

Managed Retreat from Coastal Hazards : Options for Implementation

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Partial funding and support was provided by:
Auckland Regional Council, Environment Bay of Plenty and
Thames Coromandel District Council



Auckland **Regional** Council



ISSN: 1172-4005

April 2006

Document #: 1130816v2

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Date March 2007

Approved for release by:
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Date March 2007

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Foreword

This report was co-funded by a project team from Environment Waikato, Thames Coromandel District Council, Auckland Regional Council and Environment Bay of Plenty.

Coastal hazards result from the interaction of coastal processes with human activities and structures, and can adversely affect the economy, health, wellbeing and safety of people and communities. Where coastal erosion or flooding threatens valuable coastal land and infrastructure, structures have commonly been placed to provide protection. While those structures may protect the land and assets behind them, such works interfere with the natural functioning of coastal processes and can restrict public access and reduce existing values along the coastal margin, such as recreational, aesthetic, and natural character values. These values (as opposed to property values) are rarely quantified and therefore are generally not reflected adequately in decision making. This results in a conflict between the protection of (often private) property values, and retention of the public asset, the coastal system itself and its associated values.

Because of the recognised effects of armouring structures on public values, national policy (New Zealand Coastal Policy Statement) requires that the abandonment or relocation of existing structures be considered where existing structures or development are threatened by coastal processes.

Managed retreat is a term used to describe the approach that aims to manage hazard situations by shifting assets and activities away from the coastal processes threatening them, thereby removing the hazard. Development setbacks are one method already quite widely used to avoid hazards by separating development and coastal processes.

This report considers a range of options for implementation of managed retreat. These have largely been untried in New Zealand to date, and are presented in this report to provide a basis for further discussion on how managed retreat might operate in practice. Potential barriers and risks associated with the implementation of these methods are identified and discussed. They do not represent recommendations for action to any of the councils involved in the project. Rather this report provides an information base to assist in broadening the knowledge of coastal hazard management options.

The potential management options for a given site would have to be assessed in detail on their own merits. A range of hazard management options exist and many of the methods presented in this report could work in combination with other options, rather than in isolation.

The complex environmental, economic and social impacts associated with coastal hazard management make this subject potentially controversial. Comments and recommendations made in the report are those of the author, and do not represent the opinion of any of the project team, or of any of the councils involved in funding the project.

The document can be seen as a useful reference and a step toward better understanding and implementation of a sustainable approach to coastal hazard management.

The team would also like to acknowledge Robin Britton for her valuable input throughout the project, and Jim Dahm (Eco Nomos) for his peer review of the draft document.

Executive Summary

There are substantial areas of existing development at-risk from coastal hazards in the Auckland, Waikato and Bay of Plenty Regions.

Communities have two basic alternative choices for management of the hazard. These are to

- adopt a strategy of holding the line of the shore, which involves management of natural coastal processes, or
- adopt a strategy of retreat from the hazard, which involves managing development.

Holding the line of the shore has been the generally preferred approach over at least the last century. However, it is increasingly questioned because of the high ongoing cost, the adverse effects of protection works on beach systems, and the uncertain feasibility of maintaining protection works over large areas of retreating shoreline in the long-term. Consequently, the second strategy of retreat is receiving increasing attention with an emphasis on a managed process of retreat, i.e. "managed retreat".

However, managed retreat is not well understood in the New Zealand context? This report characterises managed retreat and reviews the main options available for implementation.

Existing research and experience with coastal hazards indicates that the majority of affected property owners will not voluntarily retreat unless forced off properties by coastal processes. This usually only occurs after protection works have been tried and failed, often with adverse effects. The rapid increase in coastal property values is likely to increase reluctance to abandon property in the future. Therefore, any process of managed retreat will require intervention by local or central government.

There is now substantial evidence that provision of information to people about the existence of coastal hazards on properties will not deter investment in those properties, cause people to retreat, or alter their expectation for provision of protection works. Therefore provision of information on coastal hazards, while necessary, is not a sufficient means of implementing managed retreat.

Regulation, via district or regional plan rules will be required to implement managed retreat. These rules need to address two key elements to be effective. These are to:

- prevent of attempts to install hard engineered protection works
- require relocation or removal of buildings.

The effectiveness of existing regulation by district councils is hampered by the inability of rules in district plans to control existing uses. Therefore regional rules may be required. Now would be suitable time for regional and district councils to collectively review rules and regulatory practice to determine the best overall approach within an explicit framework of managed retreat.

Relocation of buildings on existing properties is potentially cost effective. However, it is not clear what proportion of at-risk properties this would actually be feasible on. This issue needs to be clarified by further research.

Fee simple property tenure is probably the largest barrier to implementation of managed retreat. This is because it involves an expectation of permanent use of the titles. Unfortunately, the underlying physical land may not be permanent. This problem is compounded by the high and increasing value of coastal property.

Ultimately, where shorelines are retreating, society will have to adapt its expectations about the permanent utility of titles to reflect the impermanence of the land. A concept

like lease-hold land with a defined term of tenure would be better suited to areas at medium to long-term risk, but may be inadequate where the risk is very immediate.

Purchase of private property and vesting as reserve is not affordable because of the high cost of coastal property (there may be isolated exceptions). Also purchase of at-risk properties would send a signal to property investors that it is relatively safe to continue to invest in at-risk property, and thus compound the problem.

A theoretical option would be to purchase property and then lease it. However this may not be possible under current New Zealand tenancy law, and requires more detailed legal investigation. The option of purchasing and renting properties is not fully cost-effective under current market conditions due to the low rate of rental return on investment.

A lease-for-life option may be feasible in circumstances where the lease could have a relatively long-term, but this also requires more detailed investigation.

It may be possible to make regional rules that create a finite term for the use of land within coastal hazard risk areas. This term would relate to the estimated remaining useful life of the land. The legal and practical feasibility of this needs further investigation.

The option of purchasing, covenanting and selling properties could be used to control existing development in at-risk areas. However, the practical feasibility of this in relation to the scale of the problem requires further detailed investigation.

Overall, managed retreat is unlikely to be viewed favourably by affected property owners because of the potential loss in investment in the land. However, it may be more acceptable to the wider community who are likely to be more concerned about maintaining access to and the quality of beaches. Nevertheless, the abandonment of valuable coastal property to the sea represents a cost to society as a whole. Therefore the issue needs to be considered at a national level as well as a local level.

Managed retreat would need to be implemented as a long-term strategy. It may take several generations for it to become accepted as a normal response to coastal hazards. Councils would need to comprehensively integrate managed retreat strategies into long-term urban growth, infrastructure and reserves planning, as well as regulatory planning.

1 Introduction

Councils in the Auckland, Waikato and Bay of Plenty regions have identified substantial areas of existing coastal development that are at-risk from natural coastal hazards. This situation is not unique to New Zealand. It is a global coastal planning issue of growing significance.

The traditional response to these hazards is often some form of coastal protection work. There are long-held and increasing concerns about the high costs, long-term sustainability and potential adverse effects of hard protection works. In response to these concerns, the alternative of a managed retreat from coastal hazards has been proposed overseas and in New Zealand.

However, it is not clear what:

- managed retreat means in practice
- methods are available to implement it
- the broader implications for councils and communities are.

This report has been commissioned by Environment Waikato, Thames Coromandel District Council, Auckland Regional Council and Environment Bay of Plenty. It is to provide a better understanding of what managed retreat could mean in practice and the range of potential implementation options in New Zealand.

1.1 Objectives

To assess coastal managed retreat in the regulatory, economic and physical contexts of the Auckland, Waikato and Bay of Plenty regions.

- To investigate the range of potential options for implementing managed retreat and provide a comparison identifying:
 - what agencies would need to be involved
 - barriers to implementation
 - favourable conditions for implementation.

The following matters are to be taken into account in assessing options:

- affordability
- distribution of costs and benefits
- legal feasibility
- relevance to different hazard types
- practical effectiveness
- property owner and community expectations
- risk implications
- long-term effectiveness.

2 Managed retreat concepts

The term 'managed retreat' does not appear within either the Resource Management Act or New Zealand Coastal Policy Statement. Yet it is a concept in common use in global coastal management. Managed retreat is sometimes referred to as 'managed realignment' in Europe and as 'managed relocation' in the USA.

Managed retreat can be defined simply as any strategic decision to retreat in the face of a coastal hazard. The alternative strategic decision is to hold the line of the shore against coastal processes.

A strategic decision to hold the line of the shore usually involves some form of protection work that has the intent of either stopping or offsetting erosion, or preventing inundation (refer figure 1).

In contrast, a strategic decision to retreat involves either, withdrawing, relocating, or abandoning assets at-risk. This may involve either or both private and public assets (refer figure 1).

Either strategy involves a fundamental decision as to whether coastal development is to be managed, or whether coastal processes are to be managed. This is discussed further in section three of this report.

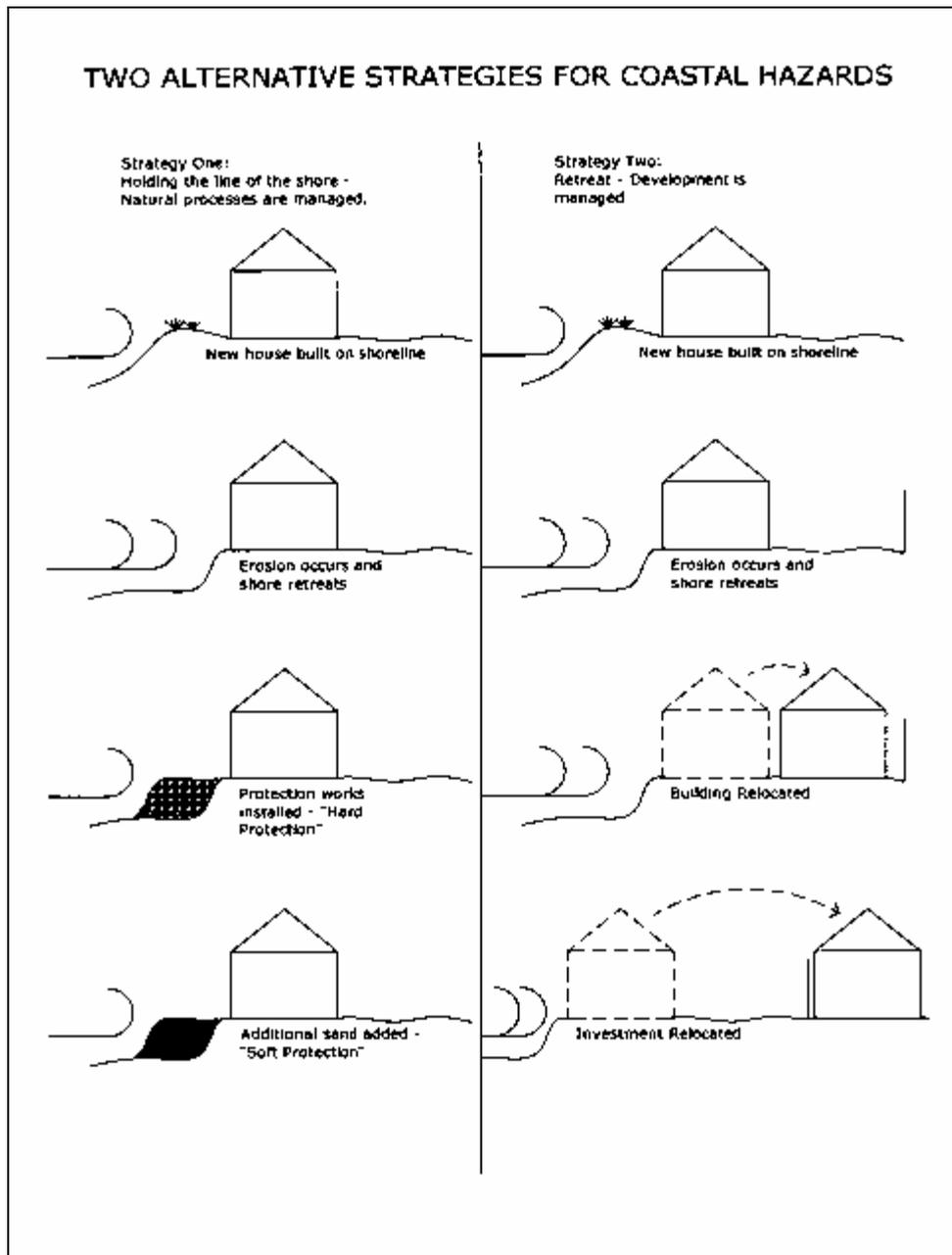


Figure 1: Two Alternative Strategies for Coastal Hazards

3 Decision making and management of coastal hazards

Communities within identified coastal hazard areas need to make decisions about how the hazard is to be managed. There are two broad alternatives for managing coastal hazards.

The first alternative is to maintain the line of the shore in its current position. This requires management of the natural processes.

The second alternative is for development to retreat from the shore. This requires management of existing development.

It is not the function of this report to comment on which alternative should be adopted. That decision will need to be made on the basis of the circumstances applying to individual beaches and associated communities within the framework of central and local government policy and regulation (refer to Section 4 for a summary of statutory requirements).

The first alternative of focusing on managing coastal processes has been the traditional approach to managing the hazard. The engineering and associated coastal process science are relatively well developed for this approach, and it is not considered further in this report.

The second alternative, of managing development has received less attention until relatively recently in New Zealand. There is a corresponding relative lack of information on the methods available for managing development to implement retreat.

Managed Retreat is a general approach, rather than a single discrete method to managing coastal hazards. Managed retreat can be implemented through a wide range of methods. The intent of this report is to outline a number of possible options for managing retreat that were identified by the project team, not to provide a complete list or discussion of all possible options for managing retreat. Some of these options are untried in New Zealand and have significant barriers to their implementation. A discussion of these options and associated strengths and weaknesses is provided for information only, and in no way represents Council Policy.

4 Statutory requirements

Consideration of managed retreat is relevant to the statutory functions of local government. Some of the relevant provisions are discussed below.

4.1 Local Government Act 2002

The Local Government Act 2002 (LGA) provides a general mandate for local government and sets functions and procedures. The overall purpose of local government is specified in section 10 of the LGA. Coastal hazards and the consideration of managed retreat are of direct relevance to this because of the extent of private and community assets at-risk (refer to Section 5 of this report).

10. The purpose of local government is—
 - (a) to enable democratic local decision-making and action by, and on behalf of, communities; and
 - (b) to promote the social, economic, environmental, and cultural well-being of communities, in the present and for the future.

Section 77 of the LGA concerns local authority decision making. This requires that alternative options be thoroughly investigated as part of decision making on any

substantive issue. In the context of coastal hazards, this means that consideration needs to be given to options for retreat as well as options for holding the line of the shore.

77. A local authority must, in the course of the decision-making process,—
- (a) seek to identify all reasonably practicable options for the achievement of the objective of a decision; and
 - (b) assess those options by considering—
 - i) the benefits and costs of each option in terms of the present and future social, economic, environmental, and cultural well-being of the district or region; and
 - ii) the extent to which community outcomes would be promoted or achieved in an integrated and efficient manner by each option; and
 - iii) the impact of each option on the local authority's capacity to meet present and future needs in relation to any statutory responsibility of the local authority; and...

Other sections of the LGA concerning functions, consultation and long-term community planning may also be relevant.

4.2 Resource Management Act 1991

The Resource Management Act 1992 (RMA) sets out functions for local authorities under sections 30 and 31 of the RMA. Some of these apply to natural hazards. Section 30 states:

- (1) Every regional council shall have the following functions for the purpose of giving effect to this Act in its region...
 - (c) The control of the use of land for the purpose of...
 - (iv) The avoidance or mitigation of natural hazards...

Section 31 states:

- (1) Every territorial authority shall have the following functions for the purpose of giving effect to this Act in its district:
 - (b) the control of any actual or potential effects of the use, development, or protection of land, including for the purpose of
 - (i) the avoidance or mitigation of natural hazards
- (2) The methods used to carry out any functions under subsection (1) may include the control of subdivision.

Neither sections 30 or 31 prescribe that remedying natural hazards is a local function. The emphasis is on controlling the effects of the use, development and protection of land for the avoidance or mitigation of natural hazards.

Local authority functions are to be exercised for the purpose of the RMA as expressed in Part II of the RMA.

