

Managed Retreat from Coastal Erosion

The Movement of People and their Coastlines

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Abstract

Coastal erosion is a planning issue of great and ever growing significance in New Zealand. Considering the long and short term advantages of mitigating this hazard through managed retreat rather than hard engineering alternatives, the successful implementation of such strategies stand against several barriers. This thesis aimed to define and discuss these barriers, including the cost of relocation, social perceptions towards managed retreat and the loss of land. With a particular focus on the Clifton coastline under the Hawke's Bay Regional Council jurisdiction, this study looked at what actions have been taken by regional authorities to minimise these barriers and how effective these steps have been.

Data was collected through the use of Key Informant interviews with employees of local Hawke's Bay Councils, analysis of coastal processes and land movement with the help of GIS and with the assistance of national and local plans and policies. Comparisons were also made to other situations within New Zealand where coastal erosion has been a planning issue. These case studies were Muriwai Beach, Auckland, where managed retreat has been successful in its implementation, and Urenui Beach, Taranaki, where a hard engineering structure was chosen over retreat from the coast. Through discussion, the outcomes of these comparisons, alongside the information gathered through desktop research and interviews aimed to shed light on possible improvements and changes to Hawke's Bay, and New Zealand's, current strategies for managing the encroaching coastline.

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Chapter One: Introduction

New Zealand, alongside the rest of the world, is experiencing increased amounts of coastal erosion along its shorelines due to the influences of events such as the global rise in sea level, increased occupancy of the coast and other anthropogenic influences (Cooper and Pilkey, 2004; Gamboa *et al*, 2008). Coastal erosion can be defined as the permanent loss of sand from a beach dune system and can be caused by both natural and human based influences (Rijn, 2011). As of 2010 it was estimated that 70% of sandy beaches across the world are experiencing some form of coastal erosion while only 10% are experiencing accretion (Peynador and Mendez-Sanchez, 2010). As coastal erosion occurs and becomes an increasingly prominent hazard for countries it is up to central and local government to plan for ways to manage and mitigate this growing hazard. As the erosion increases it will be important for both central and local government to have long term management goals for the coast which look to maintaining and protecting public access and people's properties while providing for the natural character of the coast (Waikato Regional Council, 2011). Councils and central government will have to ask themselves what it is that needs to be saved, the beach or the buildings? (Daniel, 2001).

The increase in coastal erosion is affecting large numbers of people and the associated infrastructure that is situated near to the coast. Hart and Bryan (2008) define the global coastal environment as the area that extends from the ocean shore to approximately 100km inland (pg 129). They go on to state that the coastal environment around the world was home to an estimated quarter of the world's population in 1990, with human densities in these areas approximately three times the global average. Coastlines worldwide have been shaped over time by the physical and human factors which can lead to erosion and accretion, including sea level change, waves, tides, coastal engineering and land reclamation however the processes of accretion and erosion only become hazards when they begin impacting on humans (Hadley, 2009). This influence of human populations living on the coast cannot be understated, according to the Ministry for the Environment (Ministry for the Environment, 2008) 'coastal erosion becomes a

hazard when human activity or settlement is threatened by a temporary or permanent cutback of the shoreline’.

New Zealand has seen a notable increase in its population living near the coast, in line with the global trend, since the 1940’s. The initial development of New Zealand’s coast was largely unplanned and did not take into account the changing nature of the coastline or the potential impacts of shoreline stability, engineering structures or climate change (Blackett and Hume, 2007). Induced by anthropogenic climate change, erosion worldwide is continuously exacerbated by rising sea levels as well as the legacy of negative effects from previous, mismanaged coastal protection strategies, most notably hard engineering structures (Cooper and Pilkey, 2004; Gamboa *et al*, 2008). This legacy of past coastal management decisions has resulted in the planning for the future of coastlines becoming a difficult and challenging task. Furthermore, the ever growing population living on and near the coast added to the dynamic nature of the New Zealand coastline are causing coastal management to be an increasingly contentious issue within the country (Hart, 2011; Blackett and Hume, 2007). Add to these issues the complexities around the value of properties on the coast and the amount of money that coast based tourism brings to the New Zealand economy and you are faced with a problem that is multi-faceted and challenging to manage (Daniel, 2001).

As increased numbers of homes and properties develop in the path of coastal erosion it is believed that there are two broader management options for dealing with this, to physically intervene to resist the coastal erosion or accept the changes and adapt. The first, to intervene with coastal erosion, involves the construction of structures or the use of soft engineering approached to attempt to halt or slow erosion. The second results in the coast being left to alter naturally with structures and development in the area being abandoned or relocated (Cooper and McKenna, 2008). These two broad options can then be divided into four more specific options to address coastal erosion; No action, Retreat and relocation, soft engineering or hard engineering (Komar, 2010). They are ordered from the most passive, no action, to the most invasive on the coast, hard

engineering. All four options have positive and negative aspects to them and whether they would work in an area is dependent on each location, population and issue.

In the past, hard engineering has been the popular management strategy for coastal erosion but with time it has been seen that, while hard structures appear to solve an erosion problem at a local context, it appears that these structures may then create other erosion problems elsewhere on the coastline or exacerbate existing issues (Gamboa *et al*, 2008). As time passes, and the negative effects of hard engineering felt on coastlines around the world, it is argued that the management of the coast needs to take a more nature centric approach, embracing strategies such as managed retreat or relocation, rather than the anthropogenic centred management approach of 'holding the line' that has been popular in the past (Bardsley and Niven, 2013; Rijn, 2011). While New Zealand has previously relied on hard engineering structures to manage the coast in line with the global preference (Hart, 2011) policies in national legislation such as the New Zealand Coastal Policy Statement 2010 (NZCPS) under the Resource Management Act 1991 (RMA) which promote the consideration by Councils of managed retreat and do nothing approaches, have created an opportunity for coastal managers in New Zealand to shift their frame of mind in regards to coastal management strategies (Bryan *et al*, 2008). As a function of the RMA, local government plans and policies must give effect to, amongst other statements, the NZCPS. As such, Councils, in giving effect to the NZCPS policies, are required to consider with an equal weighting managed retreat and the do nothing approaches alongside hard and soft engineering.

It is with this idea in mind that I have framed my research around how the implementation of managed retreat is occurring in New Zealand. The long term management of the coast does not come with an easy solution and this research does not assume that managed retreat is the ultimate management option for all erosion affecting property owners in New Zealand. The issue of whether managed retreat is an appropriate strategy becomes more pronounced when barriers to the implementation of alternative strategies including the negative perceptions of new management strategies by the community, cost of managed retreat and the loss of property are

considered (Waikato Regional Council, 2011). This report discusses these barriers and issues and investigates past and present implementations of managed retreat while looking at any limits to applying this management strategy to the New Zealand setting.

1.1 Research Objective

To investigate the barriers of implementation that managed retreat faces as a coastal management strategy. This research has a particular focus on the case study of Clifton Camp in Hawke's Bay which is currently dealing with coastal erosion and its subsequent hazards and management issues.

For the purpose of this report, the definition of managed retreat from Daniels (2001) will be used which explains managed retreat as either of two processes. The first is the removal of a structure from the waterfront and moving it elsewhere, either in one piece or sections. The second is abandonment. This requires the demolition of the structure situated on the shoreline. Waikato Regional Council's (2007) definition supports Daniels (2001) by explaining managed retreat as the shifting of assets and activities away from coastal processes, thereby removing the hazard'.

Within this objective, four key research questions have been determined:

- 1) Is managed retreat an appropriate management strategy?
- 2) Has the implementation of managed retreat been provided for within both central and local government legislation?
- 3) What are the barriers to implementing managed retreat from coastal erosion?
- 4) How can these barriers be overcome so that managed retreat can be implemented as a management strategy for coastal erosion?

1.2 Research Approach

In order to answer these research questions a combination of both quantitative and qualitative investigative methods were used. Qualitative research included interviews with key informants. Those spoken to included engineers, consent planners and policy

planners within Hastings District Council and Hawke's Bay Regional Council. The quantitative research included a site visit to Clifton Camp and GIS mapping.

This report is divided into six chapters, beginning with the introductory chapter followed by the context and literature review. The literature section provides information relating to coastal erosion within a global context as well as within New Zealand. Any relevant documentation and statutory frameworks are also included in this section. This section also sets the theoretical background to the investigation, looking at management strategies for coastal erosion and whether managed retreat is an appropriate option. The methods chapter provides details on the qualitative and quantitative approach used to gather and analyse information and data that has been collected during this research investigation. The results and discussion look at the issue and provide the basis of the recommendations as to if, and how barriers to the implementation of managed retreat can be overcome. A concise summary of the key findings is provided in the concluding chapter.

Chapter Two: Literature Review

As global concern over the potential issues resulting from sea level rise and increased extreme weather events arise it is predicted that so too will coastal erosion events. As a result, it is important to look to the coast and consider how it will deal with these increased pressures (French, 2006). Current coastal management strategy is steered towards modifying the coast and its processes rather than how humans interact with the coast (Waikato Regional Council, 2011). Literature indicates that there are three broad generally accepted management options for dealing with the issue of coastal erosion; Hard Protection, Soft Protection and Managed Retreat (French, 2006; McGlashan, 2003; Stewart *et al*, 2011; Hart, 2011; Daniel, 2001). These three management strategies will be outlined below.

The prevalence and impact of coastal erosion around New Zealand, and the world, deserves a management system which is strong enough to stand up to a problem which is evident all over the world and threatening large numbers of properties (Marchand *et al*, 2011).

2.1 Coastal Erosion: The Global Context

Overtime, the shape of coastlines around the world have been influenced by accretion and erosion resulting from natural and anthropogenic processes. Erosion can be caused by two separate processes, the first is that the shorelines ability to resist erosion is reduced, this can be by the loss of sediment to an area or the erection of structures near to the coast. Erosion can also be accelerated to an area when the processes acting upon the coast, such as wave energy, storms or sea level are intensified and the shoreline needs to change in order to reach equilibrium with its surroundings (Ricketts, 1986; Cooper and McKenna, 2008). Main causes of intensified processes or the loss of the coast in dealing with its surroundings can be a mixture of natural and human driven processes. Natural processes affecting coastal erosion include storm events, sea level rise or the fallout from another natural event such as an earthquake (Komar, 2005; Hadley, 2009). As these processes act upon the coast they can result in coastal hazards,

affecting humans and their activities and structures that are located in close proximity to the coast (Turbott and Stewart, 2006).

Humans also play a role in the process of coastal erosion. Mining sand and gravel from rivers removes sediment that would otherwise make its way to the coast, removing this sediment from the sediment budget and changing the dynamic of the beach (Komar, 2005). Building structures on the coasts, such as jetties, also results in a change to the longshore drift of sand as the structures create a barrier, impeding this process. This changes the allocation of sediment further along the beach and does not allow the beach to be nourished appropriately and can lead to erosion along from these structures (Cooper and McKenna, 2008; Komar, 2005). Modification of coastal margins such as dune removal, vegetation removal from the dunes or a change in waterways, wharfs and marinas such as dredging can all alter the natural coastal sediment process and cause coastal erosion (Ministry for the Environment, 2008).

Ultimately, coastal erosion is only perceived as a hazard when humans begin occupying the coastal space and placing structures on it. This defines where the coastline ought to be and does not account for the ever changing ocean (Ricketts, 1986). If humans were not present in an area and degradation of the coastline occurred, it would not be considered a hazard as humans would not be affected (Cooper and McKenna, 2008). It is these human influences which have shifted coastal erosion from a natural occurrence taking place over millennia into a problem of growing significance (EuroSION, 2004).

2.2 Coastal Erosion in New Zealand

Situated in the southern hemisphere, New Zealand spans just over 13 degrees of latitude in the south west Pacific (Bryan *et al*, 2008). With a complex geological setting New Zealand has a wide range of landform types which form a dynamic 11,000 km of coastline, the seventh longest in the world (Blackett *et al*, 2007; Bryan *et al*, 2008). It is reported that throughout the twentieth century New Zealand's global mean sea level has risen around 1.6mm per year. This corresponds with the global approximated average and is set to further increase along this trend in the future (Hart, 2011).

Since the 1940's, New Zealand, along with the rest of the world, has seen large mobilisation of communities towards the coast, resulting in an increased number of New Zealanders who are now directly affected by ocean processes (Blackett *et al*, 2007). This global trend of migration towards the coast has resulted in 10% of the world's population living less than 10 metres above sea level in 2000 (Abel *et al*, 2011). The consequence of this migration to the coast has led to a large amount of homes and infrastructure in close proximity to the coast being threatened by erosion and other coastal processes. This threat is heightened due to the initial migration and development of the coast in New Zealand not taking into account the natural movement of the oceans shoreline or its corresponding dangers. As a result, New Zealand's coastal developments are generally too close to the sea and are therefore exposed to increased levels of erosion and inundation (Blackett *et al*, 2007).

2.2.1 Past Management

Typically in the past, New Zealand has relied upon hard engineering structures to manage coastal erosion. This management of the coast, alongside New Zealand's affinity towards living by the sea has strongly influenced and affected the way that decisions towards managing coastal erosion can be made today and has left a legacy of holding the line of the coast (Hart, 2011). Now, when considering management options for the coastline, planners, engineers and scientists are faced with the challenge of creating a strategy that can accommodate both the shifting coast and perceptions of humans as to what the coast should be doing. This culmination of these factors results in decisions needing to be made which consider the all aspects of the coastline including environmental factors, recreational factors, aesthetic factors and safety factors (Hadley, 2009).

2.2.2 Changing Nature

As explained previously, the population shifting towards the coast has resulted in increased amounts of people having to deal with hazards such as coastal erosion. Now, the question is being asked as to how New Zealand will deal with the issue.

Within New Zealand, Councils are responsible for managing natural hazards under the Resource Management Act (1991). The hazard of coastal erosion is occurring in a large number of New Zealand's regions and as a result, hazard management is needing to be planned, with each region implementing their own specific form of monitoring and management depending on their specific circumstances (Turbott and Stewart, 2006). While current local government and central government policies (RMA, 1991; NZCPS, 2010) appear to be moving towards an emphasis of considering managed retreat, it is possible that the implementation of this strategy may be constrained by historic decision making and past land use which favours the use of hard engineering (Waikato Regional Council, 2011).

2.3 What is coastal erosion?

Before the barriers to managed retreat from coastal erosion can be fully understood, it is important to first understand the issue of coastal erosion and the processes which are causing it to occur. The Natural Environmental Council (2012) defines coastal erosion as the removal of material from the coast by wave action, tidal currents and/or the activities of man, typically causing the landward retreat of the coastline. It is believed that coastal erosion has occurred worldwide over most of the ten millennia of the Holocene period and it is this erosion and subsequent accretion of the coasts that have shaped them into the coastlines we know today (Cooper and McKenna, 2008). However, the process of erosion has only started to take significance when man appeared and the construction of coastal defences by humans can be traced back to when they first settled on the coast (Charlier and De Meyer, 1989).

Over the past 100 years it is estimated that approximately 70% of the world's sandy coastlines have been retreating, while only 10% have been accreting (Gamboa *et al*, 2007; Peynador and Mendez-Sanchez, 2010). It is predicted that, while the coast has always been subject to coastal erosion, climate change alongside increased numbers of people living on the coast will accelerate these changes and make them more pronounced. Due to this, it is expected that in the next 50 years, low lying coastal areas will be highly impacted and altered by coastal processes (Hadley, 2009).

