?
- What policies/mechanisms are in place?
- What is the process to create policies like?
- What is the process to implement policies like?
- What does future climate change adaptation in Dunedin look like to you?
- What are the biggest challenges to reaching these goals?

Climate adaptation and community engagement

- What is community engagement in the context of climate change?
- Who does [insert organisation] engage with and how?
- What facilitates effective engagement?
- What is the role of engagement in adaptation?
- What are the uncertainties/ challenges you face?
- Are there specific groups that are more difficult for the council to engage with? How do you work with them?