The functions of district and regional councils set out in sections 30 and 31, potentially overlap except that regional councils cannot control subdivision, and district councils cannot control existing uses of the land. This overlap is addressed in section 62 of the RMA, which provides an optional mechanism for allocation of responsibilities for natural hazards between regional and district councils via the contents of regional policy statements. Primary responsibility defaults to the regional council unless the regional policy statement specifies otherwise. Section 62 of the RMA states:

- 1) A regional policy statement must state...
 - (i) the local authority responsible in the whole or any part of the region for specifying the objectives, policies, and methods for the control of the use of land—
 - (i) to avoid or mitigate natural hazards or any group of hazards; and...

- 2) If no responsibilities are specified in the regional policy statement for functions described in subsection (1)(i)(i) or (ii), the regional council retains primary responsibility for the function in subsection (1)(i)(i) and the territorial authorities of the region retain primary responsibility for the function in subsection (1)(i)(ii).

Part II of the RMA does not provide any express management direction in regard to natural hazards other than the general overall goal of sustainable management and the subsidiary matters of national importance and other matters. Some of these relating to the natural character of the coastal environment, public access to the coastal marine area and climate change have relevance to the management of coastal hazards.

Councils can control the use of the land to avoid or mitigate natural hazards, which can be achieved by rules in plans. However, rules are not the only methods that can be used to address hazards. Councils are generally required to select the most effective, efficient and appropriate methods to achieve the purpose of the RMA.

Managed retreat is one potential strategy for avoidance or mitigation of coastal hazards that has a range of potential implementation methods that are examined in Section 6 and 7.

4.3 New Zealand Coastal Policy Statement

The New Zealand Coastal Policy Statement (NZCPS) contains specific policies on coastal hazards, which are listed below. These need to be read in the context of other NZCPS policies and the purpose of the Resource Management Act 1991. The NZCPS is currently under review and these policies may change in the future.

Policy 3.4.1

Local authority policy statements and plans should identify areas in the coastal environment where natural hazards exist.

Policy 3.4.2

Policy statements and plans should recognise the possibility of a rise in sea level, and should identify areas which would as a consequence be subject to erosion or inundation. Natural systems which are a natural defence to erosion and/or inundation should be identified and their integrity protected.

Policy 3.4.3

The ability of natural features such as beaches, sand dunes, mangroves, wetlands and barrier islands, to protect subdivision, use, or development should be recognised and maintained, and where appropriate, steps should be required to enhance that ability.

Policy 3.4.4

In relation to future subdivision, use and development, policy statements and plans should recognise that some natural features may migrate inland as the result of dynamic coastal processes (including sea level rise).

Policy 3.4.5

New subdivision, use and development should be so located and designed that the need for hazard protection works is avoided.

Policy 3.4.6

Where existing subdivision, use or development is threatened by a coastal hazard, coastal protection works should be permitted only where they are the best practicable option for the future. The abandonment or relocation of existing structures should be considered among the options. Where coastal protection works are the best practicable option, they should be located and designed so as to avoid adverse environmental effects to the extent practicable.

Policy 3.4.6 applies to existing development in areas that are identified as being at-risk from coastal hazards. This policy expressly requires consideration of abandonment or relocation as an option. There is no express requirement for existing development to retreat. The requirement is to choose the best practicable option.

Most existing developed areas are not static and are likely to be subject to demand for additional development or redevelopment at some stage. New development within existing areas is subject to policies 3.4.4 and 3.4.5. The latter effectively requires that new development avoid coastal hazards. The long-term collective effect of these policies is that the process of development and use of the land should generally retreat with retreating shorelines, unless it would be inconsistent with the Resource Management Act to do so.

Therefore a better understanding of what managed retreat could involve is required to assist in determining its practicality as an option for existing development at-risk from coastal hazards.

5 Coastal Hazard Risk

5.1 How risk from coastal hazard arises and what is at-risk

Coastal hazards arise from the intersection of natural coastal processes with human activities and assets. The types of coastal processes that can give rise to a coastal hazard include coastal erosion, storm surge and tsunami.

These natural processes occur to varying degrees on all shorelines. They only become a hazard when people build houses or undertake other activities in areas where these coastal processes occur. A coastal hazard arises where people, buildings or other assets are vulnerable to harm or damage from the coastal processes.

Consideration needs to be given to what we mean by coastal hazard risk. Risk can be defined as:

The value of assets under threat multiplied by the probability of damage occurring and life lost.

The probability of damage occurring depends on the probability of an event occurring and the vulnerability of development to damage. This will vary depending on circumstances as outlined below.

Coastal erosion and storm surge events usually occur with sufficient warning for people to evacuate from at-risk locations. Therefore the likelihood of physical harm to people is relatively low. Tsunami generated by local earthquakes are an exception, because a large surge of water can occur with little warning time

However, even where people are not physically hurt, buildings or other development can be damaged. If the erosion is severe enough the land may become unusable for residential land use. This has a direct cost in terms of lost utility, and also in terms of the potential for a loss of land value (shorefront land value is typically 2/3 of capital value). Repeated damage to buildings can also result in a refusal to provide further insurance. Interruption to business activity also has a cost.

In addition, infrastructure such as roads, sewerage, water, electricity and telecommunications are at-risk. The value of this infrastructure and its vulnerability to damage needs to be taken into account in consideration of risk. Infrastructure such as roads in hazard risk zones may also service other communities, tourism and business

activities, which are not directly at-risk but would be adversely affected if services were cut.

Responses to the hazard in the form of protection works carry an environmental risk. These may have adverse effects on the character of coastlines and public access to and enjoyment of the coast. This represents a risk of costs to the wider community that are not usually valued in dollars. An example of use of non-market valuation techniques to estimate the environmental costs of protection works can be found in the Buffalo Beach Coastal Erosion Management Strategy, (Environment Waikato 2005).

Protection works can also potentially affect natural coastal sediment transport processes in a way that generates further hazard problems in adjacent areas.

5.2 The current state of coastal hazard risk

Councils are responsible for identifying and monitoring natural hazards under the Resource Management Act. This is occurring within most regions with identification and monitoring of the coastal hazard risk being undertaken in different ways according to the physical circumstances of regions. Information available for the Waikato, Bay of Plenty and Auckland Regions is discussed below.

5.2.1 Waikato Region

The open coast storm surge and erosion hazards have been identified for Coromandel Peninsula on the east coast of the Waikato Region. The risk to residential property is monitored and reported in the Environmental Indicators (<http://www.ew.govt.nz/enviroinfo/indicators/hazards/coastal/index.htm>) and is summarised below:

- approximately 920 properties on the Coromandel Peninsula are estimated to be at-risk from coastal erosion over the next 100 years (due to current coastal processes and future sea level rise)
- of these, about 670 properties are currently at-risk
- the number of properties and dwellings at-risk from erosion has increased since 1995.
- the total value of property likely to be affected to some extent by coastal erosion over the next 100 years on Coromandel Peninsula coastline is approximately \$850 million (based on 2004 capital value).

Actual market values are likely to be substantially higher than these valuations.

The hazard risk reported above includes sandy beaches on both coasts of the Coromandel Peninsula, but does not include the West Coast of the Waikato Region or coastal hazards on cliff and estuarine shorelines. Coastal hazards are known to exist in these areas but comprehensive information has not been collated to date.

5.2.2 Bay of Plenty

Coastal hazard areas have been identified for some parts of the Bay of Plenty open coast by various councils. Bay of Plenty Regional Council is developing a coastal hazard indicator methodology that collates this information. Preliminary information available for the open coast is summarised as follows:

- 1065 properties in coastal hazard zones
- 95 % of properties in coastal hazard zones have been built on
- 20 % of properties have been built on in the last 27 years
- 60 % (634) of properties are in primary risk zones that are at immediate risk from coastal erosion

- 40% (431) of properties are in secondary risk zones that are at-risk from sea level rise over the next 100 years
- the majority of these are in the Western Bay of Plenty (373 and 288 in Waihi Beach and Pukehina Beach respectively).

This does not include any properties within the Opotiki District as hazard analysis is still in progress in this district. Neither does it include properties adjacent to estuarine areas, which may be at-risk. Further information can be found in Draft Coastal Hazards Risk Indicators Pilot Report of Proposed Indicators, Environment BOP, 2005.

5.2.3 Auckland Region

Auckland Regional Council is in the process of undertaking a region wide assessment of coastal hazards. In addition, district councils within the region have completed hazard assessments for particular areas. Auckland has a relatively large area of urban development located around the shores of the Hauraki Gulf and Manukau Harbour. Some areas such as central Auckland coastal land are fully developed with high rise, commercial and industrial activities. In these areas the shoreline is artificially controlled by a combination of reclamation and protection work.

Extensive areas of the Auckland City coastline are protected by hard protection works, and beach replenishment is being used in some locations. One emerging distinctive feature of coastal hazards in the Auckland Region is extent of cliff top coastal property vulnerable to erosion and instability. Cliffs in some areas are estimated to be eroding at an average rate of between 2m and 6m every 100 years (Moon and Healy, 1994). Comprehensive region-wide information on coastal hazard risk is not available yet.

5.2.4 Tsunami risk

Tsunami risk is not included in the above assessments of risk. Further information on Tsunami risk for the Coromandel area and Bay of Plenty Region can be found in Tsunami Hazard for the Bay of Plenty and Eastern Coromandel Peninsula: Stage 2, Environment Waikato and Environment Bay of Plenty (2004).

Managed retreat from tsunami risk has been excluded from consideration in this report, pending completion of further research on tsunami risk currently in progress.

5.3 Property values and risk

New Zealand has had active real estate investment in coastal development since the middle of the 20th Century. Investment in coastal property began for lifestyle reasons as wealth and personal mobility increased. Over the decades demand for coastal property has resulted in increased property values. Demand for coastal property has also led to the corresponding growth of the coastal property development and investment industry. This trend is global in extent.

While lifestyle is still a component of the reasons for purchasing coastal property, expectations of future capital gain are increasingly important. The rate of increase in shorefront property values has accelerated over the last several decades.

Market conditions, investment expectations, and community values all affect the potential feasibility of options for implementing managed retreat. Therefore a reasonable understanding of these is important.

5.3.1 Coastal property values

Coastal property values affect the affordability and costs and benefits of managed retreat. Land value and Capital value also alter the coastal hazard risk.

It is claimed that waterfront (beachfront, lakefront and coastal) property values in New Zealand have appreciated in value at a level generally well ahead of the overall property market (Bayleys Research, 2005). Capital gains have been highest for absolute beachfront close to Auckland, with capital growth returns after inflation of between 13% and 15% over 21 years. On a compound basis, after inflation, returns from beachfront in the surveyed areas averaged around 14% per year.

Increase in the value of coastal properties further from the beachfront has been much less rapid, at approximately a quarter of the gain of beachfront properties. Quotable Value (Watt, 2005) New Zealand analysis of Omaha land valuation data shows a rising value gap between beachfront properties and properties even just one back. Valuations for land value only are as follows: Absolute beachfront: \$560,000, on street opposite beachfront, \$160,000, next two streets back, \$150,000, next street, \$140,000 and finally, at the back of the suburb, \$115,000. In 1992 the difference was far less. The average beachfront land value was then worth \$115,000, just over twice the next step back (\$55,000) and only 2.8 times the value of the properties at the rear of the suburb. Today, nine years on, the same ratio has increased to 4.8. There are similar escalations in beachfront value occurring in other east coast areas.

It is not clear whether these trends will continue. However, it is unlikely that shorefront property will actually decrease in value, unless there is a severe global recession, or investors start to incorporate coastal hazard risk into shorefront property values.

There are three sources of indirect evidence that the ongoing increase in shorefront property values is being driven by a self-fuelling expectation of capital gain as well as lifestyle benefits.

The first of these is that the increasing value gap between shorefront and non-shorefront coastal property discussed above.

The second is that the land value of shorefront property is typically 2/3 of capital value, whereas 1/3 of capital value for non-shorefront coastal properties.

Thirdly, rental rates for coastal property do not show the same degree of decrease with distance from the coastline that property values do. For example, rental rates in the Mount Monganu – Papamoa area are \$500 - \$550 per week whereas rentals two streets back are \$400 – \$500. Within the same area, property values drop by approximately half with each street back from the beach. The value of coastal land has out accelerated its income earning potential as a rental investment and this is most pronounced with shorefront land. This trend may not continue indefinitely into the future. However, rental properties have historically had a low rate of return on investment.

5.3.2 Property values and risk

A particular point of note is that shorefront values are continuing to increase in locations such as Waihi Beach and Wainui (Doole, 2005) where coastal hazards have been identified in district plans for some decades, protection works exist, and there has been a well documented and publicised history of erosion events.

Overall the existence of known coastal hazard is not having any obvious effect on the increasing value that the market places on shorefront property value.

The observed rapid drop in property values with increasing distance from the shorefront also suggests that coastal hazard risk does not affect property value significantly.

Historical attachment of hazard notices under the s.36 of the Building Act 1991 (c.f. s.71 – 74 of the Building Act 2004) or hazard related covenants do not appear to affect property valuations either (see Section 6.1).

International research referred to in section 5.5 indicates that the absolute preference for a shorefront location overrides hazard risk.

This then raises the question as to why coastal hazard risk is not being internalised within market values. There are various possible reasons as listed below:

Possibly hazard information is not readily accessible in some cases. However, the evidence suggests that even where hazards are well known and publicised, this information does not affect market values, or at least not to the extent that values cease to increase over time.

- Possibly the risk is taken into account, but it is given less weight for one or more of the following reasons.
- Information about coastal hazard risk is submerged within a variety of other information that investors take into account.
- A lack of current direct evidence of damage, i.e. people do not believe that assessments of risk are valid in the absence of visible or recent damage. Available evidence suggests that valuations do not take into account potential risk unless there has been actual physical damage to property within the last five years.
- A belief that any damage will be minor, or easily recovered from insurance, or is easily prevented by protection works (see Section 5.5).
- A belief that it just won't happen to them.
- A belief that the cost of damage can be prevented or remedied by publicly funded protection works. This expectation may be reasonably based on a history of ratepayer or taxpayer funded provision of hazard protection works.
- A rationalisation that the probability of serious actual loss over time is perceived as a worthwhile risk when compared against the potential for capital gain over a relatively short time period. For example, the probability of any individual shorefront property being damaged within any one five year period is relatively low even within areas at current risk. This can be compared with the capital gain over the same 5-year period.
- If the risk is relatively gradual and long-term in nature, it may be possible for the property to be brought and resold numerous times at a capital gain, without immediate coastal hazard risk.
- The risk is worthwhile for purely lifestyle reasons.

To the extent that these reasons are an accurate reflection of investor perceptions, the ongoing increase in the value of property at-risk from coastal hazards, could be regarded as a rational market decision.

Also provision of more accurate information on the probability and timing of hazards, may not necessarily deter investors, i.e. more precise information on coastal hazard risk may increase their confidence in the above rationalisation process, if it confirms that risk is relatively long-term or is of low probability.

The existing coastal beachfront property investment regime implies that retreat in any form is unlikely to be popular with property owners and would be strongly resisted unless compensation is provided (see Section 5.5).

5.4 Insurance and risk spreading

Insurance is a key economic component of modern society. Insurance enables risk associated with activities or assets to be spread more widely. The presence or absence of insurance affects coastal hazard risk in the following ways.

To the extent that insurance products are available, affordable and are taken up, the risk of coastal hazard damage to property can be spread over the wider community. It enables damaged buildings to be rebuilt. Thus to the extent that insurance policies permit, development in at-risk areas is facilitated.

Also to reduce future insurance losses, there is an incentive for property owners and/or their insurers to request protection works.

It is not clear to what extent coastal erosion and storm surge damage is covered by private insurance in NZ, as this depends on individual policies.

Ministry for the Environment (Bell, Hume and Hicks, 2001) publications indicate that the insurance industry is unlikely to provide cover for direct effects of sea level rise. In practice it may be difficult to separate out the effects of sea level rise from other coastal processes.

In New Zealand, the Earthquake Commission (EQC) provides partial cover for the effects of inundation but does not provide cover for coastal erosion. The EQC is not obliged to provide a payout where damaged properties have a hazard notice under section 36 of the Building Act 1991 (now repealed, but notices continue in effect). Private insurers may take a similar position. Notices registered under sections 71 - 77 of the Building Act 2004 may have a similar effect. It is not clear if this also applies to hazard covenants inserted on titles by other means, e.g. as a result of condition of resource consent.