Erosion can be caused by two separate processes, the first is that the shorelines ability to resist erosion is reduced; this can be by the loss of sediment to an area or the erection of structures near to the coast. Erosion can also be accelerated to an area when the processes acting upon the coast, such as wave energy, storms or sea level are intensified and the shoreline needs to change in order to reach equilibrium with its surroundings (Ricketts, 1986; Cooper and McKenna, 2008). Main causes of intensified processes or the loss of the coast in dealing with its surroundings can be a mixture of natural and human driven processes. Natural processes affecting coastal erosion include storm events, sea level rise or the fallout from another natural event such as an earthquake (Komar, 2005).

Humans also play a role in the process of coastal erosion. Mining sand and gravel from rivers removes sediment that would otherwise make its way to the coast, removing this sediment from the sediment budget and changing the dynamic of the beach (Komar, 2010). Building structures on the coasts, such as jetties, also a result in the loss of the long shore drift of sand as the structures creates a barrier. This changes the allocation of sediment further along the beach and does not allow the beach to be nourished appropriately and can lead to erosion along from these structures (Cooper and McKenna, 2008; Komar, 2010). Modification of coastal margins such as dune removal, vegetation removal from the dunes or a change in waterways, wharfs and marinas such as dredging can all alter the natural coastal sediment process and cause coastal erosion (Ministry for the Environment, 2008).

Ultimately, coastal erosion is only perceived as a hazard when humans begin occupying the coastal space and placing structures on it. This defines where the coastline ought to be and does not account for the ever changing ocean (Ricketts, 1986). If humans were not present in an area and degradation of the coastline occurred, it would not be considered a hazard as humans would not be affected (Cooper and McKenna, 2008).

2.3.1 Sea level Rise

One factor that is thought to be aggravating levels of coastal erosion is predicted sea level rise from climate change and its influence is only set to increase in the future

(French, 2006). The sea level rise that has begun to be seen around the globe, and whose effects are predicted to increase in the future, is caused by the melting of polar ice caps and the expansion of the surface layer of the ocean as it warms. These two factors cause the level of the ocean to rise and begin moving in a seaward motion (Daniel, 2001). The added factor of sea level rise in coastal management further complicates any strategies that might be adopted as it adds a variety of unknowns that will need to be managed. It is not known exactly how much the sea will rise or how this will affect the coastline and how it responds to processes acting upon it. Some variables can be planned for and foreseen but it would be impossible to predict exactly how coastlines will react to these pressures (Gamboa *et al*, 2008). Hart (2011) echoes this thought and states that the questions coastal managers will have to ask themselves when considering further methods include how the coast will respond to large amounts of sea level rise and what its impacts will be.

As the pressure of sea level rise and coastal erosion impact on the coastlines it is up to coastal engineers to look to ways to deal with erosion issues to allow for the medium and long term integrity of the sea defences (French, 2006). There is no point in adopting a management strategy which will not be able to cope with the increase in pressure from the ocean that is predicted.

2.3.2 Human Influence

Coastal erosion becomes a hazard when it interferes with human activities and structures or adversely affects human's health, wellbeing, economy and safety (Turbott and Stewart, 2006). According to the Ministry for the Environment (2008) 'coastal erosion becomes a hazard where human activity or settlement is threatened by a temporary or permanent cutback of the shoreline'. Numbers of human population living on the coast are shown in Figure 1 which depicts population distribution across the world. There is a notable increased density on the coastline which illustrates human preference to live near the coast. However, while living on the coast offers an aesthetic and pleasing location to live, immovable structures so close to the coastline begin put pressure on the natural systems and processes of the coast (Bardsley and Niven, 2013). As coastal

processes change the shape of the shoreline, humans seek to stabilise this so that the structures they have places so close to the ocean are ensured of their safety. This is achieved by building walls and structures to provide a barrier (Daniel, 2001).

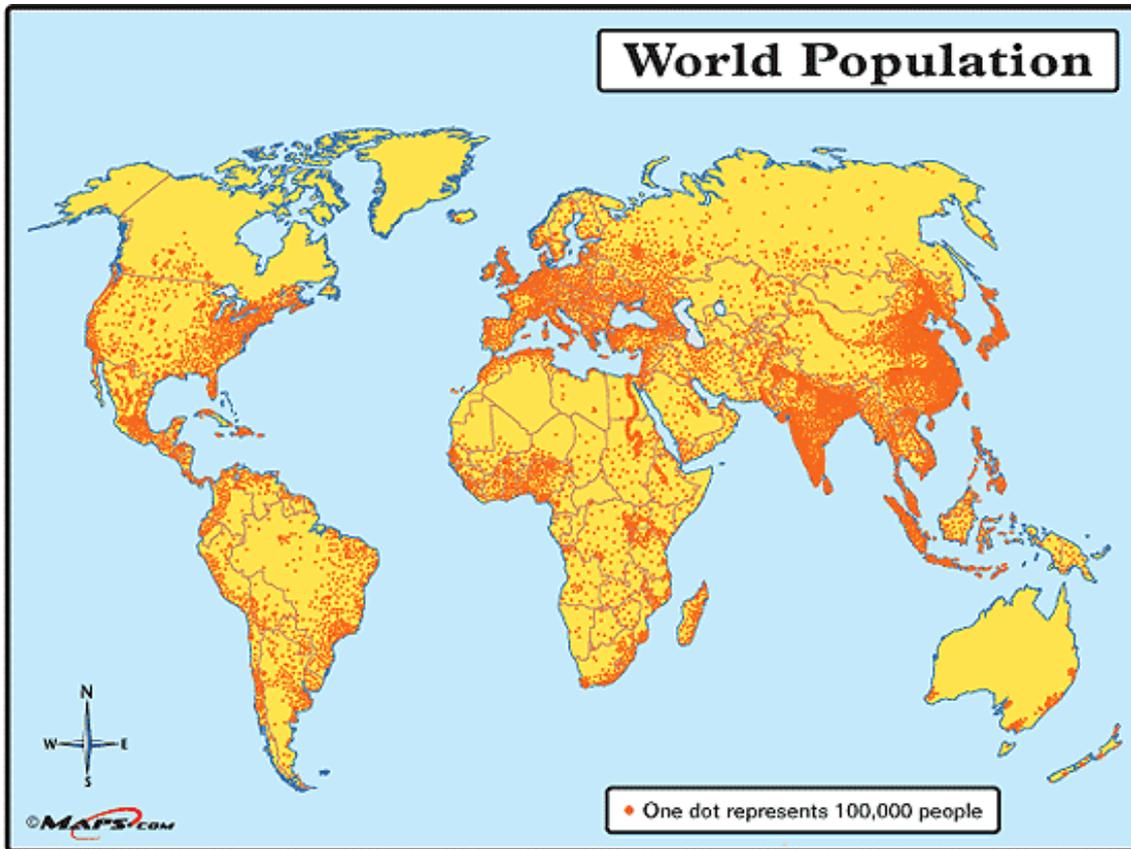


Figure 1: Population distribution across the world (Source: <http://moodle2.sd23.bc.ca/mod/book/view.php?id=23497&chapterid=10182>, 2013)

2.4 Management Strategies

This issue of coastal erosion is affecting, or will soon affect a large proportion of the world's population and considerable planning is needed to decide on which management strategy is most appropriate for each particular situation (Daniel, 2001). Both hard and soft engineering are ideologies which look towards strategies that focus on managing the land and the pressures that are acting upon it (Waikato Regional Council, 2011). This is an anthropogenic view of coastal management with the focus on how to shield development and communities from the damage that coastal processes can cause (Bardsley and Niven, 2013). In the past, hard engineering solutions have dominated the management of coastal erosion, resulting in the issue looking as though it

has been solved in a local context while tending to make the problem worse elsewhere (Gamboa *et al*, 2008). The alternative would be to take a nature centric approach and look at strategies that aim to manage humans and their behaviour (Hart, 2011). Managed retreat offers an option for a more human based change and would allow coastal processes to behave naturally (Bardsley and Niven, 2013).

2.4.1 Hard Engineering

Daniel (2001) defines hard engineering as a form of coastal management involving structures along the coastline which aim to block or dissipate wave energy or trap sand to widen the beach. This form of coastal protection works towards protecting the land and the structures and development behind it and has strong support from local communities who wish to see their cities, towns and villages protected from an encroaching tide (Blackett and Hume, 2007; Turbott and Stewart, 2006). Examples of this type of coastal protection includes the erection of seawalls and groyne structures, both of which provide a barrier between the ocean and the coastline (Alexander *et al*, 2012). Descriptions of different kinds of hard engineering structures are shown in Table 1.

Table 1: Description of defence measures (EuroSION, 2004)

Seawall	A seawall is designed mainly to resist wave action along high value coastal property and create a physical barrier between the sea and land. These can either be gravity or pile supported structure and are generally made from concrete or stone. The face of seawalls can be stepped, vertical or recurved.
Revetment	A revetment is a line or erosion resistant material like stone, geotextiles or concrete. It is built to protect a scarp, embankment or other shoreline feature against erosion.
Groyne	A groyne is a narrow structure commonly made of rubble or sheet pile. Built perpendicular to the shore its purpose is to widen or build a beach by trapping longshore drift. It can also stabilise a beach which is exposed to high energy storms. Essentially groynes act as a barrier to longshore transport and instead encourage the sand to stay in one particular area.
Detached breakwater	These are generally shore parallel structures that reduce the amount of wave energy reaching a protected stretch of shoreline. When used for beach stabilisation these breakwaters reduce wave energy and reduce the sediment carrying capacity of the waves. Breakwaters can be designed to prevent the erosion of an existing beach or beach fill, or to encourage natural sediment accumulation to form a new beach.

Hard engineering type coastal defences such as seawalls have been built since Roman times to help protect humans and their settlements from the tide (Coombes *et al*, 2007). While hard engineering options have been popular in the past, Turbott and Stewart (2006) explain that negative effects of these methods are becoming increasingly evident. Issues with hard engineering such as rising costs of protection structures, sustainability issues and adverse effects stemming from these engineered options are discussed by a number of academic articles including those by (Coombes *et al*, 2007; Turbott and

Stewart, 2006; Daniel, 2001). Turbott and Stewart (2006) discuss how, while hard engineering structures may protect the land and the assets that are located behind them, these methods do not allow the coastal processes to function naturally and can minimise coastal values such as its recreational opportunities, pleasing aesthetic and natural character. Coombes *et al* (2007) continues with this though explaining how the location of defence structures on the coast has led to a loss of intertidal habitat and the protection that this habitat naturally provides. The increasing cost of coastal protection structures is also proving to be an issue and the on-going costs and uncertainty of these structures longevity make them a cautious investment (Waikato Regional Council, 2011). Alongside these increasing costs will be the need for more frequent upgrades and maintenance as the tide imparts more pressure on the coastline as sea level rises and storm surge events increase (French, 1999). The majority of literature read during this study agrees that these negatives are leading to an increase in other, more sustainable options being sought for coastal management in the future.

2.4.2 Soft Engineering

Soft engineering is the second form of coastal management discussed throughout literature. This is a less harsh approach to coastal management but still has the aim of protecting the existing coastline from any coastal forces. Komar (2011) describes soft engineering for coastal management as processes such as beach nourishment, dune revegetation and dune restabilisation. Different types of soft engineering are explained in Table 2.

The costs to implement these management options can be high; however there are little ecological negatives to the beach resulting from this option and the community generally support it. It is dependent on the beach as to how long these options last. These options tend to keep a higher degree of natural character for the beach.

Table 2: Description of soft engineering measures (Eurosion, 2004)

<p>Beach and Dune nourishment</p>	<p>Beaches and dunes form a natural system of shore protection for coastal lowlands and associated development. Nourishing the beach offers an effective wave energy dissipater and the dunes as a flexible last line of defence.</p>
<p>Submerged nourishment</p>	<p>This can be viewed as an extension of beach and dune nourishment. This process involves the stockpiling of suitable beach material at the updrift end and allowing longshore processes to redistribute the material along the remaining beach. This can be used to recreate a beach but to also create a sand buffer which can serve to lower wave energy</p>
<p>Revegetation</p>	<p>This is technique uses natural sources to stabilise cliffs, dunes or slopes and can involve marram grass planting, foredune maintenance or forest management</p>
<p>Cliff stabilisation</p>	<p>This can involve several techniques including:</p> <ul style="list-style-type: none"> - Grading, reducing the angle of the cliff slope and/or filling the cliff - Drainage, reduce pore water pressure - Vegetation, increase the strength of the surfaced layer

Alexander *et al* (2012) explains this form of coastal management as an attempt to reduce the sensitivity of an area to coastal processes in a more environmentally friendly way. While considered more environmentally friendly and sustainable than the hard engineering option, it is unknown how long soft engineering options will last for and strategies such as beach nourishment require periodic maintenance and upkeep to ensure their effectiveness (Brown *et al*, 2006). Komar (2011) speaks of the difficulty of sourcing sand for the soft engineering method of beach nourishment. While much sand is sourced by the dredging of the continental shelf or harbours, it is also common for sand to be taken from nearby beaches. This later method has the possibility of then creating a sediment budget issue at the beach where sand for nourishment was taken

from, possibly just shifting the problem from one coastal location to another. EuroSION (2004) introduces the idea that, while seemingly effective for medium to long term perspectives, beach nourishment is not as effective as a more short term strategy. The impact of beach nourishment slows down coastline retreat but it does not stop it, making it ineffective as a more urgent management strategy. Often soft protection is used in correlation with hard structures to more fully deal with erosion issues.

2.5 Managed Retreat

The third management option is managed retreat. This is explained by Komar (2011) as the relocation or removal of homes and other infrastructure inland, out of the reach of coastal erosion. Currently this strategy is used if an area is in immediate danger. This option is often used in correlation with strategies such as set back lines or zones which allow the use of coastal land until it is no longer safe, in which instance assets and communities are withdrawn from the coast in a pre-determined manner (Bardsley and Niven, 2013; Alexander *et al*, 2012). Managed Retreat can be strategic, where the land owner acts proactively and moves their assets back from the coastline before it is threatened. Another form is where the infrastructure is demolished, sometimes with the intention of building elsewhere. In extreme cases, abandonment can also be used and is most common when the value of the infrastructure is less than the cost of relocating or protecting it (Daniel, 2001).

Managed retreat is seen as a longer term cost effective option compared to hard or soft engineering, both of which require regular upkeep and maintenance (Hardley, 2009). However, when large cities or areas with important assets of infrastructure, managed retreat may not be the most cost effective option (McGlashan, 2003).

2.5.1 Why managed retreat?

As the threat of coastal erosion increases, it appears that a shift in literature towards favouring managed retreat over hard and soft engineering is occurring. An overwhelming amount of literature is looking at managed retreat and instances in which it has been implemented. It should be acknowledged that it is not thought that

managed retreat is not the most appropriate method for all situations. McGlashan (2003) notes that managed retreat is unfeasible in many situations. When the coast is threatening a densely developed area, retreat would be impractical as the infrastructure is too valuable to lose or relocate. In a situation like this, holding the line with hard or soft engineering would be more cost effective. Despite this, managed retreat as a coastal protection strategy appears to be quickly growing in popularity. So what has driven this shift?