There is anecdotal evidence that some shorefront property owners in high value areas would still be able and willing to rebuild damaged buildings even if insurance cover was not available. To the extent that this is factually correct, it suggests that the absence of insurance cover will not necessarily deter investment in otherwise attractive coastal hazard risk areas.

Overall, insurance cover of coastal hazards is partial and is subject to change. Where it does exist, it may facilitate development within coastal hazard risk areas. It may also contribute to pressure for protection works. Conversely, a strategic decision to retreat from the shore may affect renewal of existing insurance policies for shorefront properties.

Further discussion with the insurance industry needs to take place when undertaking any detailed assessments of options at particular locations.

5.5 The social, economic and political context

Available international literature on people's perceptions of coastal values and coastal erosion has been thoroughly reviewed by Environment Waikato, (2003). The summary from that report is repeated below.

"In general, property owners are not deterred by erosion and there is an emphasis on decreasing or preventing erosion rather than relocating. For those on the shoreline, the attraction of living in an environment of persistent appeal outweighs the costs involved.

While beaches are appreciated for their natural setting, most people prefer artificial structures to preserve the status quo, rather than the idea of allowing natural processes to do their work at the coast. For property owners, adjustments tend to be measured

simply in terms of their success in preserving homes or land. This has significant implications for approaches such as “managed retreat” and the establishment of a resilient naturally functioning coastline, now being widely promoted by coastal managers.

Beachfront owners tend to use only those adjustments, which they perceive as being possible, defined by experience, subjective economic efficacy criteria and legal guidelines. Individuals may not be aware of all strategies for dealing with a hazard and the usual pattern is to repeat remedial activities that have “worked” in the past.

In general, engineering adjustments tend to be preferred, particularly rock walls (“rocks, BIG rocks, THOUSANDS of rocks” as one respondent in a survey reported). It has been observed that beach frontagers have an almost infinite faith in boulder walls and feel remarkably secure once they reside behind one!

Protection decisions are often generated by crisis erosion conditions. In situations where coastal structures are poorly regulated, there is a lack of community cohesion and no informed technical opinion, affected individuals can tend to adopt a wide variety of ad hoc adjustments.

As yet, relatively few property owners have adopted or are prepared to consider non-engineering approaches. Nonetheless, there is evidence in some studies of community awareness of the adverse effects of seawalls and a willingness to adopt non-structural approaches, including minimising occupancy of the foreshore and protecting dunes.

In many areas, beach nourishment is also highly favoured by beachfront owners and the wider community, because of the enhancement of recreational values, property values and beach quality.

The available literature suggests that most oceanfront property owners have to be forced off their property by nature and find no incentive to relocate or demolish their houses. In the owner’s perspective, the house can be replaced, as long as enough land remains to build upon.

Available studies, largely within the US, suggest a general perception among beachfront property owners that various levels of government should largely pay for protection works, while the wider community emphasises the responsibility of property owners.

However, all sectors of the community reject the view that government has no responsibility. In general, they tended to support post-disaster assistance and the use of zoning and other regulatory mechanisms to control development in hazardous areas.

The meaning that erosion holds for the community as a whole significantly influences how coastal erosion is managed and can be a very “political” process.

Therefore, to facilitate more effective management of coastal erosion, consideration should be given to integrating technical information about hazards with the interests and values of affected parties, including the wider public, in order to develop common solutions.”

Relatively little research has been done on the perceptions of New Zealanders, but there is no reason to think they are likely to be substantially different than those of other similar countries as reviewed above.

People and communities have substantial assets invested in the coastal area. They also have an expectation of future expansion in wealth through capital gain and additional development. Talk of abandonment or retreat is contrary to this ethic and

investment regime. Therefore most coastal property owner's first preference will be to hold the line of the shore (there will be isolated exceptions). This preference may apply even if doing so is not the most cost effective option, or has adverse effects on coastlines. Managed retreat has a high acceptability hurdle to overcome, at least from the perspective of coastal property owners.

5.6 Circumstances where retreat could occur

Retreat from existing coastal hazards could occur or be forced where:

- The wider community is either unable or unwilling to pay for the costs of maintaining the shoreline in a fixed position indefinitely.
- Construction and maintenance costs of protection works are higher than the capital values of the assets to be protected.
- The cost of the adverse effects on the natural character and public access to the coastal environment are, or are deemed to be higher than the value of the property to be protected.
- Individual property owners cannot afford the cost of protection works, or can get a better return on investment elsewhere, or believe that it is not their responsibility.
- Protection works have failed.
- Erosion events proceed so rapidly that there is insufficient time to construct protection works.
- Property owners individually decide to relocate buildings. There are isolated examples of as discussed in Section 5.7, but these are the exception, rather than the common response of coastal property owners to coastal hazards.

5.7 Historical examples of retreat

There are historical New Zealand examples where retreat has been forced on individuals of communities by coastal processes. More recent examples are discussed in the following sections.

5.7.1 Mokau Spit, Waitomo

Mokau Spit is subject to episodic erosion events. Forty six sections were offered for sale in September 1957. Erosion was first recorded as an issue in letters from property owners in early 1960. By 1962 the erosion was severe and threatening properties, and by May 1962 some sections were being damaged. Erosion continued for several years.

Between 1962 and 1965, 11 sections were re-vested in the crown either by surrender of licences or leases or a transfer of properties held in fee simple. The Crown (former Department of Lands and Survey) made payments to the property owners. Original 1957 purchasers got a full refund, subsequent purchasers got 50% refund, and leaseholders received nothing (Gibberd, 2005).

Twelve sections have been lost to the sea. Protection works have been attempted and have failed. Erosion has been severe in the last 10 years and protection works have been attempted and failed. In at least two cases, owners have moved the houses further landward on their sections after the difficulties with protection became evident. However, in other cases where landward relocation is not practicable, owners have persisted with attempting unauthorised protection works – including up to the present. Figure 2 shows erosion and erosion protection works at Mokau.



Figure 2: Protection Work on Eroding Properties at Mokau Spit (Environment Waikato)

5.7.2 Muriwai Beach, Auckland

Muriwai Beach is one of Auckland's most popular regional park beaches with more than 840,000 visits per year. The beach is currently undergoing erosion at rates of 1 – 1.5 metres per year, possibly of a long-term cyclic nature. Erosion is affecting a variety of public recreational assets. Initial attempts at protection work failed. A recommendation to accommodate coastal erosion by a gradual process of retreat was made (Dahm, 2002). The regional and district councils adopted this recommendation with some minor changes in 2004, following the recommendations of a commissioner (Wakeling, 2004).

This may be the only New Zealand example of the implementation of a deliberate formal strategy of retreat. However, mainly public park assets and open space are at-risk.

5.7.3 Ohiwa Spit, Bay of Plenty

Ohiwa Spit is prone to periods of cyclic erosion and accretion spanning decades. An early hotel was lost to erosion. More recently, houses were lost to the sea during the 10 years from 1965 to 1975 as shown in Figure 3, which also illustrates failed protection works. Some houses were relocated (to Matata) but others were abandoned. Some of the titles were converted to public ownership but other titles remained in private ownership. In most cases, it appears that the titles surrendered to the Crown were in exchange for alternative land elsewhere. Those retained in private ownership were either not willing to accept the exchange or (in at least one case) were not offered alternative land because they already owned local land to which it was argued the houses could be moved. This area has since accreted as part of a long-term cyclic process of erosion and accretion. Many current private landowners want to build, including at least one owner of a section that was largely lost to erosion in the last erosion cycle.



Figure 3: Erosion at Ohiwa Spit, Eastern Bay of Plenty

5.7.4 Pourewa Point, Aotea Harbour

The settlement at Pourewa point is located near the entrance to the Aotea Harbour. It has been subject to episodic subdivision since initial subdivision in 1963. The most severe erosion occurred during the 1970's.

“Shoreline erosion between 1963 and 1995 resulted in the complete loss of at least 20-22 private sections, and partial or significant loss of a further 12. Significant areas of reserve were also lost.”

“A number of properties were abandoned during the 1970's, the owners often buying other local sections – which were relatively cheap compared to other coastal holiday settlements.”

“In response, property owners have attempted to mitigate erosion with a wide variety of shoreline armouring measures. Many of these measures are now in a state of disrepair and have given rise to concerns from local iwi with respect to adverse impacts on coastal values. Property owners also have ongoing concerns with respect to the hazard posed to their properties.” (Dahm, Riddel, 2000)

5.7.5 Te Kopi, Wairarapa

Properties at Te Kopi village on the seaward side of the main road to Cape Palliser were subject to erosion. Property owners attempted a variety of protection works but these failed and both properties and baches were lost to the sea. The style of baches and value of properties was relatively modest compared with those on east coast of Auckland, Waikato and Bay of Plenty Regions. More recently, resource consent has been granted to build a boulder beach protection work to protect the main road, which provides a strategically important connection to other parts of the district (Jacobson, 2004).

5.7.6 Waihi Beach, Bay of Plenty

Waihi Beach has a history of episodic erosion and storm surge events. Some residential buildings were voluntarily relocated in response to coastal hazard events early in the history of the Waihi Beach subdivisions. However, the majority of affected residents opted for protection works.

5.7.7 Wainui Beach, Gisborne District

Wainui Beach is subject to long-term erosion occurring episodically. Two buildings on Pare St were voluntarily relocated. However, the majority of property owners opted for protection works (Department of Conservation, 2004).

5.8 Managed Retreat and Local or Central Government Intervention

A purely individualised state of decision-making does not exist in relation to coastal hazards for the following reasons.

Property owners with assets at-risk have the opportunity to seek funding or other assistance from the rest of the community. Both local and central government processes provide opportunities for this.

Individuals may be able to spread risk more widely through insurance. However, there is only partial ability for individuals to spread risk through insurance.

During the latter half of the 20th century, coastal protection works were generally considered a public good and were subsidised to varying degrees by both general taxation and rates. Protection works were often installed as emergency or short-term measures without a lot of consideration to long-term maintenance costs, effects on the coastline, or the expectation of continuing protection that would be created. This has created a legacy of expectation that continues notwithstanding that central government subsidies are no longer available. Appendix B contains a summary of the history of Wainui beach protection works, which illustrates the long-term implications of initial decisions to fund or agree to protection works.

All people have a stake in the coastal environment, even where they do not own land. This is expressed through legislation to control adverse effects on the coastal environment, define the extent of private property rights in law, and give functions and duties to local government in relation to hazards.

Managed retreat implies a system of management. That “system” is most likely to be local or central government. Intervention requires careful consideration and justification. Managed retreat implies a coordinated process for relocation or abandonment of land. In its simplest sense managed retreat means that some intervention takes place. Types of intervention for implementing managed retreat are described in Table 1.

Table 1: Types of Intervention for Managed Retreat

Type of Intervention	Method	Section of This Report
Information	Information on the extent of natural hazards Information on options for managing hazards	Section 6.1
Regulation	Rules in district plans Rules in regional plans National legislation or regulations	Section 6.2
Financial Instruments	Purchase of property Subsidies for relocation Transferable development rights Insurance fund Taxation of risk	Section 6.3, Appendix H
Public Infrastructure	Decision making about the provision, maintenance or removal of public infrastructure	Section 6.4, Appendix F

The types of intervention and their implications are discussed in more detail in the sections of this report listed in the table. In practice, a combination of methods would be required for managed retreat. Therefore methods need to be grouped as packages as discussed in Section 7.

5.9 Scale of retreat

Retreat can potentially occur at various scales depending on circumstances.

5.9.1 Micro-retreat

Micro-retreat involves elevating buildings on piles. This approach is relatively common on some US coastlines.

This may be useful option where the coast is vulnerable to episodic erosion and storm surge, but is not affected by long-term erosion. However, where the erosion trend is one of long-term retreat, the building will ultimately succumb. Maintaining utility services may also be problematic, particularly if on-site effluent treatment is being relied on.

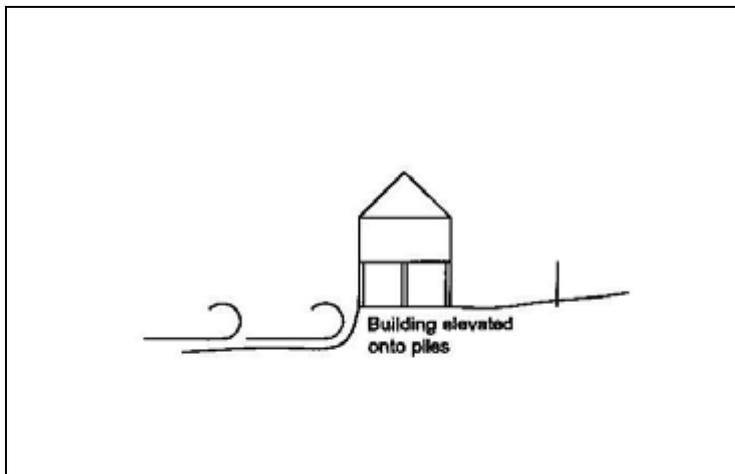


Figure 4: Elevation of Buildings on Piles

In theory elevating houses on to a pole platform should facilitate landward relocation of buildings when necessary. However, in practice, based on US experience, there is likely to be a tendency for owners to leave elevated buildings until the sea irretrievably damages them. This can have the effect of leaving houses on the coastline in various states of disrepair. The foreshore and beach becomes occupied by structures with consequent effects on public use and enjoyment of the coastline.



Figure 5: Retreat Along the Southern Portion of Kitty Hawk, USA: Houses on Stilts Being Abandoned to the Sea. Source J Titus (2002)

Literature sometimes states that elevation of buildings on poles allows for a more natural movement of sea and sand. This is partially true. But it is uncertain whether New Zealand dune vegetation, i.e. Spinifex can be maintained under a building elevated on piles. Consequently, wind driven erosion may be a problem and ultimately contribute to the hazard.

5.9.2 Relocation within a property

Shifting buildings back from the sea within existing property boundaries is the most commonly understood form of retreat. This is discussed in more detail in Section 7.2.

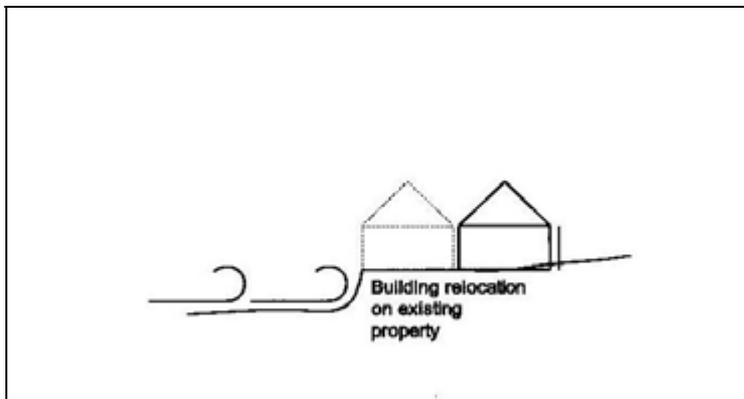


Figure 6: Relocation of Buildings on Existing Properties

5.9.3 Relocation to other sites

If relocating buildings within existing properties is not possible, then the next stage in retreat is to relocate whatever assets are salvageable to another property. If it were not cost-effective to shift the houses then they would have to be demolished. Relocation to another site is a much more costly process than relocation within an existing title, as a new site has to be purchased, and the existing shoreline site has to be abandoned.

5.9.4 Large-scale relocation of settlements

Where natural coastal processes will result in a long-term trend of erosion, large-scale relocation of communities could be necessary if a decision was made to retreat from the shoreline. This could occur as individuals remove assets from risk areas and

reallocate them. It could also arise as a planned response, which directs new development away from the hazard. Planned redevelopment or relocation of communities and development over time could take a number of forms. Some relatively simplistic schematic examples are outlined in Appendix F. All these scenarios have a high cost.

6 Methods of Implementing Managed Retreat

6.1 Provision of Information

Council functions (as discussed in Section 4) include the identification of coastal hazards and provision of that information to the public.

Information can be presented in forms that have statutory significance such as: district plans, regional plans, Land Information Memoranda (LIM) and by placing notices on titles under section 71 – 74 of the Building Act 2004 (c.f. 36 of the repealed Building Act 1991).

Alternatively, information on hazards can be presented through non-statutory methods such as technical reports, other publications, information on public websites, or public meetings.

As discussed in previous sections, there is no obvious evidence that provision of information on potential or future coastal hazards has a significant effect on the market value of at-risk properties, or peoples desire to develop, live on and protect at-risk properties.

For example, Appendix A contains valuation data supplied by Environment Bay of Plenty for Shaw Rd, Waihi Beach. This is a beach with a long history of coastal hazards that have been widely publicised and identified in the district plan. At this particular location properties are receiving partial protection from existing protection work, and there is currently a proposal to upgrade the protection work.

Some of the properties have notices warning of the hazard entered on titles under section 36 of the Building Act 1991 (now repealed, see sections 71 - 77 of the Building Act 2004 for equivalent provisions). In addition, some recent buildings are subject to consent conditions and related covenants requiring relocation or removal of buildings if threatened by coastal hazards. The district council has attached these instruments to titles when buildings are extended or replaced by property owners. The existence of these instruments does not appear to have affected the values of the properties and values continue to increase at Waihi Beach.

A similar example can be found in Thames Coromandel District, where there has been coastal hazard information included in the Land Information Memorandum (LIM) of properties since the 1980's. The hazard zones were reviewed in 2002 and more detailed information was mailed to individual property owners and included in LIM reports. The release of this hazard information in 2002 generated only minor concern among property owners and has not had any obvious effect on property values.

Actual substantial physical damage to properties may have an effect on market values. For example, one UK survey of property valuers found that where properties had been affected by flooding within the last 5 years, values were discounted by between 12-15% and properties take 2-3 months longer to sell. Valuations of properties at-risk but not flooded in the last 5 years show a less marked effect (Wordsworth, Proverbs and Antwi, 2003).

Provision of accurate information on coastal hazards is a necessary prerequisite to any consideration of options and strategies for managing those hazards.

Identification of at-risk areas in statutory plans is important to ensure that property owners and purchasers are made aware of any risks that relate to property to help facilitate informed purchase and development decisions. It is also critical for any hazard management approach involving the management of development – including any strategy involving managed retreat. It also reduces potential for council liability via the submissions and hearing process, which provides opportunities for the information to be contested. The contents of district plans and LIM are important legal reference sources for property purchasers and their advisors.

The overall message would appear to be that communities draw information about the risk from a number of sources and not just from the hazard lines or covenants applied to their properties. If councils are to ensure that the market is well informed, it is important they provide consistent messages. Inappropriate decisions in regard to shoreline armouring works, for example, may well undermine the messages that would otherwise be communicated by means of covenants or hazard lines.

More research needs to be undertaken on how property purchasers and their advisors receive and evaluate hazard information – to ensure that implications are fully understood and that councils are not sending conflicting or inconsistent messages. Such work would also help identify any further information or action that may be required to better facilitate informed decisions about hazard risk properties.”

It is unlikely that even a well delivered information package will alter coastal property investment decision making to the extent that market values take into account the potential impermanence of the land. Neither is it likely to result in voluntary relocation. Therefore provision of information on coastal hazards is not effective as a stand-alone method for implementing retreat. However provision of good information is critical to the success of any of the other options listed below.

6.2 Regulation

If regulation is to be used to implement retreat it will need to be of a form that achieves two key goals:

- prevent the construction of protection works
- require relocation or removal of buildings once a preset level of hazard or damage is reached.

The regulatory tools that are available to councils are discussed in the following sections.

6.2.1 District Plan Rules

Rules in district plans can be used to control subdivision and/or new activities on land subject to hazards. A number of district councils now have rules that control building and subdivision within identified hazard zones sometimes referred to as “setbacks”. Examples can be found in the district plans for the Western Bay of Plenty, Tauranga, Gisborne and other districts. Details vary between districts but typically:

- Subdivision to make additional residential lots in hazard areas is not allowed.
- New buildings in hazard areas require consent and may be prohibited in extreme risk areas in some districts.

- Consent conditions for new buildings typically require that the building be relocatable, and some cases require that buildings be relocated or removed if threatened by a hazard.

A sample of draft conditions of consent from Western Bay of Plenty District is contained in Appendix D: Standard Conditions for Development in the Western Bay of Plenty. A covenant on the title gives additional effect to the consent conditions.

With greenfields sites a coastal hazard zone or setback can be applied to ensure that all the buildings are located behind the coastal hazard line or setback. However, where existing developed areas are within a coastal hazard area or setback, the situation is not so simple.

Rules in district plans cannot be used to control activities, which have “existing use rights” on land subject to hazards. Buildings that have been constructed before the coastal hazard rules came into effect, have existing use rights as described in section 10 of the Resource Management Act. This means that the relatively recent coastal hazard rules referred to above do not apply to buildings constructed before the rules took effect.

Control can only be exerted when buildings with existing use rights are substantially extended or upgraded by their owners. Even where a building is modified or replaced, existing use rights still apply. Property owners can rebuild within the same general footprint of a previous building provided the effects are the same or similar in character and scale to the previous building. This applies even where new buildings are a prohibited activity.

“A dwelling with an existing use right can be reconstructed as of right where it has been destroyed by a natural hazard and where the operative district plan otherwise prohibits the erection of dwellings” (McKinlay v Timaru DC EnvC C24/01).

Because of existing use rights, it is not always possible to require property owners who are upgrading or replacing existing buildings, to relocate or rebuild in a position further back from the shore than the existing building. However, Thames Coromandel District Council has had some success in situations where the new buildings exceed existing use rights, and approximately 40 – 50 houses have been setback from the extreme risk area over the last 10 – 12 years. Given sufficient time, and room to relocate, this form of setback is a useful form of managed retreat, although the properties may still become unusable in the long-term (50-100 years) as a result of climate change.

Existing use rights create a practical problem in that existing buildings may remain unaltered (in terms of effects) and therefore uncontrolled for some time. This creates a patchwork of existing development with and without relocation controls as shown in Appendix A: Shaw Rd Waihi Beach Values. The end result can be a situation where similar adjacent land uses are subject to completely different regulatory obligations. Gradual redevelopment of sites with new buildings that are larger than existing buildings can progressively result in more properties becoming subject to relocation controls. This has happened in the Waihi Beach example illustrated in Appendix A. However, this process is gradual and also results in the value of assets at-risk increasing. The rate of urban renewal varies from location to location depending on market demand.

The application of these rules is relatively new and as yet no known examples of a district council that has actually had to enforce conditions of consent requiring relocation or removal of a building off a site altogether. There are legal issues about the enforceability of such conditions in situations where an existing use right existed. It is possible that property owners will resist enforcement of the rules.

Because of the difficulties associated with existing use rights, district council application of coastal hazard setback rules to existing at risk development, may or may not be legally sufficient to enforce managed retreat in the long-term. Consequently, district councils are typically cautious about advocating such regulation as “managed retreat”. But it is a positive step toward managed retreat and appropriate conditions of consent may make it physically easier to relocate buildings, and gives owners and investors “fair warning”, thereby facilitating retreat in the future.

District councils can also use rules to control coastal protection works on land, which typically require consent. Councils can come under considerable pressure from landowners to grant consent to new works, or to retrospectively consent illegal works. In some cases the Council may be the applicant or the landowner or both.

6.2.2 Regional rules

Regional rules can potentially control both existing and new development on land, but not subdivision. Regional rules can potentially be used to extinguish existing use rights. This is because section 20A of the Resource Management Act 1991 limits existing use rights when a new regional rule becomes operative.

However, most regional councils have chosen not to make rules controlling development within coastal hazard areas, and instead leave this function of control to district councils.

One exception is Canterbury Regional Council, which has rules controlling building and other activities within coastal hazard areas (otherwise known as setbacks) (Canterbury Regional Council, 2003). These rules allow existing uses to continue, but buildings damaged or destroyed by the action of the sea cannot be rebuilt as of right. Depending on the location and size of the building, replacement is either a prohibited or a discretionary activity. There are also prohibitions on new buildings above a certain size. In this case regional rules are expected to have the long-term effect of progressively rolling development back on a retreating shoreline. This approach is somewhat similar to that used in some states of the USA.

Regional councils can also control protection works in the coastal marine area, and potentially on land too.

6.2.3 Central Government legislation and regulation.

There is no existing central government direct regulation of activities in relation to coastal hazards. However, the Minister of Conservation has specific functions to administer the New Zealand Coastal Policy Statement, approve regional coastal plans, and is the consent authority for restricted coastal activities (which may include large coastal protection works). The Minister also has other functions under the Reserves Act and Foreshore and Seabed Act. Collectively, these have an indirect effect on coastal hazard management.

In addition, section 360(1)(i) of the Resource Management Act provides that:

- (1) The Governor-General may from time to time, by Order in Council, make regulations for all or any of the following purposes:
 - (i) Providing for any other such matters as are contemplated by, or necessary for giving full effect to, this Act and for its due administration.

This would appear to give Government the ability to make regulations relating to coastal hazards and managed retreat. This has not been undertaken to date. Further research and consultation should take place on this option.

6.2.4 Covenants

Covenants can be registered on property titles that require the owner to do, or not do, particular things in relation to the hazard. For example covenants could require that:

- buildings are to be removed or relocated when affected by the coastal processes
- protection works will not be built,
- no complaints about erosion to be made,
- no requests for protection works or consent applications to be made,
- penalties payments be made for the above.
- It may also be possible for covenants to set a term on the use of the land.

Covenants can be registered through a resource consent process as discussed in Section 6.2.1. Alternatively, properties can be purchased, covenanted and then resold as discussed in 7.4.1.

6.3 Financial instruments

6.3.1 Purchase of property

Local (or central) government could purchase property in at-risk areas. The houses could be removed and the land could then be used as public recreation reserve.

There is also an option of granting concessions or leases for commercial recreational activities on the new coastal reserve. These may attract more users and improve the overall benefit to cost ratio of land purchase. Alternatively the houses could remain and be leased back or rented to recoup some of the costs of purchase until such time as the risk is unacceptable. This is discussed further in Section 7.3. A further variation is to purchase the property, place a hazard covenant on the title, and then resell the property.

6.3.2 Subsidies for relocation

The cost of relocation could be subsidised by local or central government. This could involve the subsidisation of the costs of relocating buildings within existing properties, or relocation to other properties. This is discussed further in Section 7.2. An alternative is to provide the subsidy as a form of transferable development right as discussed in Section 6.3.5.

6.3.3 Taxation of risk or adverse effects.

Taxation can theoretically be used as a means of internalising the adverse effects of activities within market values. Tobacco tax and the more recent carbon tax are two examples of central government taxes on activities with adverse effects. To be applied to coastal hazards, a tax would need be applied to development within at-risk-areas. It is unclear whether direct environmental taxes are currently within local government powers. It would be also be unpopular. It is not considered further in this report.

6.3.4 Pre-paid relocation fund.

A system for pre-paying eventual relocation costs could be set up. The owners of at-risk property could contribute to a fund over time. Ultimately, when existing buildings are adversely affected by erosion, contributing property owners would be able to draw on the fund to pay for relocation of buildings.

It is unlikely that agreement could be reached to set up and run such a fund on a purely private and voluntary basis. Therefore a mandatory regime would be required. The contributions could take the form of a special local authority rate for at-risk properties with the fund being administered by the local authority. Considerable thought needs to be given to the practicalities of setting the contribution amount and allocating payouts fairly.

For example, on the Coromandel Peninsula east coast, research has identified about 920 properties that are estimated to be at-risk from coastal erosion by 2100, due to potential sea level rise. Of these, approximately 670 properties are currently at-risk, (they could be affected by erosion and inundation at any time), whereas the remaining 250 are considered likely to be affected in the long-term.

This creates a dilemma in that those currently at-risk (closest to the sea), would on average make fewer annual contributions than those at lower risk, before a relocation payout was needed.

It may be possible to reduce this problem by various mechanisms. Contributions could vary depending on the immediacy of the risk. Alternatively the fund could be split into two groups, or limited to the current risk group only. As the shore retreats over decades the current risk group increases proportionately.

For example, if it is assumed that:

- all houses are relocated within existing sections,
- relocation costs average \$50,000, and
- all 670 properties currently at-risk have dwellings, which need to be relocated;

then total payouts would amount to \$33,500,000. This excludes inflation, administration costs and any reinsurance or smoothing costs.

Although 670 properties are deemed to be currently at-risk, in practice they are not all going to be adversely affected at once. This is because the coastal processes do not act uniformly, the houses are not all at the same distance from the sea, protection works may exist in some localities, and there is a safety factor built into the estimate of current risk.

With further information about the probability of an event, it may be possible to estimate the average number of annual contributions an individual property owner would make before receiving a payout. This in turn could be used to set the annual contribution in order that the fund is fully funded by contributions. However, scientific information may not be sufficiently accurate at present. Even with the information, there is considerable uncertainty and risk.

Some additional complications are:

- Accumulated contributions at any point in time may not cover payouts, which would have to be financed externally. This cost would need to be estimated and built into the contribution.
- Some houses may not be relocatable within existing properties. Effectively these individuals suffer total loss if their property becomes unusable. Even if they received a compensation payout equivalent to relocation cost, this would be a small percentage of the total loss.
- The right to a payout benefit would need to transfer with sale of the property, (be sold to a new owner).
- Some property owners will end up paying more into the fund than their entitlement for a payout, unless cumulative individual contributions are capped at the estimated eventual relocation cost.

An alternative would be to pre-pay total loss, but even if this is fixed at today's costs this is roughly \$1.2 million per property or \$804 million total for the 670 properties currently at-risk. The average annual contribution would therefore be high.

All pre-pay options represent a form of compulsory saving, without a market return on investment (a bank return would be a normal minimum). Thus there is an opportunity cost of the income that could have been generated if the money was invested elsewhere. Arguably this is offset by the much higher rate of capital gain for shorefront properties in comparison to the lower capital gain from properties further back from the coast. However this trend may not continue indefinitely into the future.

Lastly, if a local authority became involved in running such a scheme there is a potential risk that the local authority (ratepayers), would inherit liability for any losses to private property owners or the scheme as a whole. This would need to be investigated further.

Overall it may be more cost-effective and administratively simpler to use a more direct form of relocation subsidy using special rating districts as discussed in Sections 6.3.2 and 7.2.

6.3.5 Transferable development right

Transferable development rights (TDR) use rules in plans to create an economic incentive to undertake development in a way that will mitigate an adverse effect.

A TDR to mitigate existing coastal hazards would need to provide a system that had the effect of removing at-risk development, and transferring that development right to properties further inland, or concentrating development into a more defensible position. The feasibility of using TDR for implementing managed retreat is discussed in more detail in Appendix G: Transferable Development Rights.

Overall TDR should remain an option for detailed consideration at individual beaches, particularly where either: relocation is feasible on existing properties, or where there is demand for redevelopment. However, the high cost of shorefront real estate indicates that TDR are unlikely to be a viable stand-alone mechanism in most locations. They may still have some value as a form of partial compensation. TDR require rules in plans and probably active facilitation by councils.

6.4 Public infrastructure

6.4.1 Effect of existing infrastructure on retreat feasibility

Modern coastal development consists of a combination of private development and infrastructure networks. Roads provide physical access to properties and are also the main corridor for other infrastructure such as water, wastewater, telecommunications and electricity supply. Infrastructure may be publicly owned, as is usually the case for roads, or privately owned, as is usually the case for telecommunications. Other community assets include public buildings, reserves and other facilities. The ongoing viability of residential and commercial development is dependent on infrastructure. Therefore the consideration of managed retreat needs to take account of infrastructure as well as residential and commercial buildings.

The overall form of existing development can have a significant effect on the practicality of retreat. This can be demonstrated by reference to three common patterns of coastal residential development as outlined below.

6.4.2 Shorefront Road with residential development landward of the road

This is a typical scenario of a shorefront road, with the sea and coastal reserve on one side and houses on the other (refer Figure 7). The houses depend of the road for physical access. The road also provides the corridor for wastewater, water, electricity and other services.



Figure 7: Road on Seafront at Buffalo Beach with Residential Development Located Landward of the Road (Photo: Environment Waikato)

In this scenario ongoing coastal erosion will affect the road before it affects the private properties. Damage to the road and utilities will affect the ongoing viability of the settlement even if the private buildings are not immediately at-risk. Further, if the road connects other communities, they will also be affected if the road is not maintained.