A shift towards a managed retreat method would mean a shift towards a more nature centric strategy with the thought of changing human behaviour, rather than altering the natural environment (Bardsley and Niven, 2013). A managed retreat approach would see humans working alongside nature rather than against it, resulting in a more sustainable and environmentally friendly outcome, French (2006) stresses that working with coastal processes rather than against them will result in a more effective and sustainable coastal management regime. Historic use of hard engineering rather than managing human behaviour has largely led to erosion problems being exacerbated over time rather than improved (Blackett *et al*, 2007). Alongside this, managed retreat also allows the coastline to remain relatively natural in comparison to harder engineering structures. Retreat rather than structures means that coastal processes can occur naturally, resulting in benefits such as coastal habitats and natural protection from flooding and erosion (Coombes *et al*, 2007).

Alongside the environmental benefits, literature also touches on economic benefits for the implementation of managed retreat. Coombes *et al* (2007) believes that, over a long time period, managed retreat is more economically efficient than hard or soft engineering methods. Articles by McGlashan (2003) and Turbott and Stewart (2006) both agree that managed retreat appears to be a more cost effective option for coastal management and that hard engineering especially is becoming unfeasible in terms of cost.

While it appears that managed retreat is gaining popularity in the academic world, there are still many barriers that it has to face before it becomes common place, both globally and in New Zealand (Turbott and Stewart, 2006; French, 2006). Coastal management has so long relied on hard and soft engineering practices that it will take a shift in perception, and some sacrifices by coastal landowners, before managed retreat is accepted as a common policy for managing the coast.

2.5.2 Barriers to managed retreat

Analysis of literature resulted in three main barriers to the implementation of managed retreat becoming evident. These were community perception of managed retreat, the cost of relocation and the loss of land to coastal processes. These three barriers arose in much of the literature and appeared to effect whether managed retreat was viewed as a viable option or not.

Community Perception to Managed Retreat

One barrier to the implementation on managed retreat that continued to occur throughout the literature was the mainly negative social perception on communities towards it. While there appeared to be positive feelings towards managed retreat from the wider community, those that would be directly affected by any form of retreat were not in favour of it (Turbott and Stewart, 2006).

Research by Turbott and Stewart (2006) discovered that the perception of managed retreat was such that the majority of landowners affected by coastal erosion would not retreat on their own free will unless forced off their properties by the processes affecting the coast. In comparison, the wider community were more in support of it as they were concerned about access to and the quality of beaches, something which they believed that managed retreat could provide.

A factor to this lack of support by the local community could be due to the large amount unknown about managed retreat, while hard engineering structures have been the norm

in the past and offer some familiarity to land owners (Alexander *et al*, 2012). Literature from Alexander *et al* (2012) and Blackett *et al* (2007) states that this social perception to managed retreat could be improved if local authorities make an effort to familiarise the community with its processes and ensure that they are kept involved and consulted with during the formation of any management strategies for the coast. It is believed that this greater understanding and involvement with the processes would help create a framework for managed retreat that both the community and local authorities would be happy and invested in (Hart, 2011). Blackett *et al* (2007) particularly believed that the involvement with communities into implementing managed retreat can be successful when the following processes are informed: the local authorities create a relationship with the community, local authorities facilitate learning and involvement, both perceived and actual risks are addressed rather than just actual risks, scientific understanding is delivered to the community in a way that they can understand it and records of all consultation time are kept to allow new comers to the process to refer back to.

Cost of Relocation

The actual cost of relocation is another perceived barrier to managed retreat which is highlighted throughout the literature. This economic cost has been pinpointed as a main reason that retreat is generally a last option for combating coastal erosion (Bardsley and Niven, 2013).

While managed retreat does appear costly initially, the cost of removal or relocation is a one-time expense while the upkeep and maintenance of soft and hard engineering is an on-going expenditure which would need to be increased as the processes acting upon the coast build (Daniel, 2001).

There are also different forms of managed retreat that can be undertaken, which will offer varying costs. The most cost effective form of managed retreat is when the structure on the property being threatened by the coastal processes can simply be

relocated elsewhere on the property. When there is not a safe location available on the property, the process becomes more costly as a new site will need to be purchased and the house relocated (Turbott and Stewart, 2006).

The cost of managed retreat is shared amongst both those directly affected by it as well as by the wider community. Abel *et al* (2011) believe that this cost instead needs to be covered by those directly benefitting from the retreat and that these costs are not passed to the wider community or to future generations. In comparison, Alexander *et al* (2012) believes that the cost should be spread to the wider community and does not believe that it is fair for individual property owners to have to cover costs when retreat will offer benefits to the entire community. This creates the issue of how these retreat strategies are going to be paid for.

Loss of Property

The third barrier to the implementation of managed retreat is the downfall of allowing valuable land to effectively be lost to the ocean (Daniel, 2001). Turbott and Stewart (2006) view this loss of land as a cost to society as a whole, especially due to this sea front real estate being so sought after. This loss of land is one aspect which makes property owners view managed retreat in such a negative way. As they retreat, they incur a loss of investment in their land as it is washed away into the ocean (Alexander *et al*, 2001). Comparatively, the wider community see this as a positive as their access to coastal land is protected and their public space is not lost (Turbott and Stewart, 2006).

2.6 Document Analysis

The key statutory documents which set out the roles and responsibilities for the management of coastal hazards are the Local Government Act (2002), the Resource Management Act (1991), the New Zealand Coastal Policy Statement (2010) and the Civil Defence Emergency Management Act (2002). These statutes offer guidelines and frameworks on how coastal hazards are to be managed and give responsibility to who is responsible for managing them (Hart, 2011).

2.6.1 Resource Management Act 1991 (RMA)

The RMA 1991 sets out the functions and obligations for local government. Included in these are the establishment, implementation, and review of objectives, policies, and methods outlined in order to achieve integrated management of the effects of the use, development, or protection of land and associated natural and physical resources of the New Zealand. Under the RMA 1991, a plan (regional or local) is the main tool for achieving these duties with a more region specific aim.

Section 6 of the RMA focuses on achieving the protection of the natural character of the coastal environment. Under section 6 of the RMA, the primary responsibility for natural hazards defaults to Regional Councils unless the Regional Policy Statement states otherwise. Therefore, unless it is expressly outlined in the Regional Policy Statement, the protection of the coast, and the management of coastal erosion falls upon an areas Regional Council.

2.6.2 New Zealand Coastal Policy Statement 2010 (NZCPS)

The NZCPS and guidelines published by the MFE, highlight that the priority should firstly be on avoidance of coastal hazards, including retreat, then on the use of soft engineering options, then finally the use of hard engineering options only where all other options are inappropriate.

Policy 3.4.6 applies to existing development in areas that have been identified as at risk from coastal hazards. Within this policy it is expressly required to consider abandonment or retreat as an option alongside soft and hard engineering strategies. Ultimately, the requirement is to choose the best practicable option for each scenario.

2.6.3 Local Government Act 2002 (LGA)

The LGA 2002 provides purpose, powers, duties and accountability to the local governments. This gives to local authorities a broad role in meeting the current and future needs of their communities for good-quality local infrastructure, local public

services, and performance of regulatory functions. It sets the duty of local authority to have a long-term plan and an annual plan.

Section 77 of the LGA (2002) consents local authority decision making. This section requires that authorities investigate and consider alternative options as part of the decision making of a substantive issue. In regards to coastal erosion, this means that consideration should be given not only to holding the line of the shore but also to options such as retreat or relocation.

2.6.4 Regional Coastal Environmental Plan 2006 (RCEP)

With the guidance of the above statutes, the Hawke's Bay Regional Council have developed and put into force the Hawke's Bay RCEP. This guides Hawke's Bays in how they deal with coastal hazards such as erosion and offers policies, objectives and rules for the region to adhere to.

Section 15 of this Plan aims to avoid the risk that coastal hazards pose by avoiding new and further inappropriate development in areas defined as being at risk from coastal erosion or inundation e.g. Coastal Hazard Zones 1, 2 or 3.

Chapter Three: Methodology

This chapter outlines and justifies the selected research approach, the methods that have been employed and the data analysis techniques that were used to answer the research questions. First the research approach is described. Secondly the data analysis methods are outlined. This chapter concludes with reflections on the limitations of the research approach.

3.1 Qualitative Research

Factors which can only be described in words form the basis of qualitative research. Qualitative research allows more in depth material to be uncovered compared to that of quantitative methods (Flick, 2009) and gives an insight to the research problem above and beyond what is available through numbers (Sarantakos, 1993). However, qualitative research is also highly dependent on opinion, personal perspective and how the interviewee interprets the question. Due to this, the validity of the research can always be questioned (Walliman, 2011). The research outcomes are also dependant on the researcher's interpretation of the answer (Walliman, 2011).

3.2 Quantitative Research

Quantitative research uncovers and makes use of empirical data. It is largely used to identify patterns and trends within sample groups which can then be applied to the wider population (England, 2006). Quantitative research and its resulting data allows researchers to draw conclusions on what has been studied and create future scenarios by working out their probability (Davies, 2007). Due to this it is considered to be less influenced by personal opinion compared to that of qualitative research (Rubin and Babbie, 2009). However Rubin and Babbie (2009) argue that quantitative data does not provide the deeper meaning or insight that qualitative research makes available.

3.3 Data Collection

The specific methods employed in this project included a combination of a literature review, semi-structured interviews, site analyses and Geographic Information Systems (GIS) mapping.

The research involved two stages of data collection. Firstly, the secondary data collection stage took place which involved the research into, and analysis of, literature relating to the research topic. Sources of available literature included journal articles, council documents, academic books, online resources and New Zealand case studies. Secondly, primary research was undertaken in Clifton, Hawke's Bay which involved key informant interviews, GIS mapping and site analysis. The fieldwork was undertaken in Hawke's Bay during the months of August and September. The mix of methods used included:

- A. Semi-structured interviews with practitioners in Hawke's Bay.
- B. Analysis of council planning documents including those from Hawke's Bay Regional council, Hastings District Council and Central Government.
- C. Case Studies of practice from three councils who have experienced coastal erosion
- D. A site visit to Clifton Camp to experience first-hand the erosion that is occurring.

Practitioners were recruited across the main functional groups in council including strategic planning, coastal engineers, hazards management and consents planning. They came across different levels in the organisations including senior managers and general staff.

3.3.1 Secondary Research

A literature review was carried out to establish a theoretical framework for the research topic and place the research into context. This highlighted areas where further study was required and connected the research to the current academic scholarship allowing key themes to be uncovered for the research project. After examining the literature and reducing the research scope, the final literature review was compiled.

3.3.2. Primary Research

Key Informants Interview Ethical Considerations

Prior to the commencement of field research, ethical approval was obtained from the Otago University's Human Ethics Committee through the submission of an Ethics B Approval form. Within this document were research details and requirements as well as information sheets and participation consent forms that were to be made available to those interviewed for this research study. Before research was begun, the research topic and requirements were fully explained to the interviewee. All respondents were then given an information sheet and consent form (see Appendix c and D) further explaining the aim of the research project and their rights as participants. This consent form was to be signed before the interview began to ensure that participants were comfortable with the interview and willing to participate.

Participants were informed that they could withdraw from the project at any stage and that, if they desired, their identity would be kept anonymous. It was ensured that Otago University ethical guidelines were fulfilled during the entirety of the data gathering stage and the data collected was securely stored in a way that only those involved in the undertaking or supervising of the research could gain access to it. Davidson & Tolich (2003) argue that there are five key philosophies on which the code of ethics is based on, and these were the foundation when designing and undertaking this research. These included: do no harm, voluntary involvement, maintain the anonymity of participants, avoid deception and examine and report honestly (Davidson & Tolich, 2003).

To achieve the aim and objectives of the research, the researcher carried out a series of semi-structured interviews. Participants were recruited based on their knowledge and professional opinions in relation to coastal management, specifically within the Hawke's Bay Region. Contacts were gained through the Hawke's Bay Regional Council and were initially approached to gauge their interest in participating as well as gaining how relevant their knowledge would be to the project. Within this initial meeting they were given a brief description of the projects purpose and aims as well as questions the

research was attempting to answer. Finally, if the contact was deemed suitable, a suitable time and venue for the interview was arranged. They were told their contribution would include a 45 minute semi-structured interview in person the researcher.

The interviews ranged from 10 to 30 minutes in duration. The open-questioning technique meant a question framework was prepared in advance and the questions were adjusted in relation to how the interview progressed. The question framework has been attached in Appendix 3. All interviews started with questions from the framework, which established the knowledge of the participant. Further questions drew more specifically on the position their specific interest relevant to the project. This allowed further questions to be asked if a topic of specific relevance and expertise arose. The qualitative nature of this study enabled the researcher to gain a comprehensive understanding of research issues and allowed flexibility within the research process. Semi-structured interviews were used to encourage participants to express their views, knowledge and experiences in their own words.

With the respondent's permission, interviews were recorded using a dictaphone and later transcribed. The qualitative comments from the interviews and vignettes were summarized in a database. The contact details of each participant were recorded to allow the research team to make follow-up contact if necessary.

3.4 Data Analysis

3.4.1 Key Informant Interviews

The analysis of key informant interviews followed the procedure of Davidson and Tolich (2003); data collection; data reduction; data organization. The first phase of the data analysis was the collection of the data into written form by transcribing the interviews. Following this the data was further analysed by coding each interview into trends and themes that appear. Once coded, the information was organised according to the research question that it related to, making further interpretation simple. Key patterns

and trends across the interviews were identified and were used to formulate the final conclusions and recommendations.

3.4.2 GIS

Maps were produced in order to show where Clifton Camp was situated in contrast to the coastal erosion set back lines that Hawkes Bay Regional Council engineered. These demonstrate the proximity of the Camp to the coast and shows where it is located within these set back lines. A map was also produced which gave a cross section of the erosion that has occurred on the road going into Clifton after illegal protection material was removed. The Hawke's Bay Regional Council provided access to ArcMap as well as their data relating to set back lines, coastal hazard areas and other relevant GIS layers.

3.5 Case Study Approach

Yin (2003, p.13) defined a case study as an inquiry that "investigates a contemporary phenomenon within its real-life context". In this project, the case study approach allowed the research team to focus on one particular area, Clifton Camp, Hawke's Bay, to analyse any barriers that an area currently threatened by coastal erosion may face in implementing managed retreat. Alongside this, the use of case studies which have already gone through the process of deciding which strategy to implement against coastal erosion allows comparisons to be drawn and lessons to be learnt. The use of case studies allows the researcher to gain further information and examine similarities and differences within contrasting areas which could inform further enhancement to current practices.

The sites used as comparison case studies were

- A. Urenui Beach, Takanaki
- B. Muriwai Beach, Auckland

All three case studies are located within New Zealand and have experienced or are experiencing some form of coastal erosion which threatened, or did threaten homes and

other infrastructure in their respective areas. Each case study offers a different way of dealing with coastal erosion and allows comparisons to be drawn as to what may be appropriate.

3.6 Reflections and Summary

This chapter has discussed the research methodology which was employed in the research project. Secondary research was undertaken through an extensive literature review while primary research involved the use of quantitative tools such as GIS mapping, and qualitative tools such as key informant interviews. The use of both qualitative and quantitative research methods was used in an attempt to overcome any limitations that either method may produce. Finally, how the data was then analysed was described and any limitations of the project that were uncovered were discussed with views on how these could be avoided if further study were to be undertaken.