Because the road will be affected first, Councils will be confronted with a decision about the future of the road first. This is most likely to be in the form of a demand to provide publicly funded protection work to save the road and thus also the properties behind it. Managed retreat in this scenario is more costly.

Removal or abandonment of the road will adversely affect the viability of the properties, even if they are not immediately affected by erosion. This would give rise to an expectation of either compensation, or provision of an alternative access route to the rear of sections. That may, or may not be possible, and relocating the road landwards is likely to require purchase of property (further research is needed to clarify council obligations on road stopping). Either alternative would be costly, as would protecting the properties in perpetuity on an eroding shore.

Loss of a legal right of access to the shore is also likely to be a significant issue to the public.

It is also likely that any initial erosion of the road will be gradual and able to be rectified by relatively low cost initial works. Consequentially, armouring is likely to be a gradual process occurring incremental costs over time. Therefore the marginal cost of adding additional protection at any point in time may be relatively low in relation to the total cumulative value of work and sunk investment. In this incremental situation, the total long-term costs, including effects on the environment, of protection may not be addressed adequately in decision-making processes.

For areas with this form of development it is probable that any form of retreat from coastal erosion will require substantial public funding. Therefore it is less likely that retreat will be a cost effective option. Exceptions may arise where:

- the cost of protection work is unusually high,
- the value of maintaining a natural shore or shorefront reserve takes precedence,
- a new public road can be provided at the rear of sections at modest cost.

Also, given sufficient advance warning it may be possible to spread the cost of relocating the road and associated infrastructure over time, i.e. do the work in sub-stages.

This scenario needs a long-term strategic approach, particularly on shores subject to long-term erosion.

6.4.3 Shorefront residential development with road access from the rear

The second typical scenario involves residential development on the shorefront with roading and other services located at the back (landward side) of the properties.



Figure 8: Private Properties on the Shorefront at Buffalo Beach with Road Access from the Rear of the Sections (Environment Waikato)

Ongoing erosion will affect the private properties before it affects the road and associated utilities. Therefore connections to roading and other utilities can be maintained despite erosion at the front of properties.

Councils may still face pressure from landowners to provide protection work, but this will be for the protection of private property rather than public infrastructure. In many cases there is a council reserve between the between the private properties and the sea. The reserve must first erode before the properties will be damaged. In this situation councils may come under pressure to locate works on the reserve to protect private property. This is discussed further in section 6.4.1.4.

The costs of retreat are initially confined to the costs of shifting buildings landward and impact on infrastructure will be minimal (on-site effluent disposal may be an issue). However, ultimately over time as erosion progresses and the land becomes unusable, the front row of houses would need to be removed altogether. Once all development seaward of the road is removed the situation then becomes similar to the first scenario above, with the road now at the front of any other properties.

6.4.4 Shorefront development with access roads perpendicular to the shore

The third typical scenario involves shorefront housing with access roads running perpendicular to the shore. Erosion will affect the shore frontage of properties and the road end simultaneously. Physical access and utility connections will remain proportionately as erosion proceeds.

Servicing of sites is not likely to be affected until erosion has proceeded to the point at which there is not enough of the site left for a building, utility connections or on-site effluent disposal. Some form of progressive decommissioning of utilities would be required, as individual sites no longer become usable. This is probably the most advantageous scenario with respect to facilitating retreat.

Where urban redevelopment is occurring for other reasons, opportunities to convert shore parallel roading networks, to shore perpendicular networks should be investigated on shorelines potentially subject to long-term erosion.



Figure 9: Shore Perpendicular Road in Auckland

6.4.5 Public reserves

Public shorefront reserves are important community assets that have a number of values to both the general public and also adjoining property owners. Reserve boundaries are fixed by the underlying property title (esplanade strips are one uncommon exception where the boundaries move with a change in position of the shoreline).

All coastal reserves have the potential to be affected by a retreating shoreline. However, the effect will vary depending on how the reserves are laid out with respect to the line of the shore.

The most common type of coastal shorefront reserve is a long relatively narrow strip of reserve running parallel to the shoreline. This type of coastal reserve will shrink progressively in size on a coast subject to long-term erosion until entirely consumed. On a shore subject to short-term erosion and accretion events, the usable width of the reserve will fluctuate and may disappear altogether for short periods.

In either case a legal right of public access to the shoreline may be lost as illustrated in Figure 10 below.



Figure 10: Cooks Beach

An alternative and less common type of reserve are the “sea-to-the-hills” type of reserve, which are more perpendicular to the shoreline. This type of reserve will still be affected by erosion, but the proportional loss of reserve area over time is less.

Public reserves that have previously become foreshore or seabed as a result of erosion were revested in Crown ownership under the Foreshore and Seabed Act 2004.

Typically, a coastal esplanade reserve will be either backed by existing residential development, or a road that is in turn backed by residential development. The high cost of developed shorefront land is likely to make it impractical to purchase additional land to add to a coastal reserve that is being lost to erosion. For this reason councils may feel obliged to, or be lobbied to protect existing esplanade reserves from erosion. There are many examples of public reserves with hard protection works. It has been suggested that Reserves Act 1977 may be interpreted to require the protection of reserves from erosion. However, this point is not clear and requires further investigation.

Also private property owners on adjacent private land have often located private protection works on reserve land (without authorisation), or demanded that the protection works be provided on reserves to protect adjacent private property. There are examples of public reserves that have been substantially consumed by historical protection work to protect private property.

New Zealand law requires that you do not remove the support that your property provides to your neighbours' property. This may lead to an expectation on the part of residents that councils have an obligation to use reserve to protect private property, and are therefore liable if this is not done. However, recent case law has indicated that councils do not have a responsibility to armour reserves to protect private property.

If councils are to adopt a policy of managed retreat, then this will have to be applied to public reserves, in addition to private property. This means accepting that one of the functions of coastal reserves is to preserve the adjacent beach, by allowing the reserve to be erode in response to natural processes.

In some cases, reserve classifications, management policy and plans may need to be modified to ensure this. Also, councils would need to expressly commit to a policy of removing illegal private protection works on public reserves, even if this were highly unpopular with residents. This may be difficult if significant time is allowed to elapse.

Consideration needs to be given to how lost reserve land can be replaced in an affordable way. This may be difficult in a built up environment. If existing developed land is being considered for purchase for reserve purposes, then consideration could be given to creating reserves that are deep, i.e. perpendicular to the coast, rather than the more traditional reserve strip that runs parallel to the coast. This has the following advantages on a retreating coastline:

- property a little further from the shoreline is usually considerably less expensive,
- the area of reserve will be less affected by ongoing erosion,
- there may be opportunities to facilitate change of roading and other network utilities to a shore perpendicular configuration,
- this may facilitate progressive removal of buildings on private sites,
- there will be less demand from private property owners to use reserves as sites for private property protection works.
- this will increase the percentage of private properties that have a visual corridor to the sea (and possibly increase their value).

One disadvantage is that it does not guarantee a continuous right of public access long the shoreline.

There are several mechanisms available to bring private foreshore back into public ownership, where private land has become foreshore as a result of erosion.

One option is to purchase private titles that have been entirely consumed by the sea, i.e. private foreshore. Once erosion has reached this stage the residual value of properties should be relatively low, with purchase being less expensive. This will provide a continued right of legal public access along the foreshore.

Another alternative is provided under the Foreshore and Seabed Act 2004, which gives the Minister of Conservation the option of requiring that private foreshore revert to Crown ownership. At this stage it is not clear what circumstances the Minister will give effect to this option. Also private interests in the use of the land may be preserved even if the underlying title reverts to the Crown. Therefore it is not clear whether this option can be used to provide for public access along the foreshore. Further research is needed to clarify this point.

6.4.6 Future provision of infrastructure and the location and form of development.

The effects of the existing location of roads on the feasibility of retreat are discussed in Section 6.4.1 above. This is expanded below to illustrate how planning for the future provision of infrastructure affects the feasibility of retreat. This applies to redevelopment of existing coastal urban areas (and also potentially to greenfield sites).

Infrastructure needs to be specifically considered as part of any managed retreat strategy for the following reasons:

- Infrastructure is potentially at-risk from coastal hazards.
- Communities are dependent on infrastructure for their on-going well being.
- Provision and maintenance of infrastructure is costly, consuming a substantial proportion of district council expenditure and decision making effort.
- Infrastructure provides important linkages between communities in different locations.
- A choice about the location of particular infrastructure can have a long-term effect on the form and functioning of a community.
- Decisions about the location, layout and maintenance of infrastructure have a direct effect on both the coastal hazard risk and also the feasibility of retreat.
- Communities go through phases of redevelopment that provide opportunities to alter both the infrastructure and communities in a way that facilitates retreat.

Roads serve as corridors for most, although not all, network utilities. Therefore decisions about the locations of road networks have a critical effect on many other utilities. The positioning of road networks is thus the most critical element to consider.

A typical coastal settlement is likely to go through several cycles of redevelopment over the 50 or 100 year planning horizons typically used for coastal hazard assessment. These phases of redevelopment provide opportunities to proactively change the layout of infrastructure over time in a way that reduces vulnerability to coastal hazards and facilitates retreat. These changes can be built into both urban design and infrastructure forward planning programmes within councils. The long time horizons provide opportunities for gradual change to a more favourable infrastructure layout.

Planning horizons need specific consideration in terms of the longevity of the infrastructure. There are various levels that this can be looked at.

At the asset item lifetime level, investment in upgrading or replacement of assets needs to take into account the likely lifetime of the land and associated properties that the asset will be located in.

At a broader level, communities expect to receive services from the infrastructure networks more or less indefinitely. Therefore planning for retreat needs to consider time frames that may be longer than the normal service life of the components.

Asset planning for infrastructure upgrades in existing at-risk areas, should to the extent possible, be done in a way that provides flexibility to alter the infrastructure at low cost in the future to facilitate retreat when it becomes necessary (Ministry for the Environment, 2004).

This also applies to the current practice of locating new greenfields coastal development behind a coastal hazard set back usually defined in terms of the likely

effects of coastal hazards over 50 or 100 years. Current projections are that sea-level rise will continue well beyond 100 years. Therefore at some stage in the future, communities considered to be “safe” will potentially be affected by coastal hazards, and they in turn will be faced with the dilemma of managing the hazard. For this reason it would be advisable for new roading and other network utilities to be laid out in a fashion that minimizes the potential costs of retreat for those future communities over time spans longer than 100 years.

A potential urban development and infrastructure layout to facilitate retreat is discussed in Appendix E.

More discussion and research should take place on how to integrate urban planning and infrastructure asset planning for areas at long-term risk from coastal hazards.

7 Options for Managed Retreat

7.1 Selecting an option

The choice of options for managed retreat will depend on a number of factors including:

- the type and extent of hazard,
- the form, pattern and value of urban development at-risk,
- the amount of weight attached to maintenance of public access, natural character, natural coastal processes and amenity values,
- political or legal decisions about the distribution of costs and benefits,
- decisions as to whether to control the uses of land by rules or alternatively alter property rights.
- prevailing public values and perceptions, and economic values.

These are explained further as follows.

If development is at-risk from storm surge only, then micro-retreat by raising the floor level of buildings may be a valid option in the short to medium term. In contrast, landward relocation of houses may be more appropriate where there is a consistent trend to erosion.

As discussed in section 6.4, the form of existing development and infrastructure may preclude some options. For example, where building coverage has already intensified, then relocation within existing sections may not be an option.

Decisions about the distribution of costs and benefits of retreat will be made within a political forum, or possibly as a result of a Court decision. If the outcome of either process is that affected property owners must bear the cost of retreat, then the type of intervention will be limited to regulation to ensure that retreat occurs without imposing costs on the general community. An owner funded relocation fund would also fall within this category. In contrast, if the decision requires distributing part or all of the costs of retreat among the wider community, then options involving subsidies for relocation, transferable development rights, purchase of affected properties, or the lease for life option may be relevant.

Decision makers may exercise a preference for interventions according to the effect on property rights. Rules alone leave existing titles and property ownership unchanged but control what can be done on the land. Thus the effect on exercise of property

rights is indirect. It is also possible to directly alter property rights by changing the ownership to either public ownership or leasehold.

In practice it is likely that implementation of managed retreat could require a combination of the different methods of intervention. The following options analyse some potential combinations.

7.2 Option 1: Relocation within existing properties

Section 7.2 examines options for implementation of retreat that focus on relocation of buildings within existing properties.

7.2.1 Summary

This section assesses relocation of existing buildings within properties. This will require regulation to ensure relocation of buildings and prevent protection works being built. Subsidies for relocation costs are an option. An alternative to regulation is for local government to purchase the properties, relocate the buildings and then resell the properties.

Relocation of buildings on existing properties is a relatively low cost form of retreat especially where it can be gradually implemented over time (e.g. as existing houses are renovated and replaced). However, it is not clear what proportion of at-risk properties relocation will be feasible for. This needs to be clarified to determine the overall relevance of this method for each region. For example, development of some sites may already have proceeded to the point where there is no further room for relocation. Relocation may be more relevant to eastern Coromandel and Bay of Plenty coasts, but may be less practicable on in some of the more developed portions of the Auckland coastline.

Even where feasible, relocation may still be resisted by property owners.

The option of purchasing properties, relocating buildings and then reselling the properties appears likely to be affordable (refer Section 7.2.3) in present circumstances. This option may be relevant where the adjustment needs to take place within a few years. More detailed assessment of this option is required to determine practical feasibility, limits of application and the extent of any residual risk to the council from undertaking the works.

7.2.2 Descriptions

Relocation involves landward shifting of at-risk buildings within the same properties. This includes relocation of on-site effluent treatment systems and other services.

Any existing protection works could, depending on circumstances, be left in position, removed or relocated landward.

Four versions of this option can be considered depending on the source of funding, i.e. the distribution of the cost of relocation.

- Version 1: owner funded.
- Version 2: local government funded.
- Version 3: local government purchase, relocate and resale.
- Version 4: incentive through transferable development right (see Section 6.3.5).

In version one, the property owner pays for the cost of relocation. In version two, local government pays the cost of relocating the building within the property. In version three, local government purchases the property at market value, then pays for relocation of the building, then sells the property at market value. This option may also include altering property boundaries, public reserves and public infrastructure if this would result in a lower risk or a better return on investment.

7.2.3 What form of intervention is required

All Versions:

Information needs to be provided to accurately define the extent of the hazard and the time frames over which those hazards will affect individual properties.

Versions 1: Owner Funded, 2: Local Government Funded and 4: Incentive Through Transferable Development Right

Rules will be required to prohibit protection works. Regional rules will be needed to prohibit protection works in the coastal marine area. District plan rules can be used to prohibit new protection works on land. However, where existing (presumably inappropriate or failed) protection works have existing use rights, then regional rules would be needed to ensure their removal (refer to section 6.2.2).

Rules will also be required to enforce relocation. District plan rules can place conditions on new building within coastal hazard zones, but cannot control existing buildings. Therefore regional rules will be required if it is necessary to relocate buildings with existing use rights.

These rules will need a set a trigger level for relocation. There are a number of options for choice of this trigger level. For example district plan rules controlling new building within coastal hazard areas in Western Bay of Plenty District set a potential relocation trigger of erosion reaching to within 8m of the building. Within the USA, triggers for mandatory relocation are commonly set at a percentage of structural damage to buildings. Section 8.1 discusses relocation triggers in more detail.

The development of national regulations to the same effect would be an alternative to district and regional rules.

Version 4 requires additional rules to set up a transferable development rights system.

The regulation and enforcement described above is not required under version 3. Therefore the associated regulatory development and enforcement costs do not arise in version 3.

Versions 2: Local Government Funded and 3: Local Government Purchase, Relocate and Resale

Both these versions require direct public funding. However, the extent of funding differs markedly. For example relocation costs were estimated at approximately \$50,000 per house in the Buffalo Beach Coastal Erosion Management Strategy, 2005, whereas the current average valuation of those houses was \$820,000, which is likely to be less than the true market value. For such high value shorefront properties, the annual gain in capital value is likely to exceed the cost of relocating buildings (assuming current market trends in coastal property values continue into the future). Within version 2: the amount is relatively small but is not recovered. Within version 3 the initial amount is higher but may be recovered on resale.