Key informants were chosen due to their professional expertise; however, if further study was to be conducted it would be beneficial to also conduct interviews or surveys with the Clifton Camp community and the wider community. Due to only Council experts being spoken to, a relatively refined opinion was gathered, most notably, the lack of community perspective meant much of the report is from the opinion of the local authorities.

Chapter Four: Results

This chapter presents the results gathered through four key informant interviews, desktop research interpreting and analysing Council reports and plans and using GIS mapping to depict coastal hazard zones. Discussion of the results outlined in this chapter aims to provide a holistic view of the impacts of coastal erosion, the validity of retreat as a management strategy and the barriers to the implementation of this method in order to answer the research questions presented in Chapter One.

4.1 Case Study: Clifton Camp

This project focuses on the case study of Clifton Camp in Hawkes Bay and the erosion occurring at this site. The location of Clifton can be seen in Figure 2. Much of this information was sourced from reviews of council reports and plans. The Hasting District Plan (2013/2014) states that the future of Clifton Camp and its coastline is uncertain as it is particularly vulnerable to coastal erosion and has been in this state for some time. Access to the Camp Ground and the Clifton Boat Ramp which adjoins the campground is under serious threat due to this erosion.

Clifton is a very small settlement consisting mostly of farming community as well as two motor camps and a large café. Surrounding land use is historically farming and horticulture however; small communities along the coast including neighbouring Te Awanga and Haumoana are becoming more prominent (Environmental Management Services Ltd, 2009). Clifton is situated on flat, low lying land with hills, including those of Cape Kidnappers, surrounding the area. Cape Kidnappers along with nearby vineyards and the Hawke's Bay climate makes Clifton a popular tourism destination with many visitors once choosing to stay at Clifton Camp (Hastings District Council, 2012c).



Figure 2: Location map of Clifton, Hawkes Bay (Source: Google Maps, 2013)

Historically Clifton, as well as neighbouring Te Awanga and Haumoana, is prone to significant coastal erosion with the camp ground, motor camp and its access road all at serious risk of coastal erosion. Concern towards erosion occurring at and around Clifton first arose in the 1970s and has escalated since then (McGlinchy, 2006). In 2004 Tonkin and Taylor estimated the shoreline retreat for Clifton to be approximately 0.75 m per year. The Regional Coastal Hazard Assessment has identified Clifton as being in the Current Erosion Risk Zone and it is susceptible both to coastal erosion and inundation from stormwater flowing off the surrounding cliffs.

The Hastings District Plan offers three options as to how this issue could be managed at Clifton Camp:

- A. Protect existing access to campground and boat ramp;
- B. A managed relocation of the campsite to the general locality of the existing No.2 campground, along with a wider public reserve development;

C. No Council involvement in providing for future recreational opportunity in Clifton.

The No.2 campground provides an alternative location for the Clifton Campground if managed retreat was to go ahead. This alternative location is shown in Figure 3.



Figure 3: Image of Clifton Camp and the Fishing club looking north towards Haumoana (Source: Hastings District Council, 2013).

A site visit was undertaken to the location of Clifton Camp on 15 August 2013 to see the extent of the erosion that has occurred over the last few years. Photos from this visit are seen below (Figure 4) and show the amount of erosion that has occurred. Noticeable is

the land beneath the access road having been worn away and the ground on which a toilet block was located having been eroded so that the pipes are visible from the beach.



Figure 4: Photographs of Clifton Camp Erosion (Source: Personal Collection, August 2013)

4.1.1 What is occurring?

The Hawkes Bay Regional Council s42A report (2013) for coastal protection works at Clifton Camp states that the area has been subject to on-going and significant erosion over many years. Key informant 1 explained the situation at Clifton as ‘a trend of erosion from Clifton (all) along the Awatoto coastline’. This erosion, which is believed to have been occurring since at least the 1930’s (McGlinchy, 2006) is occurring at a rate of approximately 0.75 m per year, but can be upwards of 13 m per year depending on weather related shoreline fluctuations (Tonkin and Taylor, 2004). Since 2009 approximately 20 metres of coastline at Clifton Camp has been eroded. This intensity of erosion has occurred since unconsented and illegal coastal protection works were

removed from along the road into the camp. Key Informant 1 explained that, if the protection works had not been in place then this level erosion would still have occurred, however it would have taken place over thirty years rather than four or five years. The extent of this erosion can be seen in the GIS map in Figure 5.

Clifton Camp is situated within the Coastal Hazard 1 boundary, as designated under the Hawke's Bay Regional Council, Regional Coastal Environmental Plan (2006), which identifies the Camp as being in an area which is currently at risk of coastal erosion or inundation. Figure 5 illustrates the extent of Coastal Hazard Zones 1, 2 and 3 in the Clifton Area and shows where Clifton Camp is located in relation to the Coastal Hazard Zone 1 boundary. Coastal Hazard Zone 1 is identified as being at the highest risk of coastal erosion and inundation.

The processes occurring at Clifton Camp show the reality of this classification with erosion which has resulted in a loss of land from the Camp at a rate of approximately 25 m in the past four years (Beca, 2013). The effects of this erosion on the campsite can be seen in Figure 3. In a bid to protect themselves temporarily from this erosion, on 13 August 2013, consent was granted to Clifton Reserve Society by Hawke's Bay Regional Council to erect two coastal protection structures, consisting of concrete blocks, within Coastal Hazard Zone 1. According to the Officers Report (dated 13th August, 2013) the blocks were placed to prevent the imminent loss of a power pole and damage to the store and caretaker's house as a result of on-going coastal erosion. This consent was later amended on the 28th August 2013 to include the placement of additional concrete blocks within the original concrete blocks to create a full line barrier.

4.1.2 Why is this erosion occurring?

Scientific reports and articles were virtually all in agreement as to why erosion was occurring at Clifton Camp. The general consensus, supported by Key Informants 1, 2 and 3 was that the 1931 earthquake that struck the east coast of the North Island on the 3rd of February has had a significant contribution to the erosion seen along the coastline that Clifton sits on. Komar (2010) and Clode *et al* (2009) both explain that after the 1931

earthquake, the stretch of coast that Clifton Camp is situated on experienced a subsidence of one metre while other locations, such as Tangoio, north of Clifton, experienced uplift of nearly two metres.

Key Informant 2 supported this by noting that it was the 1931 earthquake that brought the land down. Komar (2010) continued by stating that this 1m subsidence after the 1931 earthquake was certainly a factor in the extensive erosion that has occurred along the Clifton coastline for the 75 years since it. Hawke's Bay Regional Council's report (McGlinchy, 2006) agrees that erosion along the Clifton shoreline and further north is thought to have resulted from the 1931 earthquake and the resulting geographical changes that this caused. However, while the 1931 earthquake was seen as a trigger for the erosion in the Clifton area, it was not seen as the sole cause.

Key Informant 1 discussed the idea that the shape of the bay may have contributed to the high rates of erosion that is occurring in the area.

"I think most of it is the shore wanting to re-orient itself into that dominant wave action, so its perpendicular to the wave action so there's very little currents and the angle of the shoreline is slightly off from the wave direction so you can transport, transport occurs until such time that the cranular bay occurs."

One question that arose during the interviews was whether erosion occurring from the Cape Kidnappers Cliff south of Clifton Camp caused sediment to move along the shore, and why this was not causing accretion for the area. Key Informant 1 said that while there appears to be episodic periods of sediment coming from the Cape Kidnapper Cliffs, unknown amounts of material coming from nearby rivers such as the Tukituki, and sediment coming from manmade deforestation in the hill country, there is still 'a lack of material coming into the network'. Key Informant 2 also raises the idea that sediment could reach the coast from the Tukituki and drift south; however continues by stating that 'coastal guys are saying that the net drift of sediment is to the north' which is supported by Key Informant 3 who states that 'long shore drift goes to the north and that Clifton is effectively upstream of the river mouths that feed gravel into the system'.



Figure 3 Cross section of coastal erosion on the road to Clifton Camp since protection structures have been removed (Source: Hawke's Bay Regional Council GIS, 2013)

The diagram below (see Figure 5), taken from Komar’s article on Shoreline Evolution in Hawke’s Bay (2010) demonstrated this south to north sediment movement which is occurring at the Clifton shoreline. Key Informant 2 goes on to say that ‘there is a sediment deficit at Clifton. Some of that may be related to geomorphology’.



Figure 4: Map of Clifton Camp in relation to Hawke's Bay Regional Council Coastal Hazard Zones (Hawke’s Bay Regional Council GIS, 2013).

A 2006 report by the Hawke's Bay Regional Council (McGlinchy, 2006) supports the theory that lack of sediment supply to the area is a major contributor to this erosion. Further discussion states that due to the predominant wave direction, a net northerly movement of beach sediment occurs along the shore and away from Clifton. Simply put, the 2006 Report states that 'there is less sediment entering the beach system than there is leaving and the balance erodes from the beach affecting the adjacent coastal communities'.

In terms of how much sediment is leaving the beach system, Clode *et al* (2009) estimate that around 61,600 m³/yr of sediment is removed from the coastal unit that Clifton Camp is located in, with the majority of this loss believed to be occurring from the southern area of which Clifton Camp belongs to.

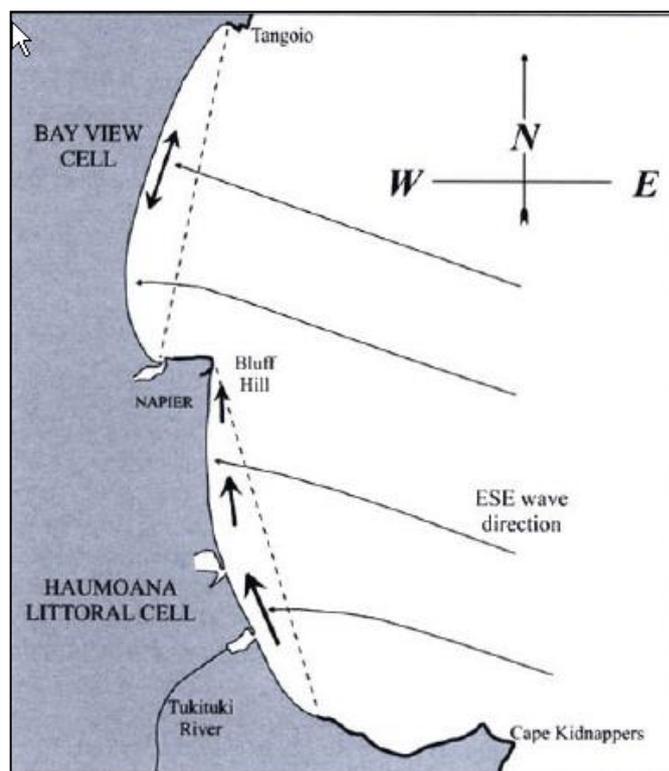


Figure 5: Orientation of the Haumoana Littoral Cell. The arrows show the patterns of longshore sediment transport (Komar, 2010).

In contrast to the previous points, Key Informant 2 raises the question as to whether erosion along the coast had been occurring long before the 1931 earthquake; however hadn't been noticed until after that event.

'I've seen aerial photos where right in front of Haumoana all the houses have a big beach in front of them which was surveyed once upon a time as a paper road. So once upon a time the beach was much bigger. So if the beach was slowly eroding we probably didn't pay attention until it begun nibbling away at properties. So it wasn't noticed until it started to effect people.'

4.1.3 What is the plan for the future?

While consent for a temporary seawall has been granted, there has been no agreement as to who will provide the \$200,000 to \$300,000 to pay for this structure. Key Informant 1 notes that this cost only covers the erection of the structure, with additional funds required to when the structure is removed. If a renewal or new consent is sought to keep the structure there or to improve it, additional costs will again occur. Key Informant 2 also brought up the question of who was to pay for this structure. He asked, 'if the council/rate payer is paying for this, are there other projects that the Hastings District Council is better spending the money on? Especially if this is just a temporary structure'. Key Informant 2 went on to say that if those who will directly benefit from the structure, notably the camp and the fishing club pay for the temporary structure, then it is their choice to make this investment, and that they do not believe that this cost should be worn by the rest of Hawke's Bay. Key Informant 2 would have to see real value in the erection of a seawall, even if it were temporary, to want to spend this money on it as, in their opinion, this money could be spent establishing the Camp or Fishing Club at a different location.

After 5 years this temporary seawall consent will expire and Key Informant 4 explains that the plan put to Council upon seeking the consent was that the Camp would move to their extension Camp which is less affected by erosion.

Plans for the future of Clifton Camp appear to be uncertain. Key Informant 2 explains how resolutions for the erosion issue, including the possibility of managed retreat at Clifton, have been put on hold by Hastings District Council for a two year period. Key Informant 2 worries that this may be giving Clifton residents a false sense of hope that the issue will be resolved, however, Key Informant 2 thinks that 'Hastings District Council has just put the issues in the too hard basket'.

4.2 Is managed retreat an appropriate management strategy?

Key informant 2 believes the Hawke's Bay Regional Council considers managed retreat as a viable management option and definitely acknowledges it as part of the 'toolbox'; however they also appreciate that there are some situations in which this management option may not be appropriate.

A number of factors to be considered before managed retreat was seen as an appropriate management strategy arose in the interviews, as well as during desktop research. The factor of cost effectiveness was one that arose during all Key Informant interviews. This revolved around the thought that managed retreat would only be an appropriate management strategy for coastal erosion if it was viable in terms of cost. According to Key Informant 2, all management options are on a 'level playing field' when the strategies are first being considered. The option which is chosen and utilised is dependent on such factors as the community and funding. In Key Informant 2's opinion 'cost effectiveness is key, getting the best bang for buck'. This thought is reiterated by Key Informant 1 who noted that 'there is a cost benefit analysis, weighing up the cost of protecting an area versus the cost of letting it go'. In their opinion this factor needed to be looked at before any decision could be made as to whether managed retreat was appropriate. A comment by Key Informant 3 noted that while managed retreat appeared to be a good option as a concept, this may not be the case once details are looked into and the question of funding arises.

4.2.1 Nature centric vs. Anthropogenic Management Strategies

A theme that arose within the interviews was that the style for managing coastal erosion appeared to be shifting from an anthropogenic management style to a more nature-centric management style. Key Informant 2 said that ‘one thing we are doing globally, if not locally, is making more and more decisions with a nature centric view. Working more with nature rather than against it’. This is shown in the Hawke’s Bay Regional Coastal Environment Plan policies, particularly Policy 15-1 which refers to a set of environmental guidelines to manage coastal erosion and inundation risks. Most relevant is Issue 1: Management Approach, shown in Table 3 below. This guideline prioritises management strategies for coastal erosion, beginning with a way that manages people rather than the surrounding environment. Key Informant 2 says that the reasoning behind this strategy is that first and foremost it allows ‘natural processes to act as if they were unimpeded’ and if that causes problems then to ‘work with mother nature and as a last resort let’s build something’.

Key Informant 1 supports the idea that the initial management strategy should be a nature-centric approach; however, he does note that, while a nature-centric approach is the favourable one, it is not the most popular with the community.

‘You should look at managed retreat as a first option then through to the hard engineering. It should always be the way you look at things. Because as soon as you have hard engineering, the costs and impacts are going to be huge. But socially, most western countries really struggle with managed retreat’.

Table 3: Relevant Coastal Erosion Issue (Source: Hawke’s Bay Regional Coastal Environment Plan, 2006)

Issue	Guideline
Management approach	<p>Coastal hazards will be proactively managed and prioritised in the following ways:</p> <p>Avoidance of new development in areas that are, or have potential to be, subject to coastal erosion or inundation</p> <p>Maintaining and enhancing natural values and features that provide a buffer against coastal erosion and inundation;</p> <p>Relocation and removal of existing uses and development from areas at risk of coastal hazards will be evaluated, and implemented if appropriate;</p> <p>Evaluating, then implementing if appropriate activities which mitigate coastal hazards (for example beach nourishment), and then;</p> <p>Evaluating, then implementing of appropriate subject to Guideline 10, permanent structures (for example sea walls, groynes, artificial reefs) to mitigate coastal hazards.</p>

4.2.2 Has the implementation of managed retreat been provided for within both central and local government legislation?

Answers from Key Informant interviews gave a range of opinions. Most notable was the fact that Councils are not obligated to protect private property under local and national legislation. Both Key Informants 1 and 2 were keen to note that Regional Councils have no legal obligation to organise and fund coastal protection structures and do not have to implement a hold the line strategy if it is seen as unviable. Key Informant 2 supported this by saying ‘Regional Councils have no obligation to protect or hold the line. We are not, as a council, in the business of

building coastal defence structures. In terms of coastal protection we aren't legally required to, so we don't go there'.

Key Informant 4 said that the Regional Coastal Environment Plan (2006) contains policies that prioritise different management approaches, with managed retreat being of a higher priority. These policies generally encourage use of other options, including managed retreat, before hard engineering, which is only considered appropriate when it is the best practicable option and adverse effects can be minimised.

Key Informant 1 states that, if the Council has an asset that it believes is important to protect, then holding the line may be an option they will implement. However there is a cost benefit analysis, which needs to be taken into account.

Looking to Central Government Plans and Policies and how they provide for coastal management and managed retreat; the Resource Management Act 1991 requires that local government establish, implement and review objectives, policies and methods in order to achieve integrated management of, amongst other things, the coastal environment. From this comes the New Zealand Coastal Policy Statement (2010), a National Policy Statement which states policies in order to achieve the purpose of the Resource Management Act in relational to the coastal environment of New Zealand. Policies and objectives which relate to coastal erosion and planning for managed retreat are shown in Table 4.

Table 4: Summary of relevant objectives and policies from the NZCPS (NZCPS, 2010)

Objective/Policy	
Objective 5	<p>To ensure that coastal hazard risks taking account of climate change are managed by:</p> <ul style="list-style-type: none"> Locating new development away from areas prone to such risk; Considering responses, including managed retreat for existing development in this situation, and; Protecting or restoring natural defences to coastal hazards.
Policy 3	<p>Precautionary Approach:</p> <p>Adopt a precautionary approach towards proposed activities whose effects on the coastal environment are uncertain, unknown or little understood but potentially significantly adverse, and;</p> <p>In particular, adopt a precautionary approach to use and management of coastal resources potentially vulnerable from climate change so that avoidable social/economic loss and harm to communities does not occur.</p>
Policy 4	<p>Integration</p> <p>Provide for the integrated management of natural and physical resources in the coastal environment and activities that affect the coastal environ. This requires: coordinated management or control of activities within the coastal environment and working collaboratively with other bodies and agencies with responsibilities and functions relevant to Resource Management.</p>
Policy 24	<p>Identification of coastal hazards</p> <p>Identify areas in the coastal environ that are potentially affected by coastal hazards, giving priority to the identification of areas at a high risk of being affected. Having regard to:</p> <ul style="list-style-type: none"> Physical drivers/processes that cause coastal change including sea level rise; Short and long term natural dynamic fluctuations of erosion; Influences that humans had/have/are having on the coast, and; Extent and permanence of built development.
Policy 24	<p>Subdivision, use and development in areas of coastal hazard risk:</p> <p>In areas potentially affected by coastal hazards over the next 100 years</p> <p>encourage redevelopment, or change in land use, where that would reduce the risk of adverse effects from coastal hazards, including managed retreat by relocation or removal of existing structures or their abandonment in extreme circumstances, and designing for relocatability or recoverability from hazard events.</p>
Policy 27	<p>Strategies for protecting significant existing development from Coastal Hazard Risk:</p>

	<p>In areas of significant development likely to be affected by coastal hazards: Promote/identify long term sustainable risk reduction approaches including relocation/removal of existing development or structures, and; Identify the consequences of potential strategic options relative to the option of do-nothing.</p>
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4.3 What are the barriers to implementing managed retreat from coastal erosion?

Three recurring themes as to the barriers identified in implementing managed retreat were found in both Key Informant interviews and desktop study. These were the concepts of loss of land, public perception and the cost of relocation.

4.3.1 Community Perception

Key Informant 3 believes that the perception of coastal residents is very negative towards managed retreat, and that the perception of the general public is ambivalent unless it involves the use of public funds. They go on to say how coastal residents see managed retreat as ‘an abandonment of them by public authorities and claim an inequality with urban residents whose properties are protected from river flooding by stop banks’. Key informant 1 says that there is the perception that the Council should bail out those being affected by coastal erosion, and either pay for the removal and relocation of the water front properties, or build a seawall to protect those properties. Key Informant 4 believes that Territorial Local Authorities within Hawke’s Bay are encouraging this perception and promoting a continued reliance on engineering solutions rather than seriously looking at alternative management strategies.

While the majority of residents close to Clifton Camp and its coastline appear to have a negative view of managed retreat, Key Informant 4 believes that the wider community is less concerned. They say that there is a tension from the wider community, who see what they may have to pay for coastal management and do

not believe that the benefits from these measures are worthy of the costs. A telephone survey by Cinta Research during the LTP submission period (HDC Council Meeting Agenda, 30 May, 2012) identified that people in the community were more prepared to pay in order to fund a concrete groyne than they would be to help pay for managed retreat in their area. The results from this survey are shown below in Figures 6 and 7. To support this preference for a hard engineering protection, the Council Agenda from a meeting on the 30 May 2012 stated that many written submissions for their Long Term Plan opposed managed retreat as an option outright, while 95% of written submissions received from the Haumoana/Cape Coast area, of which Clifton Camp is a part of, opposed managed retreat. The opposition to this option was such that members of a lobby group 'Walk on Water' (WOW) amended the Hastings District Councils official Draft Long Term Plan submission forms to include a tick box which read 'I oppose 'managed retreat' for the Cape Coast and would like it taken off the Council agenda until all other options for coastal protection are exhausted'.

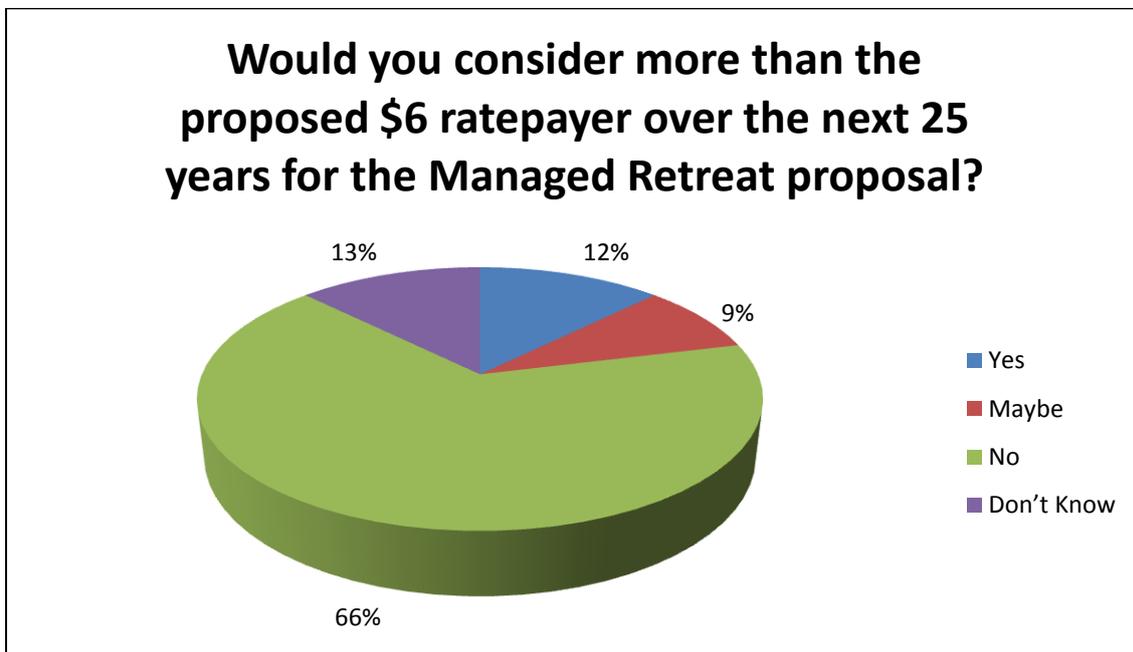


Figure 6: Graph of Hastings ratepayers opinion on paying for managed retreat (Hastings District Council, 2012a)

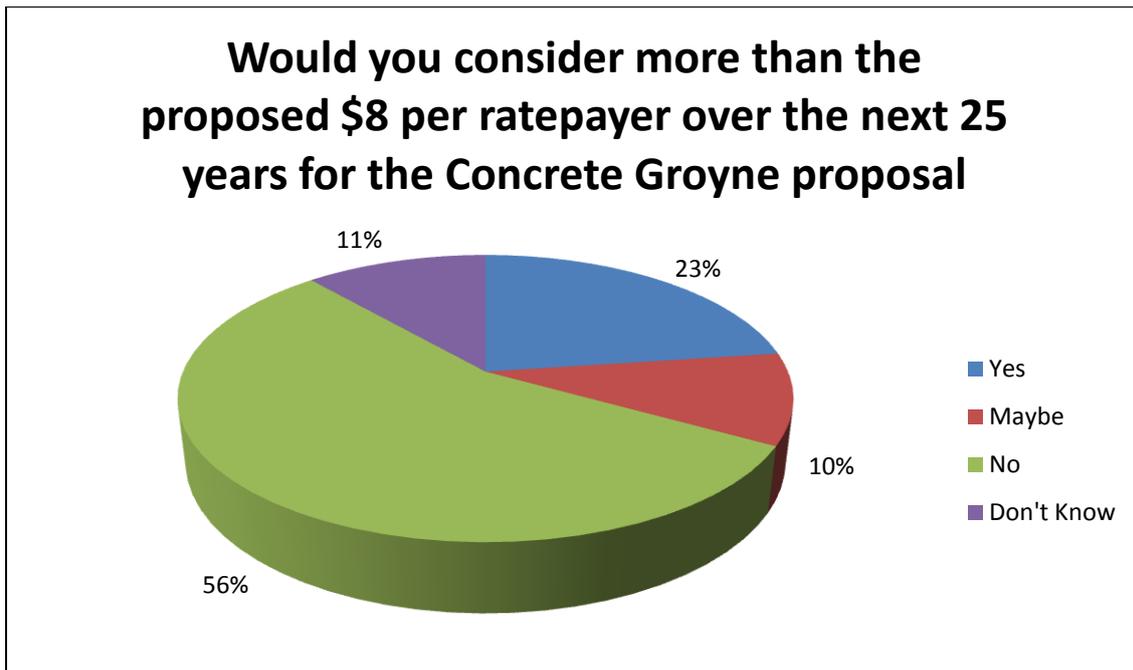


Figure 7: Graph of Hastings ratepayers opinion on paying from a concrete groyne (Hastings District Council, 2012a)

4.3.2 Cost of managed retreat

When looking at the barrier of the cost of relocation, Key informant 2 says the main question is ‘who pays? Who bears the brunt?’ Key Informant 4 does not believe that Councils will pay for coastal management and that currently it is generally private funding which is occurring. Council will pay to protect its infrastructure but is not willing to provide funding to protect private property. Key informant 3 reiterated this by saying that ‘it is difficult to justify the use of public funds for managed retreat’. Key Informant 1 supports this and suggests that public funding would be ‘more appropriately used for protecting public assets’ rather than spent replacing private assets that have been lost due to managed retreat of the do nothing approach.

In regard to whether local councils would pay for the protection or removal of the camp, Key Informant 2 says that, as it stands, Hawke’s Bay Regional Council would not pay for the protection or relocation of the camp. While the only way Key Informant 2 saw any funding from the Hawke’s Bay Regional Council for Clifton Camp is if they ‘came cap in hand to us’, and put up a good argument as to why the Regional Council should spend money on helping a private land owner, when the

Council has other investments which benefit the entire Hawke's Bay region that they could instead spend that money on. Key Informant 4 says that, while Hawke's Bay Regional Council is not prepared to fund coastal management at Clifton Camp, Hastings District Council is. This is supported by the Hastings District Council District Plan (Hastings District Council, 2013) which states that protection works at Clifton Camp would need to be paid for, whether in full or in part, by rates. However it goes on to say that the degree to which Hastings District pays for this needs to be taken into consideration, thinking about things such as the nature and degree of public benefit and whether rates money should be used to fund a project like this.

Key informant 3 believes that cost becomes more of a barrier when managed retreat involves 'actually relocating dwellings and providing sections for them'. This cost barrier subsides when managed retreat allows nature to take its own course to a higher degree; he then believes the barrier shifts to sympathy and compassion for those who are losing their homes to erosion.

4.3.3 Loss of land

Key informants 1 and 2 both noted that managed retreat leading to the loss of viable land, both for the community and for private land owners, was a major barrier to the implementation of managed retreat. Key Informant 1 stated that:

'People just don't want to move. It's partly people's semi emotional attachment to their property but there's also a financial implication. If they walk away from their house and land there's a financial loss. If the land is relocatable, there's a loss of the land value.

Key Informant 4 supports this by saying that 'for long term residents, erosion has slowly taken more and more of their property over 50 years. They have an emotional tie to their property'. The residents at Clifton and further along the coast do not want to see any more of their property lost to the ocean.

4.4 How can these barriers be overcome so that managed retreat can be implemented as a management strategy for coastal erosion?

4.4.1 Consultation with the community

Key informant 2 believes that an option for assisting managed retreat in becoming implemented is to consult with the community and convince them that the strategy is what is best for the community. They went on to say that informing coastal residents of the hazard and what is occurring to the coastline will allow them to be better informed on the situation, and allow them to make educated decisions on what occurs in their community. Key Informant 2 explains this by saying that, if the community is educated on the options, their outcomes and what it takes to bring these about, then they can make better informed decisions about their future rather than the Council telling them what to do. Key Informant 3 agrees with this statement and says that it is difficult for the community to get on board with a management strategy if there is uncertainty over what it will really mean. They go on to say 'it is how you define managed retreat; I would imagine that many consider nature taking its course to be an option, however what managed retreat involves is another matter'. It is with community consultation that this uncertainty could be resolved.

However, it was raised that, while consultation has positive outcomes, there comes a point where too much consultation can be done. In Key Informant 2's opinion, 'you can consult, consult, and consult, but even a decision to make no decision is good'.