7.2.4 Who Needs to be involved

Versions 1: Owner Funded, 2: Local Government Funded and 4: Incentive Through Transferable Development Right

District and regional councils would need to cooperate in the development and enforcement of appropriate rules. There is a significant administrative cost to this (costs will vary but may consume a significant fraction of available policy development budget for a typical council).

Councils may also need to modify other planning rules, for example, yard requirements, that are a barrier to relocation.

Councils would need to maintain a monitoring system to determine when relocation was necessary and to ensure that it was carried out.

Version 2: Local Government Funded

Councils would need to allocate funding for relocation subsidies via the annual and long-term community planning processes. Eligibility criteria would need to be developed. An assurance system would be needed to ensure that subsidies were allocated correctly to achieve the desired result. An alternative would be a nationally funded relocation subsidy scheme.

Version 3: Local Government Purchase, Relocate and Resale

Councils would need to allocate funding for property purchase via the annual and long-term community planning processes. This implies some initial research to determine likely purchase cost, a mechanism for reaching a market price agreement, relocation costs and eligibility criteria. An administration system would need to be set up to manage the purchase, relocation and resale system.

All three versions would require ongoing communication with affected property owners and the insurance industry.

7.2.5 Risk outcomes

Risk should be reduced by the relocation of buildings. However, land value is currently (2005) approximately two thirds of capital value on the shorefront. Therefore the investment in the titles remains at-risk.

This option only reduces risk where relocation is feasible on the property and will result in a significant reduction in risk.

Both buildings and land will remain at-risk in a scenario of ongoing long-term erosion of the shoreline.

Relocation of the buildings should eliminate the need for protection works. However, property owners may still want to install protection works to protect the utility and value of the land.

The council takes on short-term risk if it buys properties, relocates buildings and then sells the properties. There is a possibility of long-term financial risk if the programme did not achieve the expected returns.

7.2.6 Barriers

The main barriers are summarised as follows:

All Versions:

There may be insufficient room on existing properties for meaningful relocation. This may be because:

- the buildings take up most of the existing lot size
- of unfavourable topography
- there other constraints on other parts of the lot
- there is insufficient room to relocate on-site effluent disposal
- the extent of the relocation available on the lot will not significantly reduce the hazard, or may worsen other hazards

- some building designs may be more difficult or expensive to relocate
- of other planning rules e.g. height to boundary, yards, vegetation clearance, etc
- of owner expectations to be able to develop or build on the entire property.

In addition, owners may be unwilling to abandon shorefront location. An absolute shorefront location is a lifestyle ideal for many and is also prime real estate. Given the cost required to obtain such property, there is likely to be an unwillingness to retreat, even within existing property boundaries (refer to section 5.5).

Version 1: Owner Funded

Owners may be either unwilling or unable to pay the cost of relocation.

Versions 1: Owner Funded and 2: Local Government Funded

The absence of rules or inadequate enforcement of rules prohibiting protection works and controlling relocation. The experience from parts of the USA that have gone as far as prohibiting armouring, is that there is a lot of potential for failure in compliance with rules preventing hard protection works. Enforcement would need to be uncompromising.

Version 2: Local Government Funded

Community unwilling to subsidise relocation costs.

Version 3: Local Government Purchase, Relocate and Resale

Difficulty in negotiating purchase price.

Potential risk to ratepayers if relocation costs are higher than expected, or resale price is lower than expected or is insufficient to recover costs, or if the hazard is not fully removed.

7.2.7 Favourable conditions

Large deep and flat properties with small timber framed houses that have been designed and built with relocation in mind.

7.3 Option 2: Change property rights to public ownership

Section 7.3 examines options for implementation of retreat that focus on public ownership and use of at-risk land.

7.3.1 Summary

At-risk properties can be purchased by councils, buildings can be removed, and the land can be vested as reserve or managed under other low risk forms of land use.

However, councils may still come under pressure to protect reserves from erosion. Therefore, purchase of properties would need to be coupled with an express policy of allowing the shoreline to fluctuate or retreat on the newly acquired land.

The high cost of shorefront land makes this option generally unaffordable. Also public purchase of land (at market rates) sends a signal to property investors that it is relatively safe to invest in high risk areas. Therefore purchase of at-risk properties may compound the overall risk problem.

7.3.2 Description

Creation of coastal shorefront reserves is a traditional New Zealand way to provide for public access, recreation, the natural character of the coastline, and to provide a coastal hazard buffer. Usually these reserves are created at or before the time of residential subdivision. This reduces the cost to the ratepayer of acquiring the reserves.

Acquiring existing residential coastal development for reserves is relatively uncommon because of the high cost to ratepayers. Nevertheless, setting affordability issues temporarily to one side, purchase of public reserves is an administratively relatively straightforward way of conjunctively managing the hazard, improving public access, and enhancing natural character.

If the primary objective is to reduce hazard risk, the overall aim is to convert private title to some form of public ownership with use rights limited to relatively low hazard risk activities. In practice the land would need to be purchased at market rates. Buildings and protection works could then be removed. The land could be held by a council as general title, or alternatively, vested as a reserve. Subsequent land use could involve either passive recreational use or commercial concessions and leases for marine recreation related activities.

Concessions are unlikely to generate sufficient income to significantly offset the cost of purchase. They may however, attract more visitors to the reserve and adjacent shore, which would add to the benefits in cost benefit analysis.

The concepts of purchasing and then renting, leasing, or covenanting is discussed further in Section 7.4.

7.3.3 What form of intervention is required

Purchase could be on either a willing seller basis or a compulsory basis.

7.3.4 Who needs to be involved

Properties would need to be purchased by either central or local government. However, central government has not traditionally purchased small strips of developed coastal land, preferring to concentrate its available budget on a limited number of larger blocks of undeveloped coastal land with exceptional natural character value. This position is unlikely to change substantially so it is probably appropriate to assume that any purchase cost would primarily have to be met by district or regional ratepayers.

An alternative is for properties to be purchased and managed by a private trust. However, cost is likely to be prohibitive. Existing land conservation trusts generally focus on undeveloped rural land with high ecological values and relatively low land value.

Legislation provides standard mechanisms for local government purchase of land. Voluntary purchase can be achieved through agreed valuation. In practice, where more than a few properties are to be purchased, a mandatory process would probably be required.

7.3.5 Risk outcomes

Placing land in public ownership has the potential to reduce coastal hazard risk in two ways.

Firstly, buildings and associated living space can be removed from the hazard area.

Secondly, changing to public ownership has the potential to halt the constant increase in land value. However, this depends on the form in which the land is held. If it remains held as general land then it can potentially be developed at any time.

Accordingly its land value may continue to increase and the loss of this land will be a cost to council and society as a whole. If the land is vested as a reserve it loses some of its development potential (depending on the category of reserve) and the value will decrease accordingly.

If concessions are granted for use of the space then some risk will remain to the concession holders (and possibly the council). The extent of risk can be controlled by the terms of the concession lease.

Public ownership will not necessarily prevent protection works being installed. As discussed in Section 6.4.1.6, councils often feel obliged to protect reserves from erosion and there are numerous examples of such protection. Provisions in reserve management plans and district plans expressly preventing the installation of protection works could counter this tendency. However, it should not be assumed that a change to public ownership would automatically result in a system that allows shorelines to retreat naturally.

7.3.6 Barriers

Cost is the main barrier. Purchase of shorefront property is very expensive. As discussed in section 2.3, the cost will vary depending on the location. Typical Waikato Region CV values are:

- Coromandel East Coast shorefront CV \$500,000 – 1,000,000
- In Raglan, some harbour-front sections have CVs around \$400,000 - and \$500,000 on the open coast at Whale Bay, but many others are less (<200,000).
- At Aotea, shorefront property CVs are about \$140,000.
- At Kawhia they are around \$150,000-200,000.
- At Mokau the rateable value of shorefront sections is between \$50,000 and \$100,000 - these are in a hazard zone and properties have been severely threatened by erosion over the last decade.
- Actual market prices will be higher, e.g. up to 30% higher on the east coast.

Also the existence of a coastal hazard risk generally does not affect market prices in the absence of actual damage (see section 4.6). Therefore unless buildings have recently been damaged by hazards (within the last 5 years), the properties would have to be purchased at full market value.

For example, there are approximately 670 properties on the open coast of the East Coromandel Peninsula currently at-risk. These properties had a 2004 valuation of approximately \$924,000 each. Actual market values are probably 30% higher, giving \$1.2 million each or \$804 million total (very approximately). This only includes those properties currently at-risk. It does not include those at-risk from sea level rise over the next 100 years.

For comparison, Environment Waikato's forecast revenue for 2005 is \$61 million. Clearly, the option of general widespread local government purchase is unaffordable, unless there is some way to recover costs (see section 7.4).

Value data for Auckland and Bay of Plenty regions have not been collated. However, given that shorefront/cliff top property values in Auckland and BOP are at least as high as those on the Coromandel, it is likely that the value of property at-risk in the other two regions is similarly large.

Individual exceptions may occur in situations where only a small number of houses are at-risk, or values are unusually low. For example, there are approximately 15

properties at-risk of erosion at Mokau, with a market value of approximately \$100,000 each or \$1.5 million total. While purchase may be affordable, it may not be the most cost effective option when compared to other methods discussed in this report.

The 670 properties currently at-risk within eastern Coromandel are those that are potentially subject to natural shoreline fluctuations of 35-40m (includes 10m safety factor). These fluctuations could occur at any time as a result of storms or other coastal processes, but are unlikely to occur in any one storm. Beaches on Coromandel typically experience periods of several years when erosion dominates, and often longer periods dominated by accretion. These cycles, rather than individual events, result in the full range in shoreline position. When such events occur, not all properties will be affected equally as the processes that cause them do not act uniformly along the coast.

If understanding of coastal processes was precise enough it may be possible to predict those most likely to be at-risk in the next event and selectively purchase those. However, the present state of scientific knowledge is probably not precise enough to do that with sufficient certainty.

Even limiting purchase to the worst 10% would still cost roughly \$80 million, which is clearly still unaffordable.

Another option would be to limit purchase to those properties, which have not been built on. However, within Bay of Plenty for example, only 5% of at-risk properties have not been built on. The percentage in the other two regions is probably similar or even lower. Therefore purchase of undeveloped properties will have negligible effect on the overall risk or the feasibility of retreat. Also shorefront land value is approximately two thirds capital value so the saving is limited.

One hypothetical strategy could be to wait until properties are severely damaged by hazards and then offer to purchase them at a discounted price. However, it not clear how much could actually be saved as the land value may be relatively unaffected, particularly as erosion usually occurs episodically with intervening periods of stability, which may give rise to an expectation of being able to rebuild. Also any prior public indication by a council that it may consider purchase could have the effect of holding residual valuations higher. Regulation would still be required to prevent installation of protection works.

To take this point further, if a council or government did adopt a strategy of widespread purchase of at-risk property, this could, rather perversely, force the market values of at-risk properties higher. Purchase would therefore need to be spread out over time. Even so, property owners may still expect councils to pay above market prices, which could make negotiation protracted.

Also, once a council starts purchasing land, this will create an expectation that other at-risk properties will be purchased. As discussed in Section 5.5, international research indicates that owners of at-risk property commonly have the expectation that government is responsible for and will ultimately fund risk reduction. The strength of this expectation roughly correlates with the immediacy of the risk, and applies whether or not government actually is legally responsible.

It is quite possible (but difficult to prove) that this expectation, fuelled by continuing past provision of protection works, is a substantial contributing factor to the continuing high value of at-risk properties.

Therefore if councils want to avoid fuelling this expectation further, they should resolve not to purchase at-risk properties and should make that resolution known.

Other barriers include the following:

- Unwillingness to sell. Can be overcome by mandatory designation process.

- Maori Land – unlikely to be available for purchase. Compulsory acquisition not appropriate.

Overall the option of local government purchase of at-risk developed properties appears to be unaffordable. There may be isolated exceptions.

Any decision to purchase at-risk property needs to be carefully considered in terms of its precedent setting effect, and in terms of its effect on property owner perceptions of council responsibility for hazard risk. A decision to purchase at-risk property is likely to send a signal to property investors that they can continue to invest in at-risk coastal property without financial risk.

Councils could consider adopting a policy of not purchasing property at-risk of coastal hazards in order to send a clear signal to property investors. Any such decision needs to be clearly communicated to property owners by inclusion in statutory plans, LIM and other methods.

Furthermore, the high total value of property at-risk has serious financial implications for councils, if hypothetically, the Courts found councils to be partly or completely liable for hazard losses. This is a hypothetical risk, which is beyond the scope of this report to assess. Reference to this issue is not intended to imply that councils are liable.

7.3.7 Favourable conditions

Favourable conditions for purchase can be relatively simply defined as:

- Low land values. This situation is likely to be increasingly rare if not nonexistent in the shorefront coastal environment.
- A small number of affected properties within a region. This does not apply in the Auckland, Waikato or Bay of Plenty Regions.

7.4 Option 3: Change use rights to a fixed term of use

Section 7.4 examines options for implementation of retreat that focus on limiting the term of use of at-risk land.

7.4.1 Summary

Fee simple titles create a significant barrier to the implementation of retreat, as market values do not currently reflect the potential impermanence of the land. People are understandably reluctant to abandon the investment, particularly when shorefront property values continue to increase in value.

A form of land tenure with a fixed term of use, equivalent to the projected remaining safe useful life of the land, would be better suited than fee simple title to areas at long-term risk from coastal hazards. There are two potential approaches to managing land with this aim.

The first approach is to use regulation in one form or another to limit the duration of use of land without altering the underlying title.

The second approach is to alter to form of land tenure. Potential methods include:

- purchasing and renting shorefront properties
- purchasing and leasing back properties
- purchasing, covenanting and selling properties.

Regulation for a fixed term of use may be possible with regional rules. However, more detailed examination is required of the legality of rules with a fixed term, and the

scientific practicality of determining an appropriate term. Regulation could be used in combination with some of the other options.

Purchasing and renting shorefront properties would have a high cost at current market rates (ref: Section 7.4.6). It is not clear whether current market conditions will continue into the future.

Purchasing and leasing properties as a lease-for-life, may be feasible where the term can be relatively long, but will be costly in circumstances where the term is relatively short. The overall effectiveness of this option is limited by the proportion of property owners willing to enter into a lease-for-life.

Purchasing, covenanting and selling properties is potentially feasible and affordable but requires more detailed investigation. Compulsory acquisition may be necessary and it is unclear what effect a covenant with a term would have on the resale value.

7.4.2 Descriptions

Most coastal residential development is based on the concept of individual fee simple titles. The owners of any title have exclusive use of that title, i.e. a property right. This title-based property right is not usually limited in time, even if individual owners pass away, the owners change, or the sea erodes the land (this does not imply unlimited uses as there are restrictions on what people can do on their land).

This persistence of the legal entity of the title and the exclusive use right it provides is the basis of the investment value of coastal property. Under normal circumstances, people expect to have exclusive use of a property for as long as they wish to retain ownership of it. Where land is a scarce resource as it is on the coast, investors compete through the market to own titles, and the value of those titles increase over time.

However, the permanent persistence of the title ignores the reality that the underlying land may itself be impermanent. More specifically, the boundaries of a title do not retreat with the shoreline on a retreating coastline. Market values for land titles appear to reflect a belief in the persistent utility of titles rather than the actual duration of usable land in a coastal hazard area.

Erosion threatens both the utility of the title and, if the land is irretrievably eroded its market value. This naturally leads to attempts to hold the line of the shore in order to protect the usefulness and future value of the title.

An option is to change the nature of property rights, so that the use has a fixed duration that reflects the likely duration of the land on a retreating shoreline. There are a number of ways this could be done. These are considered as separate versions below depending on the method of implementation. Version 1 uses regulation to alter use rights, whereas versions 2 – 4 alter the form of land tenure. The versions are:

- Version 1: RMA Regulation or Covenants Only
- Version 2: Buy and Rent
- Version 3: Buy and Lease-back
- Version 4: Buy, Covenant and Sell.