4.4.2 Spreading the cost

Key informant 2 discusses how there is a risk of Councils setting a precedent if they chose to pay to protect a private property from coastal erosion. When this occurs, others threatened by the same hazard believe that the Council should then pay for all other private property protections from the same hazard. One possible solution to the cost barrier that arose during the research was the concept of spreading the

cost from coastal erosion to lessen the burden. Key Informant 1 furthers this thought by adding that 'there is a perception in the coastal area that the Council should bail them out'. They add that, Councils paying for the protection of private land owners who chose to live in a coastal hazard zone is 'setting the precedent that if you make a bad decision, the Council will bail you out'. Key Informant 1 lives inland from the Clifton area and personally would not want to pay to protect those properties which are beach front. They go on to ask why the public should have to pay to protect someone else's house which has no real personal value to them.

Key Informant 2 states that while the Hawke's Bay Regional Council will fund research and investigations as far as is reasonable, they will not fund these investigations 'till the cows come home'. They have also taken a firmer stance and have said 'no, we are not going to fund coastal defence'. In the Hawke's Bay Regional Councils mind, they are the regulatory authority and, as such, it is not their position to pay for coastal protection. It is of their opinion that protection from coastal hazards should be a 'user pays type process' with the thought that the further away you are from the problem, the less you should pay.

'Should someone on the other side of Hawke's Bay have to pay to protect land an hour's drive away? Is that fair? It's one thing for those staring down the barrel of the costs to come to the Council but, at the end of the day, the Council is taking rates from ratepayers and residents elsewhere in the district to compensate for a private land owner'.

In terms of cost for the different management options, Key informant 2 explains how costs were looked at over a 50 year period. Using this method, the initial cost has to be looked at and then on-going maintenance needs to be taken into account. Any costs after this 50 year period became uncertain due to inflation. This method allows a longer term evaluation of the costs to be undertaken.

4.4.3 Only use when appropriate

Research has ascertained that while appropriate in some instances, managed retreat is not a solution for all coastal erosion problems. Key Informant 2 explains this by saying that ‘managed retreat is an option in the toolbox. It has its place in some situations but isn’t appropriate in all situations’.

One aspect that Key Informant 1 indicated was that it may have an effect on whether managed retreat would be appropriate at the Clifton Camp location is that of the tourism value of the area.

‘The tourism aspect of that area is conflicting; you have the gannet tours which access along the beach so you need the beach to transport the people on. There is the value of that business which needs to be compared to the value of the camp and the marine club. If you put a seawall in, the beach will be lost over time, restricting access to the beachfront’.

Key Informant 1 says that you need to ‘look at the value of what is to be protected by that scheme’. They go on to explain that cost is also an indicator of whether managed retreat is suitable for a location. They state that ‘there is a tipping point when things are justifiable to protect an area which is retreating’. To decide whether it is cost effective to protect or retreat, things like roading and infrastructure need to be taken into account.

4.5 Summary

This chapter has outlined the results obtained from both field work and desktop research. This involved GIS to interpret coastal hazard zones, interviews with 4 Key Informants and the analysis of plans, reports and other documents relevant to the topic. From the use of these different methods, the results presented in this chapter have created a holistic view of whether managed retreat may be appropriate for the Clifton Camp location, what the barriers to the implementation of this strategy may be and some possible options to overcoming these barriers.

Chapter 5: Discussion

Jesus said the wise man builds on the rock and the foolish man builds on the sand, but not that storms come to both. The house on the rock cannot be shaken, but the house on the sand? Well the foundation makes all the difference" Matthew 7:15-29

The primary aim of this research was to investigate the barriers to the implementation that managed retreat faces as a coastal management strategy. This research took a particular focus on Clifton Camp in the Hawke's Bay and draws from two different case studies from within New Zealand who had different experiences when they attempted to implement managed retreat to deal with coastal erosion.

An explanation of the results discussed in Chapter four will be discussed and analysed, and the implications of these results for the implementation of managed retreat will be suggested. The results of this research will also be compared with the work of other researchers and with managed retreat strategies that have been undertaken or have been attempted to be undertaken in other areas around New Zealand. Finally any limitations to the methodology adopted are addressed, and suggestions for future research are detailed.

5.1 Is Managed Retreat an appropriate Management Strategy?

While the general consensus from research conducted, both through desktop studies and interviews, indicated that managed retreat was an appropriate management strategy, there were a number of tests a location had to pass before its appropriateness could be determined. Key Informant 2 introduced this idea of appropriateness as all management options being on a 'level playing field', with each strategy, be it managed retreat, do nothing or hard engineering, being equally considered. Which strategy is ultimately chosen to be implemented depends on a number of factors including cost effectiveness, the perception of the community, funding and other criteria.

This suggests that if a location was to fit a certain criteria, that it may be suitable for managed retreat. Alternatively, if a location was not to fit a certain criteria that it may be more appropriate to consider other options such as hard or soft engineering which would be better suited to a locations particular landscape features and surroundings.

One such factor which may determine whether managed retreat is appropriate for an area is how cost effective the strategy would be. If managed retreat was not viable in terms of cost then

it would be inappropriate to attempt to implement it in an area. Key Informant 1 explained this by noting that ‘there is a cost benefit analysis, weighing up the cost of protecting an area versus the cost of letting it go’. Key Informant 1 goes on to say that ‘there is a tipping point when things are justifiable to protect an area from going into retreat’, and they do not believe that, in regard to Clifton Camp, it is cost effective to implement a hard or soft protection strategy. An example of an area within Hawke’s Bay which would be cost effective for hard protection strategy is given by Key Informant 2. They believe that the value of the land and activities at Clifton Camp would not be worth the cost of protecting the land. This is in contrast to somewhere like the Marine Parade where, if erosion was to occur, millions of dollars of infrastructure and property would be at risk. According to them, Marine Parade would be cost effective to protect due to its value, but Clifton would not.

5.1.1 Nature Centric vs. Anthropogenic

Both the literature on coastal erosion management and the key informant interviews discussed how growing importance was being placed on creating coastal erosion strategies that were more nature centric rather than completely anthropogenically biased. As discussed in Hart (2011), this strategy looks more at focussing on altering humans and their behaviour, rather than trying to control the surrounding environment, and offers an option for a more human based change which allows coastal processes to behave naturally rather than trying to control them. This more environmentally friendly focus is seen in Issue 1 of the Hawke’s Bay Coastal Environment Plan which prioritised managed retreat and avoidance of new development in erosion prone areas over management strategies such as beach nourishment and seawalls. The presence of this issue within a Hawke’s Bay planning document means that the region is on its way to following the other countries around the world with a focus towards this more nature centric style of management, and that managed retreat may be considered if it has this backing. This is confirmed by Key Informant 2 who says that ‘one thing we are doing globally, if not locally, is making more decisions with a nature centric view. Working more with nature than against it’.

Implementing managed retreat at Clifton Camp would be an example of where a more nature centric management strategy could take place. However, this nature centric approach is not always popular with communities. Western communities in particular do not often support taking the more nature centric option as it is seen as giving up and letting nature win.

5.1.2 Has the implementation of managed retreat been provided for within central and local government?

It appears that the coastal management strategy of managed retreat is well provided for within central government as well as more locally within Hawke's Bay. This is governed by the overarching documents, the RMA 1991 and its subset the NZCPS 2010 which has policies that appear to call for the serious consideration of managed retreat before any hard or soft engineering is proposed. This is echoed within Hawke's Bays Regional Coastal Environment Plan which prioritises managed retreat over hard and soft engineering.

With this in mind, managed retreat will not always be chosen as the management strategy. Key Informant 1 states that, despite this ranking of management options, if the Council has an asset, such as roading or other infrastructure, that it believes is valuable and needs protecting, holding the line with hard engineering may be an option that they will implement.

Despite the fact that managed retreat appears to be well provided for within the country's legislation and Plans, it is provided for in a very general capacity. While the NZCPS 2010 and Hawke's Bay Regional Council Plans both state that managed retreat must be considered equally alongside the other management options, there is no strategic planning in place with which to implement a solution. This is evident within the management of Clifton Camp. While under the Hawke's Bay Regional Council RRMP there are plans which state that managed retreat must be considered as a viable option, there is no managed retreat plan established by local authorities to guide this process. If something like a managed retreat plan was established then it would offer a guiding document with which to implement managed retreat that the general public could refer to. This Plan could provide backing for local authorities when they bring the strategy of managed retreat to a community and offer a game plan on how the process will be carried out. This would create a transparent and systematic process which would be set out from the beginning of implementation.

5.2 Case Studies: Muriwai Beach and Urenui Beach

Clifton Camp and its shoreline is not the first location within New Zealand that has had to deal with coastal erosion issues. As stated by Turbott and Stewart (2006) a large portion of the New Zealand coastline is being affected by coastal erosion in some way. Two such areas within New Zealand which have experienced coastal erosion and have gone through the process of considering managed retreat as a coastal erosion strategy are Muriwai Beach in Auckland and Urenui in Taranaki. Both locations have gone through the process of deciding which management strategy is most appropriate for their coastline and have had similar barriers to

that which Clifton Camp is currently facing. The way in which these barriers were dealt with played a role in which management strategy was adopted at each location. The locations of each beach are shown in Figure 8.

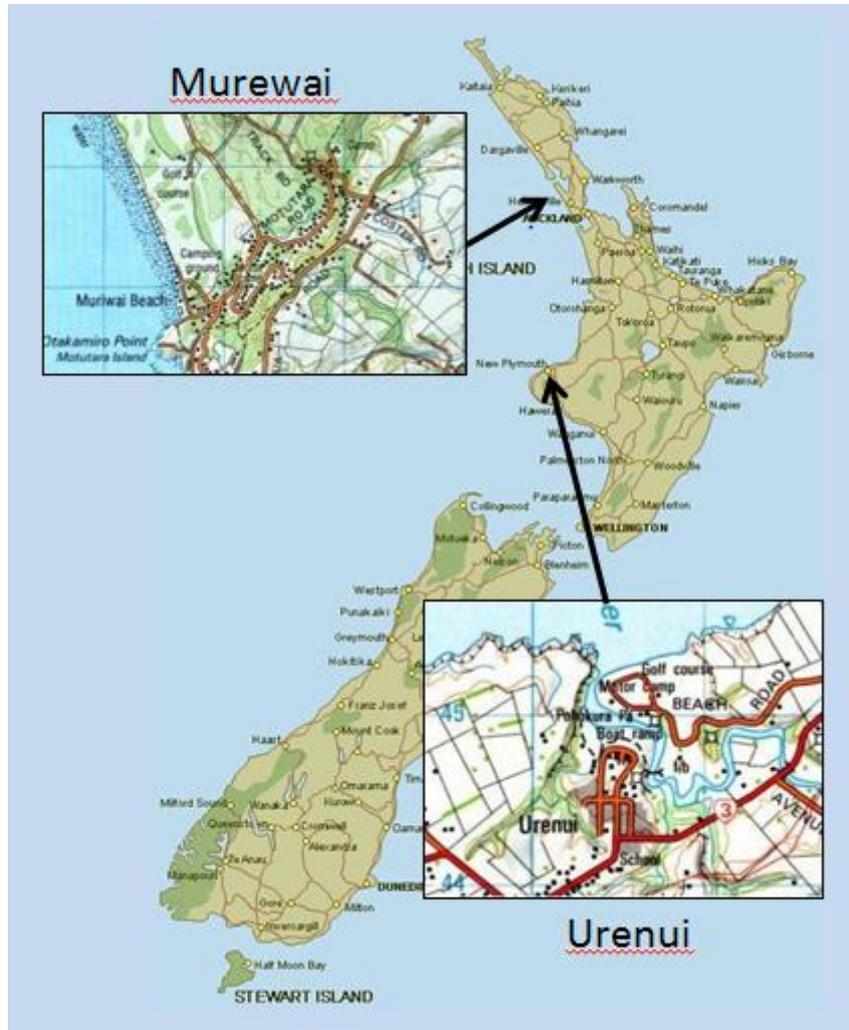


Figure 8: Location of Case studies within New Zealand (Source: Google Maps, 2013)

5.2.1 Muriwai Beach, Auckland

Muriwai Beach has experienced issues with erosion since the 1960s with public parks, car parks, a surf club and roading all being at risk from the approaching coastline. As of 2006 the coastline was experiencing erosion at rates of 1 to 1.5 metres per year (Blackett *et al*, 2010). Initially, protection work including a seawall to protect a car park and gabion baskets and tipped rock to stop erosion where a road and boat ramp enter the beach were attempted to try hold the line, however this work failed. Consultation between the Council and the community resulted in the recommendation that retaining the natural character of the beach was the most important outcome for the area and a strategy was adopted which resulted in the staged implementation or gradual process of managed retreat of the coastline (Hart, 2011).

Notable in this case study was the level of consultation undertaken with the community. As explained by Blackett *et al* (2010), the Regional Council hired a consultant to work with the local community and key stakeholders to find a solution. Having a third party facilitate the process helped to ease some distrust that locals had for the Council. Important to note in this case study was that the stakeholders were not campaigning for a preconceived outcome, they were open to all ideas as long as the natural character of the coast was retained. The staged retreat recommended from this process meant that, when certain trigger points or locations were reached, the assets that were affected were then relocated. Much like the Clifton Camp example, the Council had made available some land on which to relocate some of the infrastructure too. This made the process much easier and reduced the cost of finding somewhere to move to.

What Clifton Camp could learn from the process that Muriwai Beach went through is that the consultation process can be a very powerful tool, however, little will be achieved if the community goes into consultation with its decision on what they want the outcome to be already made. Going into a consultation process with an open mind and a willingness to consider all possible alternatives makes the process much more effective and beneficial for the community. If consultation is done well through the use of stakeholders and community groups, the process can be more inclusive and better represent the outcome that the wider community want achieved. Another thing that Clifton Camp and the Hastings District Council could have taken away from this example is that managed retreat does not have to be an immediate change. However, Clifton Camp is now at the stage that an immediate result is needed because too much land has already been eroded. If a management strategy was put in place for Clifton Camp and its coastline when erosion first started to be noticed then a similar management strategy to Muriwai could have occurred. This would have allowed time for the community and beach goers to adapt to the change as well as spreading the cost and relocation over an extended period of time. The staged implementation of the managed retreat also allows flexibility for the unpredictable nature of coastal erosion and gives the council time if they need to reevaluate their strategy (Blackett *et al*, 2010). Unfortunately, it is too late for this type of staggered approach to managed retreat to be implemented at Clifton Camp, but it could still be something that Hastings District Council and Hawkes Bay Regional Council could take away and consider for use in other areas in the Hawke's Bay that are experiencing erosion.

5.2.2 Urenui Beach, Taranaki

Urenui Beach on the west coast of the North Island experienced coastal erosion which threatened a very popular public golf club and baches (Blackett *et al*, 2010). It is estimated that erosion is occurring at up to 1.07 metres per year with reports of erosion reaching rates of up to 6 metres per year at the eastern end of the beach (District Council, 2007). A small proportion of the community formed a lobby group and pushed for a sea wall despite others in the community being against the armouring of the seawall (Taranaki District Council, 2007). Due to the level of pressure being put on the District Council, like with Muriwai Beach, a consultant was hired to lead consultation talks. The community was consulted with and the recommendation from the consultant was that a strategy of managed retreat should be implemented. This was not supported by the stakeholders, a group largely made up of golf club members and bach owners, who wanted to hold the line and campaigned as such. The opinion of these powerful few overwhelmed the wider community who were not appropriately represented and the lobby group succeeded in being granted consent for a temporary seawall. Subsequently, a temporary 10 year rock wall was built to protect the golf club. As a result, the wider community lost a high tide beach, the natural character of the beach was adversely affected and edge effects of the wall are negatively impacting on the nearby unarmoured sections of the coastline by exacerbating erosion there (Blackett *et al*, 2010).

A difference between the process that occurred in the Muriwai and Urenui examples was the difference in perception and representation of the community stakeholders. By having a well rounded, representative group of people acting as stakeholders, Muriwai were able to reach a decision which achieved what the wider community wanted. In contrast, the less representative stakeholder group at Urenui meant that large portions of the community were underrepresented and their wants were not realised.

Similar to Clifton Camp, Blackett *et al* (2010) explained how the Council took an extended period of time when considering a solution for the erosion at Urenui Beach. This led to unease and impatience within the community, as well as preconceived positions on what they wanted to occur. This led to a much more difficult process and should be something the Hawke's Bay local government are wary of. A similar situation to Urenui could occur at Clifton, with people unwilling to view alternatives, if the Council does not act early and continue engaging with the community rather than putting the entire process on hold for two years as is suggested in their Long Term Plan.

5.3 What are the barriers to implementing managed retreat from coastal erosion?

As discussed in the results, there were three very clear barriers to the implementation of managed retreat; the loss of land, cost of relocation and the community perception of managed retreat. While there were other barriers that arose, including its viability for a location, which is discussed in the above section and a continued reliance on engineered solutions, the three barriers identified above came up in all Key Informant Interviews as well as in a large portion of the literature.

5.3.1 Community Perception of Managed Retreat

After reviewing the Key Informant interviews and analysing the literature, it appeared that those immediately affected by coastal erosion have a negative perception of managed retreat, with the perception becoming less negative and more ambivalent as the distance increases. This perception by the immediate community was so against coastal erosion that the majority of property owners affected by coastal erosion would not retreat on their own free will unless forced off their properties by the processes affecting the coast. This was supported by results of a survey undertaken by Cinta Research during the Long Term Plan submission period in which only 12% of those from the Clifton area interviewed said they would be willing to pay \$6 more in rates per year to fund managed retreat while 23% were prepared to pay \$8 more to fund a hard protection method.

Hard engineering practises such as seawalls and groynes still appear to be the most popular management option for those at Clifton who are affected by coastal erosion. Key Informant 4 is of the belief that this view is being encouraged by some Territorial Authorities in the Hawke's Bay region that promote a continued reliance of engineering structures rather than seriously considering alternative management strategies such as managed retreat. This encouragement comes despite planning documents within the Hawke's Bay, most notably the Hawke's Bay Regional Coastal Environmental Plan 2006, calling for serious consideration of managed retreat as an option. Local Authorities within the Hawke's Bay will need to work together in the future in order to have an integrated coastal management system for coastal erosion. Without this, any implementation of managed retreat will be difficult if the possibility of a hard protection structure is available which would protect a landowner's property. It is unlikely that property owners will choose to support a management strategy such as managed retreat which would result in them having to leave their property or lose some of it to the rising tide if there is still a chance that a Council could choose to hold the line.

Much of the confusion from landowners who expect Council to pay to protect their properties from coastal erosion stems from the Council funding the construction of stop banks which protect properties prone to being flooded from rivers in the region. Key Informant 3 explained that landowners experiencing coastal erosion see managed retreat as an 'abandonment of them by public authorities' while other landowners living on flood plains are being protected from their hazard by Council funded stop banks. The difference between the two situations is that the stop banks are also protecting council infrastructure such as roading and pump stations which would be costly to fix. This is also the reasoning behind why the Regional Council pays to nourish Westshore Beach when it is required. The cost of what would happen if this protection did not take place far outweighs the cost of protection. However, in the case of Clifton Camp and the Fishing Club, besides from the boat ramp, there are no Council owned assets at the site which the Council sees fit to protect. This is justified reasoning for the Council not to protect a location. However, the immediate community see this as their Council not helping them in their time of need. A possible remedy to this could be if increased consultation takes place in communities directly affected by coastal erosion, to explain the difference between Council funded stop banks or protection at Westshore Beach compared to funding hard engineering structures at Clifton Camp. This may reduce some of the confusion that appears to be occurring and may allow the residents to understand that they are not being forgotten.

While their feelings towards how coastal erosion is to be implemented are not as passionate as those who live directly on the coast, the wider community still hold opinions and views towards managed retreat and the other protection strategies. A large majority of the wider community, as noted by Key Informant 4, views the management of the coast with hesitation. They understand that there is an issue but are cautious as to how much they would have to pay in order to manage it. For costly fixes such as seawalls and groynes which protect and hold the current line, the wider community do not believe that the benefits achieved from these measures are worthy of the costs that they have to pay. While those not directly affected by coastal erosion see no benefit from paying to protect private land, Turbott and Stewart (2005) state that there is support by this group for managed retreat which does not restrict access to beaches or reduce the quality of public areas like holding the line may. This hesitation from the wider community on having their rates put towards protecting private property is expected. An important question which needs to be asked when considering management proposals for coastal erosion is; who pays for protection if it was to occur? And why should the wider community have to put their money towards a project which will only directly benefit a small

section of the community when there are many other issues within the region that a larger amount of the community could benefit from?

5.3.2 Cost of Relocation

Bardsley and Niven (2013) identify the cost of relocation as one of the main reasons that managed retreat is generally a last option when managing coastal erosion. When deciding upon a management strategy, one factor which is strongly taken into account is the cost effectiveness of the option, with the most effective being seen as favourable.

Lawrence *et al* (2013) sees this as a negative aspect of looking for the most cost effective strategy. This has a bias towards looking at short term costs and benefits, which generally favour management options that can be implemented straightaway to give immediate benefit to existing property owners such as seawalls or beach nourishment. Longer term strategies such as managed retreat which would instead benefit future generations and the wider community are seen as costly and inferior.

While the managed retreat strategy does cost more initially compared to the other options it is important to keep in mind that the cost of removal or relocation is intended as a one-time expense. Once a house has been shifted back on its property or removed from the property, the cost is complete. Comparatively, the upkeep and maintenance of soft and hard engineering is an on-going expenditure which would need to be increased as the processes acting upon the coastline build (Daniel, 2001). Key Informant 2 took this idea on board when working through the numbers for a management strategy at Haumoana, Hawkes Bay, just north of Clifton Camp on the same coastline. When considering what strategy might be appropriate for the area, Key Informant 2 said that they ran the numbers 50 years into the future. This would therefore, include the upfront cost as well as ongoing maintenance.

When not just the initial cost but also the maintenance costs are considered, managed retreat may appear more favourable. Additionally, managed retreat has the potential to occur over a long period of time and does not need an immediate fix for all properties, whereas a soft or hard option creates the initial up front cost and then on-going costs. Managed retreat offers an opportunity to begin preparing for the inevitable cost ahead of time, as not all properties are affected by the approaching coast at the same time. This staggered nature of managed retreat, as well as the ability to predict the coastlines movements to stagger removal, makes this retreat option more achievable.

This was supported by Key Informant 3 who stated that cost becomes more of a barrier when dwellings need to be physically removed from their current location and have a new section provided. This form of relocation is a lot less cost effective compared to the option of just shifting a dwelling landward while remaining within the same property.

5.3.3 Loss of Land

Loss of land was another barrier to the implementation of managed retreat. This barrier was explained by Key Informant 1 who said that people's attachment to their property, along with the financial implications, meant that people did not want to relocate. This was supported by Key Informant 4 who said that people have emotional ties to their property. They went on to say that so much of their land had already been taken by coastal erosion; they did not want to see any more land lost to the ocean.

As land is lost to the ocean, the loss of investment in a property owners land is also washed away into the ocean (Alexander *et al*, 2001). There is a direct financial implication to land owners whose properties are affected by coastal erosion. It is important to note, alongside the financial repercussions of coastal erosion, that there is an emotional aspect to the process which is separate to the monetary aspect. Property owners have an emotional attachment to their land and this is something that cannot be recognised or provided for within a Plans objectives or policies. While Councils can plan out the costs of relocation and compensation for the removal, retreat or relocation of one's property, there is little thought to the emotional attachment to a home

Additionally, Turbott and Stewart (2006) view the loss of land from coastal erosion as a cost to society as a whole, not just the immediate landowners. They view the sea front as highly sought after real estate which people use and enjoy. However the same article explains that some of the wider community may see managed retreat in a positive light. If a beach adopts a managed retreat strategy over hard protection structures, the coast remains natural and offers benefits to the entire community as coastal land is protected, and their public space is not lost. This is something to consider in the Clifton Camp case study. The beach that runs along the front of the Camp is the access way for tourist tours to Cape Kidnappers, located south of the camp. This is a popular tourist attraction for Hawke's Bay which could be negatively affected if a hard defence structure was to be erected to protect Clifton Camp. The beach could be negatively affected and beach access to Cape Kidnappers lost to the public.

5.4 How can these barriers be overcome so that managed retreat can be implemented as a management strategy for coastal erosion?

So how might some of the barriers discussed in the previous section be overcome so that managed retreat can be seen as a viable management strategy for coastal erosion, both generally and more specifically at Clifton Camp? Within the following section, possible solutions to these barriers such as spreading the cost, consulting further with the community and only considering managed retreat when it is an appropriate option will be discussed.

5.4.1 Consultation with the Community

One notable barrier to managed retreat being implemented was that the immediate Clifton community had such a negative view of the strategy. As shown in the results section, more people within the immediate vicinity of Clifton and its coastline would pay to fund a groyne field than pay a reduced amount to fund managed retreat (Hastings District Council, 2012b). This was supported by Turbott and Stewart (2006) who believed that, while there appeared to be positive feelings towards managed retreat in the wider community, those who would be directly affected by retreat were not in favour of it. Key Informant 1 believed that this was, in part, due to a lack of knowledge around the issue and the options available. Resulting from this is the idea that further consultation with landowners immediately affected by coastal erosion may result in managed retreat may become a more attractive option. Alexander *et al* (2012) and Blackett and Hume (2007) stated that, if communities were better familiarised with managed retreat, and were able to gain a better understanding of the process and the reasons behind why it might be implemented, those landowners immediately affected may have a more positive response to the strategy.

While a large amount of consultation has taken place with the Clifton community and other nearby areas immediately affected by coastal erosion, if managed retreat was presented more as a legitimate option to them rather than one of many possible solutions, then it may be taken more seriously. Blackett and Hume (2007) believed that consultation would be most effective when a number of criteria were achieved. These included the Council forming a relationship with the community, the community being given the chance to be informed and learn about the processes being proposed, and the strategies being delivered to the community in a way that they can understand. If the community is able to take a step back and look at the effects of holding the line on the wider community, they may see that, holistically, managed retreat is the strategy that is the best for the community.

While extra consultation could be a possible aid in managed retreat being considered as a viable solution to the coastal erosion problems at a location, it is important that results come out of this solution. While from the Hastings District Council Long Term Plan consultation involved itself with the community along the Clifton coastline, a main resolution that came from this was that the managed retreat strategy be put on hold for a further two years (Hastings District Council, 2012c). Rather than coming closer to a solution, the Council is just extending the period in which they have to make a decision. This in turn is creating a sense of hope in the community that, since managed retreat is being side-lined, that a hold the line option may instead be implemented. If this continues to occur there may come a point where too much consultation can occur, as discussed by Key Informant 2. This can result in people losing interest in the process and no longer being interested in considering alternative strategies.

5.4.2 Spreading the cost?

One possible solution which came out of this research was that spreading the cost amongst those affected may minimise the cost barrier.

Key Informant 2 discusses how, if Councils help fund coastal erosion management strategies, they may set a precedent. This could result in others who are threatened by the same hazard believing that they too should be looked after in a similar way. Instead, if the cost is spread around the community in a user-pays type situation where those who are most affected pay the most, with this amount decreasing as you get further from the location, then the precedent for that style of payment is set. Reasoning behind this method is given by Key Informant 2 who said 'should someone on the other side of Hawke's Bay have to pay to protect land an hour's drive away? Is that fair?' That is the crux of the situation. What is 'fair'? While it is not 'fair' that Clifton Camp is slowly being washed away by erosional processes, the Camp has been aware for a long time that these processes are occurring. Is it 'fair' to make the wider Hawke's Bay communities rates go towards an issue that has been known for some time and which only affects a small amount of the population? Abel *et al* (2012) believed that the cost should be covered by those directly affected from the retreat, and that costs should not be passed to the wider community or future generations. Alexander *et al* (2012) however, believes the cost should be spread amongst the wider community and that the property owners should not have to cover the costs when retreat will benefit the entire community. By spreading the cost to make those who benefit the most from the management strategy to pay the most while those who do not benefit pay the least, a fairer system of payment is created. While those not directly affected do not

have to pay a huge sum, they are still contributing towards the payment of a community feature that they will have the ability to benefit from.

Key Informant 1 explains that generally, it is the private landowner's choice to live in a coastal hazard zone. In the Clifton Camp area, erosion has been a well-known issue since the 1931 earthquake. Since this time, landowners in the area have been offered a relocation package of which only one chose to take. The landowners in the area are aware of the danger that they face and have chosen to do nothing about it. If the Council were to pay for the protection of this private property then, as Key Informant 1 stated, this would be 'setting the precedent that, if you make a bad decision, the Council will bail you out'. This is not the management strategy that the Regional Council wishes to adopt. Local government within Hawke's Bay and throughout New Zealand cannot afford to fund all coastal erosion management strategies. Turbott and Stewart (2006) note that most regions within New Zealand are experiencing coastal erosion. If a precedent was set that expected local Councils to fund the management of this hazard then it is likely that rates throughout each region, even in areas not directly affected by coastal erosion, will have to increase in order for these strategies to be paid for.

Hawke's Bay Regional Council have taken a firm stance in regard to funding any coastal erosion management options, with Key Informant 2 stating that while the Regional Council will continue to fund research and investigations when needed, they will not fund coastal defence. This leaves it up to the territorial authorities, in Clifton Camps case, Hastings District Council, and the community to come up with the funds for which ever management strategy is implemented. The current strategy as laid out by Key Informant 4 is for Hastings District Council to provide the \$200,000 needed for the temporary wall at Clifton Camp which has been granted consent, half of which needs to be paid back by the camp. The other half will come from rates and other budgets. After this, the future of the Camp is uncertain. Some proposals that have been discussed include a soft engineering approach involving the creation and re-vegetation of a sand dune barrier with a backstop concrete wall as well as the camp relocating to the extension camp location, purchased by the Hastings District Council, which is less affected by erosion.

5.4.3 Only use when appropriate

The final solution to removing barriers to the implementation of managed retreat is to only offer it as a strategy when it is an appropriate and viable option. This report does not presume that managed retreat is a fail proof solution to all coastal erosion issues. This sentiment is shared by Key Informant 2 who explained that 'managed retreat is an option in the toolbox. It has its place in some situations but isn't appropriate in all situations'. There are a number of criteria around

cost effectiveness and appropriateness of a location that need to be considered before managed retreat is offered as a possible management strategy for areas affected by coastal erosion.