Version 1: RMA Regulation or Covenants Only

In this version the emphasis is on using RMA rules to specifically reinforce the temporary nature of land subject to coastal hazards. The underlying property titles are not altered, but rights to use land are altered. In particular, existing use rights are altered. The intention is to both regulate for retreat and to specifically alter market perceptions about the permanence of shorefront land at-risk from coastal hazards. The rules would need to do two things. Firstly, to create a set time limit for residential or commercial use of at-risk land (refer to **RULES ON THE USE OF LAND** below). Secondly, to

prevent the armouring of the shoreline (refer to **SEE RULES CONTROLLING PROTECTION WORKS** below).

Rules on the Use of Land

Existing district plan rules (refer Section 6.2.1) concentrate on controlling building activity within the hazard zones. Also the focus is on relocation of buildings. The underlying viability of residential land use is not directly targeted by these rules (and cannot be because of existing use rights). Consents issued under these rules have conditions that focus on ensuring the buildings are relocatable and set trigger conditions for relocation. These existing rules may be unintentionally creating a short-term market focus on compliance with building requirements rather than the long-term viability of continuing residential land use. This appears to apply even where covenants specify that buildings may have to be completely removed at some unspecified date in the future (see Section 6.1).

Consideration could be given to rules that expressly create a finite term to the residential or commercial land use. Such rules would have to be made by a regional council in order to control existing uses. They would require a resource consent for a residential or commercial land use in an at-risk area.

Consent would be issued subject to an express condition limiting use to a maximum number of years. This would be determined by the estimated useful remaining life of the property before it succumbs to erosion. Once the consent expires the owners could have the option of applying for a new consent (if any land remains), or abandoning residential use of the land, or selling at the residual value. Because this provides for a fixed term of use, it may affect market perceptions about the future utility and value of land.

An alternative form of rule could make the land use a permitted activity subject to a condition limiting use of land in coastal hazard areas to a maximum number of years. However, this would place the onus of monitoring and enforcement on the council, the difficulty of which should not be underestimated. The effect on market perceptions is also less direct.

Rules Controlling Protection Works

Existing rules controlling protection works usually require that resource consent be obtained. This theoretically allows case-by-case consideration of protection works. However, it creates a tendency towards armouring of shorelines for various reasons discussed below.

While in theory there is no presumption that consents will be granted, there is a fairly widespread public expectation that they will be. This is reinforced by the fact that by far the majority of resource consents are actually granted (for example Ministry for the Environment (2005) statistics indicate that 0.7% of all resource consents were declined in the 2003/04 year).

Councils face a lot of political pressure to grant consent for protection works. This applies even where property owners have known about the hazard in advance and are subject to resource consent conditions requiring relocation. It can become a fundamental political issue of protecting people's private assets versus protection of the coast.

Often such works are sought in semi crisis conditions, which tend to create an impetus towards getting the works done and worrying about their sustainability later. In some cases this is facilitated by rules that take a permissive approach to protection works. Rule 16.7.1 Short-Term Structures for Hazard Management (Controlled Activity), of the proposed Waikato Regional Coastal Plan (Environment Waikato, 2001) is one example.

Many protection works have been constructed illegally in the past. Dealing with these retrospectively creates an enforcement problem. Requiring illegal works to be removed is unpopular with residents and puts councils in a difficult position with respect to potential for erosion to continue and cause damage. In practice, legal action is often limited to requiring retrospective consents.

Councils themselves may prefer protection works because of a desire to retain the existing revenue base from rates.

In addition, there is a tendency to propose hard protection works as a temporary short-term measure to buy time. This has occurred at Wainui (refer Appendix B) and Waihi Beaches. However, once hard protection works are installed it is politically very difficult to remove them. They become the long-term option, with incremental upgrades occurring to inadequate initial designs at less marginal construction cost. Thus armouring of shorelines with protection works can proceed incrementally, even where this is not the best option.

In some cases councils have made a genuine attempt to look at alternative options (e.g. Buffalo Beach Coastal Erosion Management Strategy, 2005). Assessment to determine the best practicable option for the future, as required by the New Zealand Coastal Policy Statement, requires considerable time, research and consultation to do properly. A consent process for a seawall is an inadequate process for making broad strategic decisions as to whether to retreat or to protect shorelines where urban development is at-risk.

Overall reliance on a consent process to control shoreline armouring is inadequate if retreat is the preferred option, or a decision has not been made as to whether either retreat or protection should occur. It also sends the wrong signal to property investors who may think that the consent process is not a serious obstruction to installation of protection works.

Therefore consideration could be given to making hard shoreline protection works a prohibited activity on those open coast shorelines with significant natural character and recreational value. This would send a clearer signal about the importance of those values and also the potential impermanence of land. Enforcement would also be more clear-cut in that retrospective consenting is no longer possible. Under this scenario consideration of the best practicable option, as required by the NZCPS, occurs outside of the consent process. In the event that hard protection works are selected as the best option for a particular shoreline, a plan change can be used to provide for the particular protection work.

Covenants on titles can also potentially be used to prevent property owners from:

- complaining about erosion
- lobbying for protection works
- lodging applications for protection works
- building protection works, and
- can set penalty payments for any of the above.

Note that “no complaint” type covenants, such as that in the first and second bullet, are increasingly used to control reverse sensitivity (particularly to noise and odour). However, there are some unresolved questions about the amount of legal weight they have if enforcement is required. Therefore “no complaint” covenants should be combined with other covenants to prevent the building of protection works and require the relocation and removal of buildings.

Where there are already rules that require a consent process for an activity on hazard prone land, covenants could be implemented relatively simply as an internal administrative decision. There are already established precedents for these types of covenants in cases involving reverse sensitivity. Regional rules would be required to

apply such covenants to existing uses. Alternatively, property could be purchased, covenanted and resold – see version 4.

Version 2: Buy and Rent

Another option is for local authorities to purchase properties and rent them out on a short-term basis. Buildings would be removed when threatened by erosion.

Version 3: Buy and Lease Back

This option also requires that properties be purchased. Existing owners are given an interest in the form of a lease-for-life or a lease until erosion makes the property unusable. The market value purchase cost is reduced by the value of the lease-for-life, which is set at a token annual payment. The general public would not have legal access to the land until such time as the leases end. On expiry of the lease, buildings can then be removed and the land opened to public use.

The following examples are calculated using Schedule 2 of the (repealed) Estates and Gift duties Act 1968 as an approximate guide only for the purchase of a \$1 million dollar at-risk coastal property.

- Example one: property is purchased from a 40-year-old female. The value of the lease for life is approximately 82% or \$820,000. The purchase cost is approximately 18% or \$180,000.
- Example two: property is purchased from a 50-year-old female. The value of the lease for life is approximately 72% or \$720,000. The purchase cost is approximately 27% or \$270,000.
- Example three: property is purchased from 60-year-old male. The value of the lease for life is approximately 54% or \$540,000. The purchase cost is approximately 45% or \$450,000.

The key feature of a buy and lease back option is that the initial purchase cost is reduced by the value of the lease-for-life. This will depend on circumstances, i.e. the longer the likely lifespan of the original owner the longer the lease and the greater the reduction in initial cost.

The lease would need additional conditions to require relocation or removal of the buildings if threatened by erosion during the lifetime of the lease.

Version 4: Buy, Covenant and Sell

Properties can be purchased at market prices, covenanted to require retreat, and then resold at market prices. This is an alternative to using regional rules to the same effect. The opportunity could also be used to relocate some buildings as discussed in Section 7.2.

7.4.3 Form of intervention required

Version 1 requires regulatory intervention to alter rights to use land. Versions 2 to 4 require council purchase of land (though it is possible that version 4 could be managed so that councils do not actually buy or sell the land). Version 4 also requires a regulation in the form of covenants and associated enforcement.

7.4.4 Who needs to be involved

Version 1: RMA Regulation Only

This version requires rules in plans. Regional councils would need to make rules about existing residential uses and rules on protection works in the coastal marine area. Either district or regional council rules can control protection works on land, but

regional rules would be needed if control was required over works that have existing use rights.

Where there are already rules that require a consent process for an activity on hazard prone land, covenants could be implemented relatively simply as an internal administrative decision. There are already established precedents for these types of covenants in cases involving reverse sensitivity. Regional rules would be required to apply such covenants to existing uses.

Version 2: Buy and Rent

Local government would need to buy at-risk coastal land and then rent it out. The land could be either held as general land or possibly vested as a local purpose reserve. However, as residential use continues, vesting as a recreation or esplanade reserve may not be appropriate. An alternative would be to set up a trust or company to manage the land.

Version 3: Buy and Lease Back

Local government would need to buy at-risk coastal land and then lease it back to the original owners as a lease for life at a token rate. The land could be either held as general land or possibly vested as a local purpose reserve. However, as residential use continues, vesting as a recreation or esplanade reserve may not be appropriate.

Version 4: Buy, Covenant and Sell

Local government would need to buy at-risk coastal land, covenant it and then sell it. Provision would need to be made for long-term covenant monitoring and compliance. It may be possible to set up a variation to this concept using a system of willing sellers and buyers where the council pays the transaction costs but does not actually buy or sell the land at any stage.

7.4.5 Risk outcomes

Version 1: RMA Regulation Only

These types of rules are specifically intended to facilitate retreat and influence market perceptions about the potential impermanence of land. The ultimate aim is ensure investment in buildings and other activities on land are proportional to the remaining useful life of the land. In this context individual buildings become expendable if they cannot be relocated on existing sites.

It is not clear to what extent land values would be affected by such rules. Possibly there would be little initial effect until the underlying practice of retreat was established in practice.

These types of rules or covenants are also intended to prevent armouring of shorelines unless this is the best practical option. This reduces the risk of loss of the public value of the coast.

Version 2: Buy and Rent

This option allows residential land use to reflect the actual useful remaining life of the land. There is a major financial risk to the local authority – see barriers.

Version 3: Buy and Lease Back

The buy and lease back option has the potential to partly reduce hazard risk in two ways.

Firstly, the terms of the lease can provide that residential buildings are removed when erosion reaches a preset level. The term could be set at a predetermined level of erosion. For example, the lease could end when erosion reaches a set distance from the foundations of a building, or when damage to the building reaches a preset level.

Secondly, the lease-for-life creates an interest in the property that devalues it at that point in time.

The remaining useful life of the land may not match the actual remaining lifetime of the owner. If the useful life of the land is less than the original owner's lifetime, then the owner will suffer a loss. If the useful life of the land is longer than the actual life of the original owner, then the council will be able to rent out the property for the remainder of its useful life. This may not necessarily be sufficient to offset the initial purchase cost.

The lease for life only discounts part of the initial cost of purchase. Also, once the lease-for-life expires, the property reverts to full market value. Ultimately this represents a loss to ratepayers when the building has to be removed because of the coastal hazard. It is possible that a council may be tempted to use protection works to maintain the future value of their asset.

Difficulties may arise if someone wishes to relinquish their lease-for-life, prior to its expiry because the council may need to purchase the remaining value. Property values may have increased in the interim, making compensation potentially expensive.

Version 4: Buy, Covenant and Sell

The ultimate aim is to ensure investment in buildings and other activities on land are proportional to the remaining useful life of the land. In this context individual buildings become expendable if they cannot be relocated on existing sites.

Given the current rate of capital gain from shorefront property it should be possible for a council to purchase property, covenant it and sell it without any loss. However, if the market dropped for some reason then it is possible that the council could make a loss.

It is not clear to what extent land values would be affected by such covenants. Existing valuation practice does not appear to take the effect of hazard covenants into account. However, if the effect of the covenant was to set an express short-term use of the land then it is possible that this would be taken into account by future purchasers and the resale value would be devalued accordingly. Also valuation practice may change in the future to the effect that hazard related covenants do reduce values. While this would be desirable from a hazard reduction point of view it could cause a loss to the council.

7.4.6 Barriers

Version 1: RMA Regulation Only

Use of regional rules to control existing uses on at-risk land would be unpopular with landowners. Although regional councils do have this power, it is not an area of control they have traditionally exercised Canterbury Regional Council is one exception and some shift in political and corporate culture may be required. Existing regional plans would need to be changed via the statutory process. It is likely that such changes would be resisted by property owners through the submission and appeal process. This could take some years to complete and have a significant policy development cost. Consent processing and compliance resources would also need to be provided for.

There may be claims that compensation should be paid. The detail of the rules would need to be justifiable in the context of the effects that are to be controlled to avoid successful claims of unreasonable restriction on the use of the land.

In practice deriving an accurate scientific estimate of the remaining useful life of land may be complex and subject to considerable uncertainty.

There does not appear to be any particular reason why rules could not have an express term of for land use. However, this requires legal confirmation.

Rules prohibiting hard protection works on the shoreline may receive broad community support but would still be opposed by property owners and possibly some councils.

Version 2: Buy and Rent

Initial cost is the main barrier, as shorefront property is very costly. The cost of purchase can be partly recovered by returns from renting. However, the rate of increase in coastal property value has out accelerated increases in rental rates to the extent that coastal property rentals are not sufficient to pay-off a standard 25-year mortgage. Even if the term is stretched to 50 years, which may be possible in a 100-year coastal zone, it is still not possible to recover the cost of purchase by renting.

Table 2 gives the approximate rental rate required to recover the purchase cost of coastal property assuming interest at 7%. This does not take into account maintenance costs and bad debt.

Table 2: Rental Rate Required to Recover Purchase Cost

Cost of Property	Weekly rental required to pay back purchase over 25 years.	Weekly rental required to pay back purchase over 50 years.
\$6,000,000	\$10,000	\$9,000
\$3,000,000	\$ 5,000	\$4,500
\$1,200,000	\$ 2,000	\$1,700
\$ 500,000	\$ 850	\$ 700
\$ 250,000	\$ 425	\$ 350
\$ 100,000	\$ 175	\$ 150

(Table prepared using a standard mortgage calculator. Actual figures will depend on prevailing interest rates, repayment intervals, percentage occupancy in practice and other factors.)

East coast beachfront prices can range from \$500,000 to \$6 million or more depending on location. For comparison weekly long-term rental rates in:

- Takapuna/Milford are approximately \$500
- Mount/Papamoa are approximately \$500 – 550 (shorefront) and \$400 – 500 (two streets back)
- Tairua are approximately \$250
- Pauanui are approximately \$300.

In addition, long-term rental is uncommon on the Coromandel Peninsula.

Short-term holiday rental rates are higher than long-term rental rates. In one example, advertised holiday rates at Pauanui are:

- Winter \$90/night or \$500/week
- Off Peak Summer \$20/night or \$750/week
- Peak Summer \$220-\$250/night

Ref: www.baches.co.nz/bhh/listing/0/259 (as of 2005).

Other examples indicated that peak summer rates may vary between \$165 to \$430 per night for short-term rental.

These short-term rates are high in relation to long-term rental rates. However it is not clear what the net return would be taking into account administration, maintenance and un-rented downtime would be. This would require more detailed investigation to assess.

Overall the disparity between property values and long-term rates may be too great to make this an affordable option under current market conditions.

Version 3: Buy and Lease Back

Individual property owners may be unwilling to enter into a buy and lease back option for personal reasons. This option could only be implemented on a voluntary basis under current legislation. The attractiveness of this option would depend on individual economic circumstances and life style aspirations.

This option is unlikely to appeal to individuals who:

- do not need the cash,
- would not want lose the full existing capital value or potential future capital gain
- have debt secured against the property that is greater than the cash value of the lease for life
- want to pass the property on to future generations of family members.

Conversely, this option may appeal to individuals who are asset rich but are cashflow poor, have few other options to generate income to cover living expenses and want to retain exclusive use of the property for the rest of their natural lives.

The overall effectiveness of this option in managing retreat would be reduced if the number of properties subject to lease-for-life was low. Other property owners may still promote protection works.

The initial purchase cost could still be substantial even after the value of the lease for life was deducted. It is difficult to estimate the actual cost as it requires detailed knowledge of market values and the demographics of property ownership and potential uptake rates. The following hypothetical examples are given to illustrate the effect of different assumptions about uptake rates.

- Example one: if it was assumed that the 670 properties at current risk on the Coromandel east coast beaches have a collective value of \$804 million or \$1.2 million each, and the average value of the lease-for-life is around two thirds (a 52 year-old male) of market value, then the cost could be approximately \$265 million assuming 100% uptake or \$136 million at 50% uptake.
- Example two: if it was assumed that the 270 properties at long-term risk (100 years) on the Coromandel east coast beaches have a collective value of \$180 million or \$700,000 each, and the average value of the lease-for-life is around two thirds (a 52 year old male) of market value, then the cost could be approximately \$60 million assuming 100% uptake, or 30 million assuming 50% uptake.