When deciding whether Clifton Camp is a viable candidate for managed retreat those same criteria outlined above need to be considered. When looking at cost effectiveness for managed retreat to be implemented at Clifton Camp, the cost of protecting the Camp needs to be considered against the cost of relocation to another area while keeping in mind any revenue that the Camp may bring to the region. The temporary protection works currently consented at Clifton Camp will cost approximately \$200,000, with the Camp having to pay half of this while the Hastings District Council covers the remainder (Hastings District Council, 2012b). This is a considerable cost for a temporary protection structure. If a longer term structure is proposed once the current consent expires then the cost of this will be expected to be even more. If managed retreat were to occur the Camp already has a proposed location to move to which Hastings District has said they will purchase for the Camp. Therefore the only cost they will need to cover is the relocation of any infrastructure and the start up costs of getting the alternative campsite set up. This is a onetime cost rather than recurring cost. With either management option, the campsite will continue to run; therefore revenue from visitors will keep coming into the region.

In terms of the appropriateness of managed retreat for the Clifton Camp location, there are not many other options which can be undertaken while retaining the factors that make the coastline such a popular visitor's attraction. If hard protection structures were to be erected at the camp it is possible that the ocean will continue moving landward, removing the beach until the ocean met the wall. This could remove beach access to Cape Kidnappers, a popular tourist attraction which is south of Clifton Camp as well as removing an important feature of staying at Clifton Camp, the beach. Alternatively, a soft engineering approach which involves the creation and revegetation of a sand dune barrier, with a backstop concrete wall has also been proposed for the camp. While in theory this sounds like a possible solution to the coastline retreating, it is not certain that this will work. Instead the Camp could spend the money to implement the strategy, only to have the ocean erode away the sand dune barrier, leaving the unnatural concrete wall as the barrier. If managed retreat was implemented then the coastline would have space to move and reach equilibrium which still retaining the natural beach slope. There is the chance that the coast will continue to erode until it reaches the cliff face, however if this does occur then at least the coastline will still appear natural. If managed retreat was to be implemented at Clifton Camp there is not much in terms of assets that need to be removed besides from the structures existing

at the camp. This could be a different situation if there was more development and infrastructure where Clifton Camp is located.

With these two criteria in mind, managed retreat appears to be an appropriate strategy to implement at Clifton Camp. The cost of relocating the campsite is a one off cost and is likely to be less than the cost of armouring the coastline to hold its position. Additionally, there is not a significant amount of development or infrastructure that would need to be relocated if the managed retreat strategy was implemented. If an urban area was located where Clifton Camp is then a hold the line structure may be more appropriate as the cost of relocating would be increased and managed retreat would be less viable.

5.5 Summary

This chapter has examined the results of this research in relation to the existing literature on outdoor space. The prevalence of coastal erosion in New Zealand is increasing, both from changes to coastal processes and from the influence of people living on the coastline. While previously there has been a tendency to hold the line, the literature and planning documents are beginning to suggest the adoption of a more nature centric management strategy such as managed retreat.

While the management strategy of managed retreat is becoming considered more seriously as a coastal erosion management option, there are still serious barriers which impede its implementation. Community perception, loss of land to the ocean and the initial cost of managed retreat all contribute to making managed retreat a less desirable management strategy. Solutions to how these barriers may be overcome are evident in both literature and through research undertaken for this project, including learning from New Zealand towns that have previously gone through the same situation that Clifton Camp is experiencing today. In order to remove these barriers, the solutions suggested within the research should be considered within management strategies as a way of increasing the probability of managed retreat being considered as a viable management strategy in the future.

Chapter Six: Conclusion

New Zealand is currently facing the challenge of managing increased instances of coastal erosion and its effects on the coastline. The decision that both central and local government now face is which coastal management strategies should be adopted around the country? Should New Zealand continue as it has in the past and favour hard protection structures which hold the coastline in its current position but are costly and take away the natural character of the shoreline? Or should New Zealand continue in the direction that national plans such as the NZCPS (2010) is taking and begin seriously considering alternative options such as managed retreat?

This research report investigated the barriers that the implementation of managed retreat faces as a coastal management strategy. This research had a particular focus on the case study of Clifton Camp in Hawke's Bay, which is currently dealing with coastal erosion and its subsequent hazards and management issues. This research objective lead to the following research questions that underpin the scope of the research report:

- 1) Is managed retreat an appropriate management strategy?
- 2) Has the implementation of managed retreat been provided for within both central and local government legislation?
- 3) What are the barriers to implementing managed retreat from coastal erosion?
- 4) How can these barriers be overcome so that managed retreat can be implemented as a management strategy for coastal erosion?

As a result of the research, including desktop analysis of local and central government plans and policies, interpretation of GIS mapping and key informant interviews several clear research findings were established. The results from the GIS mapping showed that Clifton Camp was located well within Coastal Hazard Zone 1, as defined in the Hawke's Bay RCEP. Additionally, it was seen from a cross section of erosion mapped on the road into the camp ground that erosion of the coastline was occurring at close to five metres every year.

While much of the literature suggested that managed retreat was an appropriate management strategy, there were a number of criteria that were raised before retreat would be suggested for a location. These criteria, consisting of the cost effectiveness of implementing managed retreat and the value of the land that would be lost were both tests that would need to be passed

before managed retreat would be seen as appropriate for an area. If these criteria were not passed then it was believed that alternative management methods be considered.

The research undertaken also found that the implementation of managed retreat within New Zealand was provided for within policies in the NZCPS (2010) while it was provided for more locally within the Hawke's Bay RCEP (2006). Despite these policies stating that managed retreat needed to be considered alongside other coastal management strategies, there was no evidence of a managed retreat plan of strategy in place in the Hawke's Bay in which to facilitate this implementation. Until this takes place the policies in these plans will remain suggestions of how the coast should be managed.

The report also analysed two coastal locations which have already gone through the process of choosing a management plan to implement with one, Muriwai Beach in Auckland implementing managed retreat while the other, Urenui Beach, choosing to hold the line and erect a protection structure. These case studies provided lessons on the right way to deal with communities if managed retreat is a strategy that is wished to be implemented. Most notably, achieving consultation with an unbiased group of stakeholders who represent a wide range of the community will create a fair and constructive process. It was also noted that planning processes which are drawn out and do not achieve results may cause the community to lose faith in the process and become entrenched and unwilling to be negotiated from their own opinion.

Resulting from the research of coastal erosion management strategies, a number of factors were noted which appeared to act as a barrier to managed retreat being implemented. These barriers were identified as being the cost of implementing managed retreat, the loss of the property to the ocean and the negative attitude of the community towards managed retreat. A possible solution to the barrier of the cost of managed retreat was spreading the cost, first amongst those who directly benefit from the process and then amongst the further community. As shown in the Muriwai Beach example, the cost can also be spread over a period of time, making the initial cost much less. In regard to the negative opinion held by the community, a possible solution identified was to hold further consultation which aimed to educate the community about managed retreat in order for them to better understand the strategy. It was noted that, while further consultation could be a solution, it was important that this could not be consultation for the sake of it. Results needed to come from the process or else the community would tire of the process. Finally, only suggesting and attempting to implement managed retreat when it was an appropriate option was seen as a solution to the barrier of the land being lost. The personal experience of losing ones property to the ocean should not be easily passed over

and it is important to consider all of the factors before managed retreat be proposed. It is also important to make sure managed retreat is a financially and socially viable option before it is considered as a management option. If there are important assets and infrastructure situated on the land which is proposed for managed retreat, it may be more financially viable to hold the line rather than pay to relocate it elsewhere.

In regard to the Clifton Camp example, it appears that managed retreat is a viable option. The land that the camp is situated on is valuable in the fact that it has sea views and is in a scenic location. If a hard engineering structure were to be implemented then these factors may be degraded. The camp already has a location to move to which still holds the same benefits that the current location does, however it is less susceptible to coastal erosion. While the Hastings district Council is willing to help fund protection works now, it is unlikely that they will continue to do so to such an extent in the future and this is something that the camp should be wary of.

6.1 Recommendations

The implementation of managed retreat within New Zealand, and more specifically at Clifton Camp still has a long way to go before it is seen as a viable option alongside hard and soft engineering. This is despite its provision within both regional and central plans. In order to promote its implementation as well as assisting local authorities to come to a final decision in regard to the management of coastal erosion at Clifton Camp, a number of recommendations have been developed.

Recommendation 1: Clifton Camp uses the temporary protection structure that is currently consented to allow the removal of its assets and infrastructure from the camp. The Camp should then relocate to the location provided for by the Hastings District Council and allow its current location to naturally retreat.

Recommendation 2: Hastings District Council and Hawke's Bay Regional Council work together to create a Managed Retreat Strategy Plan. There needs to be a regional plan in place which extends from the policies in the RCEP in terms of the implementation of managed retreat and sets out guidelines to how managed retreat might be implemented within the region.

Recommendation 3: Undertake further consultation with both the wider community and those immediately affected with the intention of coming to a solution. The

Hastings District Council putting the concept of managed retreat on hold for a further two years, as stated in its current Annual Plan, is just avoiding making a decision. Coastal erosion will not stop occurring while the management of it is put on hold and decisions need to be made as to the future of the coastline, whether they involve managed retreat or not.

Recommendation 4: Information needs to be provided to coastal communities to further educate them on coastal erosion and the possible implications of each management strategy. Communities that are better educated on the issue will be able to participate more effectively in consultation and be more knowledgeable when it comes to recommending a viable management strategy.

Recommendation 5: The Hawke's Bay Regional Council and the Hastings District Council need to come to a firm agreement as to what and how much each council is willing to contribute to the management of coastal erosion. This will allow better informed decisions to be made as the funding of the outcome of this will be clearer.

Recommendation 6: Take into account lessons from councils which have already been through this process and use the positives and negatives of these processes to create a better coastal erosion management system for the Hawke's Bay Region.

Recommendation 7: To continue research into the topic of coastal erosion within Hawke's bay to be able to better identify possible future issues. Clifton is not the only area within Hawke's Bay that is being affected by coastal erosion but it offers an opportunity for Councils within the region to learn from it and better manage future situations.

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Appendices

Appendix A – Key Informant Question List

Questions for Council Interviews

- What is the Council's current policy on managing coastal erosion?
- Does the Council consider retreat/relocation as a management option?
 - o If yes, do you believe this is with an even weighting compared to other hard and soft engineering options?
 - o Why?
- What barriers do you believe Hawke's Bay face in implementing a managed retreat strategy?
- What do you perceive the Hawke's Bays public's opinion to be on managed retreat?
 - o If negative/positive, why do you believe this to be so?
- Generally, is the cost of relocation more than the cost of protection?
 - o Would the difference in cost influence the strategy implemented in the area?
- Where does the funding for coastal management come from? Public vs private? How is this funding allocated?
 - o Eg if council assets are involved, does this affect the difference in funding?
- Will the council's policy towards coastal management change as climate change comes into effect?
- If managed retreat were to occur, do you believe the council would be prepared to fund relocation?

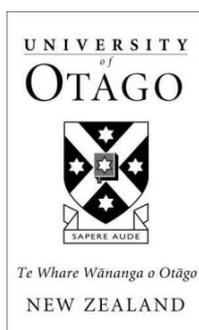
Clifton Camp

- Why do you think erosion is occurring at such an accelerated rate in the Clifton area?
- Do you believe managed retreat/relocation is a viable option for Clifton camp?
- What other methods of implementation do you believe would be suitable for Clifton?
 - o Are any of these more supported by the community?
- Would the council pay for the relocation of the camp?
- Is the land at Clifton too valuable to lose?
 - o What factors influence whether an area is suitable for managed retreat or not?
- In your experience, is there a big difference in perception of managed retreat between residents of the Clifton area and the wider community?
 - o How do you think this perception could be changed for the positive?

Appendix B – List of Key Informants

Key Informant	Occupation
Key Informant 1	Senior Environmental/ Asset Engineer – Hawkes Bay Regional Council
Key Informant 2	Team Leader Policy – Hawke’s Bay Regional Council
Key Informant 3	Environmental Policy Manager – Hastings District Council
Key Informant 4	Senior Consents Planner – Hastings District Council

Appendix C – Information Sheet for Interview Participants



Managed Retreat from Coastal Erosion: the movement of people and their coastlines

Information Sheet for Interview 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?

The main aim of this research is to investigate the barriers to successful implementation that managed retreat faces as a coastal management strategy

What Type of Participants are being sought?

A range of participants are being sought and include; members of the Hawke's Bay Regional Council and Hastings District Council staff who have been involved with the management of coastal erosion in the chosen case study locations.

What will Participants be Asked to Do?

Should you agree to take part in this project, you will be asked to take part in a semi-structured interview of approximately one hour. It will involve the interviewer asking questions about coastal erosion and managed retreat within New Zealand.

What Data or Information will be Collected and What Use will be Made of it?

The interview will be audio recorded and segments are likely to be used as part of the researchers Master of Planning thesis. All attempts will be made to preserve participants' anonymity. While some identifying information may be collected at the time of the interview – including full name and job position – this will not be stated in the project report. Participants will be referred to as 'Key Informant X'. Identifying information and full interview transcripts will only be made available to the researcher and their supervisor at the University of Otago.

Data will be securely stored on a password protected computer that only the researcher has access to. At the end of the project any personal information will be destroyed immediately, except as required

by the University's research policy. Any raw data on which the results of the project depend will be retained in secure storage for five years, after which it will be destroyed. Reasonable precautions will be taken to protect and destroy data gathered by email. However, the security of electronically transmitted information cannot be guaranteed. Caution is advised in the electronic transmission of sensitive material.

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 your anonymity.

Participants will have the opportunity to withdraw any statements given during the interviews. Such omissions should be requested before September 30, 2013. Likewise, participants will be given the opportunity to view the data or information that relates to them. Again, this should be requested before September 30, 2013. Participants are also welcome to request a copy of the completed thesis. It is expected that the final thesis will be available by March 2014.

Can Participants Change their Mind and Withdraw from the Project?

You may withdraw from participation in the project at any time and without any disadvantage to yourself of any kind.

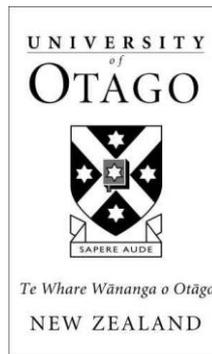
What if Participants have any Questions?

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

Laura Tinker	and/or	Senior Lecturer Wayne Stephenson
Department of Geography		Department of Geography
Phone: 0274219893		Phone: 03 479 8776
Email Address: tinla189@student.otago.ac.nz		EmailAddress: wjs@geography.otago.ac.nz

This study has been approved by the Department of Geography. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph 03 479-8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

Appendix D – Consent Form for Participants



Managed Retreat from Coastal Erosion: the movement of people and their coastlines

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 understand that I am free to request further information at any stage.

I know that:-

1. My participation in the project is entirely voluntary;
2. I am free to withdraw from the project at any time without any disadvantage;
3. Personal identifying information from audio tapes will be destroyed at the conclusion 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 will involve the topic of coastal erosion and the strategies towards management of coastal erosion. The precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the interview develops. In the event that 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. There are no known or anticipated risks to participating in this study;
6. There will not be any compensation for participation in the study;
7. The results of the project may be published and available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity;
8. I grant/ do not grant * permission to allow the researchers to audio record my interview
9. I grant/ do not grant * permission to allow the researchers to audio record my interview

*Please indicate by circling

I agree to take part in this project.

.....
(Signature of participant)

.....
(Date)