If the average age of property owners is older then the duration of the lease-for-life is relatively short and the purchase costs will be higher.

Conversely, the length of the lease-for-life can be extended by including younger members of the owner's family. This reduces the purchase cost but this may cause problems if the usable lifetime of the land is less than the actual term of the lease-for-life. This may be a viable option where the risk is relatively long-term, for example sea level rise over 100-years. The following example illustrates the reduction in value from a long lease for life.

- Example three: if it was assumed that the 270 properties at long-term risk (100 years) on the Coromandel east coast beaches have a collective value of \$180 million or \$700,000 each, and the average value of the lease-for-life is around 90% of market value (a 28 year old female), then the cost could be approximately \$18 million assuming 100% uptake, or 9 million assuming 50% uptake.

It is not clear how the lease for life concept could be applied to properties that are in a trust or are owned by a company.

Version 4: Buy, Covenant and Sell

There are no major barriers to this other than that it would have to be undertaken at a rate and a way that did not expose a council to significant short-term financial risk or further increase the price of coastal property. Either a voluntary or compulsory process could be used.

The overall effectiveness of this option in managing retreat would be reduced if the proportion of the properties covenanted was low. Other property owners may still promote protection works. Compulsory acquisition may be required to give sufficient coverage.

This approach appears to be new to New Zealand, though it is used in USA and Canada for conservation purposes.

This approach may not work well where property has already been damaged.

7.4.7 Favourable conditions

Version 1: RMA Regulation Only

The use of regional council rules to control of existing uses.

Coastline that has a very high natural character or recreational value.

Property that is at-risk but is not yet protected by hard protection works.

Version 2: Buy and Rent

Economic circumstances where rental rates and property values are equivalent. This is unlikely at current market rates but circumstances may be different in the future.

Version 3: Buy and Lease Back

Moderate property values.

Relatively long lease-for-life.

Relatively long estimated useful land life.

This option may be better suited to areas at long-term risk from erosion due to sea level rise. Generally, but not in all cases, these properties will be further from the shorefront and therefore worth less, and the lease-for-life can potentially have a longer period, thus lowering the initial purchase costs.

Version 4: Buy, Covenant and Sell

At-risk properties that can be purchased and resold on a willing seller basis.

8 Staging Retreat

The extent and timeframes over which retreat could occur will vary depending on a variety of factors. Some of these are discussed in the following sections. Starting the process of retreat off in the beginning may be the most difficult part of retreat.

8.1 Retreat from episodic erosion events.

Beach erosion is usually of episodic rather than gradual and consistent in nature. Periods of erosion may set in relatively rapidly and unpredictably as a result of changes in weather patterns or long-shore sediment transport systems. In addition, episodic erosion events can occur as a series of clustered events in rapid succession.

In between erosion episodes, beaches may be relatively stable and will usually accrete or regain erosion loss. Because of this, a particular area of beach may have the appearance of being stable and low risk for quite substantial periods of time between episodes of erosion.

The phenomena of episodic erosion may overlay and mask the process of any long-term trend of shoreline retreat caused by alterations in sediment supply, land subsidence or sea level rise.

This creates a particular problem for implementation of managed retreat for regions such as Waikato and Bay of Plenty where approximately 70% and 60% of properties respectively are located in areas at current risk from episodic erosion. The current (or primary) risk zone includes the maximum area at-risk from an episodic event that could occur at any time.

As discussed in section 5.5, most people's assessment of the risk is based on their personal observations. Experience with historic hazard events is down weighted fairly rapidly with time (people are likely to discount experiences of hazard events that are more than five years old). Therefore landowner perceptions of risk are likely, on balance, to be heavily influenced by the relatively long periods of beach stability. The situation becomes even more complex where ad hoc protection works exist, which property owners may have considerable faith in.

It is likely to be difficult to persuade most people of the need for retreat in advance of an episode of erosion. On the other hand it may be difficult to organise timely retreat when an episode of erosion sets in. This raises the question of what the trigger level should be for actually implementing relocation or removal of existing buildings. There are three basic alternatives:

1. Require relocation or removal of all buildings from inside the current risk zone as soon as possible. The practical implication of this is that approximately 670 buildings on the Coromandel East Coast and 634 buildings in the Bay of Plenty would need to be either relocated or removed. As some properties are entirely, or mainly within the current risk area, residential use of these sites would have to be abandoned completely.

Taking this step would obviously be unpopular with existing property owners. There will be little obvious need from the property owner perspective, to do anything about the problem until an episode of erosion sets in.

Given that many of these properties may remain unaffected by episodes of erosion for some time, forced abandonment of a site may be viewed as an unreasonable restriction on the use of the land in the absence of compensation.

Even where relocation is feasible on existing sites, this is still likely to be resisted by landowners due to cost and other reasons. However, a claim for compensation would be more difficult to pursue, as use is not being prevented.

Notwithstanding these difficulties prior relocation of buildings to the extent possible within existing sections, is arguably the most cost effective way to reduce risk. Further research would be required to determine the overall extent of any risk

reduction benefit taking into account the actual physical feasibility of relocating buildings on-site.

2. Require relocation or removal of buildings when erosion reaches within a set distance of the building. This requires making a judgment about what is the best trade off between allowing use of the site, and providing sufficient buffer between the building and the shoreline to provide sufficient time for the building to be relocated before it is damaged.

In practice, a risk remains because episodes of erosion can start with little warning and proceed rapidly placing buildings at-risk. It may be difficult to organise relocation of buildings at relatively short notice. Property owners may instead opt to try and protect their property.

Notwithstanding this potential problem, some district councils in New Zealand are starting to adopt this approach. To date, no New Zealand council has had to enforce these rules in practice, so they remain untested.

3. Allow buildings to be damaged before requiring relocation (which is used in some US states). In this case the relocation trigger is set at a percentage damage of buildings, and the replacement building must be set back at a distance that is outside the current risk area. This gives the property owners the maximum possible lifetime from an existing shorefront building location. However, it does not prevent damage to existing buildings.

It can also result in a shorefront and foreshore dominated by buildings in various states of disrepair. The outcome of this method may be inconsistent with maintenance of natural character and public access.

This approach is usually accompanied by a prohibition on hard protection works, and the overall approach tends to focus on prevention of armouring of the shoreline rather than a reduction in risk.

In some locations, such as Ohiwa Spit, episodic erosion may take the form of cycles of retreat and advance spanning several decades. During phases of shoreline advance there may be demand to rebuild on sections from which houses were removed during the phase of erosion. One distinguishing feature of this situation is that existing use rights will have lapsed once a building has been removed from the site for more than 12 months. Consideration should be given as to whether it is appropriate to allow rebuilding. If it is not then, specific rules or a covenanting process may be needed to achieve that if none already exist.

The choice of trigger point for retreat on shorelines at-risk of episodic erosion requires further consideration and debate. This should include an evaluation of the relative efficiency and effectiveness of district and regional council regulation of retreat, and whether or not building relocation costs should be subsidised in any way.

8.2 Situations with existing protection works

Some existing coastal settlements at-risk from coastal hazards have existing seawalls. Many of these areas are still considered to be at-risk because the seawalls were installed in an ad hoc fashion in response to episodic erosion and are not considered to be of a standard that will provide long-term protection.

This is a particularly problematic situation with respect to initiating a policy of retreat as the existing seawalls represent a fairly firm statement towards a policy of holding the line of the shore. This applies even if the protection works are not physically effective as protection works.

Ultimately this comes down to a question of whether hard protection works are an acceptable solution on a shorefront. This decision needs to be made before a decision is made about retreat (or alternatively soft protection works). Decision-making on the acceptability of hard protection works needs to incorporate the viewpoints of the wider regional community as well as affected property owners.

If hard protection works are not an acceptable solution, then the community has the choice of either holding the line of the shore using soft protection methods such as beach replenishment, or alternatively retreating.

8.3 Managing retreat of protection works

The option of landward relocation of protection works has been proposed as a solution to an existing coastal hazard risk in some locations. This involves relocating existing shorefront protection works to a more landward position where it is sometimes referred to as a backstop wall. This approach is used for managed retreat of coastal flood defences on some UK estuarine coastlines and is termed managed realignment in the UK.

This approach has the advantage of relocating the hard protection work to a position embedded in a dune, where it will be less visible, and will interact with foreshore sediment processes less frequently. Shifting the protection work landwards will provide more room for a normal foreshore and dune system to operate and accumulate sand. It also provides more beach area for recreation and amenity.

This option relies on there being an existing reserve or other setback of substantial width between the existing position of the protection work and buildings to be protected. This may not always be the case. Potential disadvantages with this approach are as follows:

If it is possible to shift the protection work to a position where it rarely interacts with the foreshore, this begs the question of whether a protection work is needed at all. Reinstalling the removed sea wall could be costly and may not yield any readily quantifiable risk reduction benefits, at least in the medium-term.

If the shoreline is retreating in the long-term, then the backstop wall will eventually become the fixed position of the shoreline. As there will be no further room to relocate the protection work (unless buildings are shifted) it will then become the focus of debate on whether to retreat or to hold the line of the shore. As the protection work already exists it may be very difficult to initiate a process of retreat.

If the backstop protection work is properly designed using modern accepted standards, on the assumption that it will need to be the final and complete defence against erosion, it will need to be a substantial and costly structure. Properly designed rock protection works usually have a wide footprint, i.e. they are significantly wider than they are high. This means that the new protection work could occupy a substantial area, offsetting some of the original advantages of shifting the existing protection work.

Backstop walls are possibly better suited to locations experiencing episodic cycles of shoreline fluctuation rather than long-term retreat. The structure will only be exposed to the sea episodically and could possibly be of a less robust and cheaper design as it is exposed to less wave energy.

Backstop protection works may be best considered as a more environmentally sustainable option for holding the line of the shore, rather than as a final solution for managed retreat. Councils also need to ensure that backstop walls meet accepted modern design standards for protection works taking into account their intended purpose.

8.4 Long-term retreat

All three regions (Auckland, Waikato and Bay of Plenty) have areas of existing development at-risk from long-term erosion hazards. These areas extend landward of the areas assessed to be at current risk. Assuming that the scientific assumptions behind these assessments are correct, the implication is that the area of current risk will gradually encroach landward over time.

The practical outcome of this is that there will be less and less room available on existing sections for relocation of buildings to occur. In the meantime, it is likely that these sections will have increased in value.

At this point retreat means literally that existing sections will need to be abandoned. This imposes either a major cost on landowners or alternatively a major cost to the wider community if compensation were to be provided. This is a difficult point in the process of retreat that would need to be anticipated and addressed.

In addition, as retreat progresses, more modification of infrastructure will be required. In some cases this may involve progressively altering the layout of utilities and the associated development. As the process of long-term retreat is expected to be relatively slow, there are likely to be opportunities to gradually build these changes into long-term urban development and renewal strategies.

In the very long-term, sea level rise is projected to continue beyond the 50 or 100 year planning horizon usually used for coastal hazard planning. Within the first 50-100 years it may be possible and cost effective to use soft protection options such as beach replenishment to hold the line of the shore.

However, as sea level rise accelerates over time, the cost and physical difficulty of maintaining the shoreline will increase, partly because of the change in sea level and possibly because sand will become an increasingly costly and scarce resource. This increasing cost may be partly offset by the increasing value of the property it protects, but ultimately holding the line of the shore may become unaffordable. This suggests that communities should use the time brought by such soft protection works to alter the pattern of urban development into a form that facilitates retreat that may ultimately be unavoidable.

An alternative long-term scenario is that the costs of protection from sea level rise will increase more slowly than the increase in the value of coastal property and ability to pay for protection work. Initially sea-level rise could force a retreat because the value of properties is lower than the cost of protection work. The frontier of development would be progressively pushed back by the sea, while still accumulating investment to the immediate landward side as property values rise with increasing proximity to the sea. This process could continue indefinitely or until the value of assets at-risk escalates to the point at which it becomes cost effective to build protection works that are physically capable of stopping retreat. There may still be an environmental and social cost of holding the line of the shore if beaches cannot be maintained.

9 Summary

9.1 Coastal hazard risk and perceptions

There are substantial private and public assets at-risk from coastal hazards in all three regions.

Public perception of coastal hazard risk is dominated by personal experience, which is often of a relatively short-term nature in relation to the natural processes that change

the shoreline and contribute to hazards. It is also qualified by the potential economic and lifestyle value of investment in coastal property.

The value of these assets is increasing at a rapid rate because of capital gains in shorefront property investment are higher than some other forms of property investment notwithstanding potential coastal hazard risk. Potential capital gain is a strong incentive to further develop in coastal hazard areas. Properties in well-known coastal hazard areas are increasing in value. This is driving up the value of assets at-risk.

9.2 The acceptability of retreat

While people value natural beach systems, overseas research suggests that the majority of people prefer intervention to stop erosion, rather than letting shorelines naturally retreat.

Most property owners affected by coastal hazards will not voluntarily retreat and have a strong preference for hard protection works.

Hard protection works are the historically preferred solution to coastal hazards in New Zealand. In the past, the construction of private property protection works has been subsidised by local authorities and central government.

The community as a whole is likely to view soft protection options such as beach replenishment favourably, and may be willing to support zoning and regulation of building on dunes to reduce risk.

There is little or no New Zealand research on the acceptability of retreat as an option, but it is likely to be opposed by property owners. Available evidence indicates that property owners are generally reluctant to relocate building landwards on existing properties. Actual abandonment of existing properties is likely to be firmly resisted.

9.3 New Zealand examples

There are examples of forced retreat within New Zealand. This has usually occurred after protection works have been tried and failed. Mokau Spit is a current example of this.

Muriwai beach is possibly the only New Zealand example of the deliberate application of a policy of retreat. However, this area contains relatively few private assets.

Some district councils and one regional council now have rules that require new buildings in coastal hazard areas to be relocated or removed if threatened by the coastal hazards. These rules usually include a requirement to either relocate or remove buildings threatened by coastal hazards. These rules are relatively new, and actual enforcement of relocation has not been required to date and remains untested.

9.4 Overseas Examples

A form of managed retreat is applied within some coastal US states, and on some estuarine coastlines in the UK.

Rolling easements are used in some US states to regulate for removal or relocation of buildings damaged by hazards. Regulatory emphasis tends to focus on prevention of armouring of shorelines. Beach replenishment is popular and is subsidized, though the continuance of this subsidy is now being debated.

A form of managed retreat called managed realignment is being used in the UK for retreat of coastal flood defences on predominantly rural estuarine coastal land.

Examples of managed retreat on the UK open coast are rare, and protection works are still highly favoured.

In contrast, the Netherlands opted for a nation wide policy of holding the shoreline in the 1990's. This includes use of soft protection works.

9.5 Options for implementing retreat

9.5.1 Non-regulatory options

Non-regulatory options alter the distribution of costs and benefits of retreat within society in a way that facilitates retreat. In a pure cost benefit analysis no account is taken of the distribution of costs and benefits. However, the distribution of costs and benefits is politically, socially, legally and financially important.

Provision of information on coastal hazards is a necessary first step but will not:

- deter investment in at-risk coastal property
- alter market perceptions of the value of shorefront property
- cause people to relocate, or
- reduce future demand for or construction of protection works.

Councils need to include information on coastal hazards within statutory plans to both reduce liability and as a prerequisite to any strategy for addressing the hazard.

Purchase of coastal hazard affected properties is a high cost option for councils or central government. For example, there is, very approximately, NZ\$1 billion of private property at-risk on the Coromandel east coast alone. This basic observation applies whether or not there is a perception of an obligation to purchase land. Councils may need to consider making a clear public statement that they will not purchase land at-risk from coastal hazards (to create reserves), in order to send a clear signal to property investors.

Purchase of at-risk property and then renting until removal of buildings is required (so as to recover some costs) also has a high cost in most cases at present. This is because shorefront property values have increased to the point where the initial purchase cost cannot be recovered at current market long-term rental rates. It is not clear whether these market circumstances will continue into the future.

Subsidies for relocation of buildings on existing sites would cost considerably less than purchase of properties. However, the cumulative cost of such a subsidy scheme could still be high.

A pre-paid scheme for funding relocation may be difficult to implement because of the unpredictability of erosion events and administrative complexity. It may also have liability implications for councils.

A "hazard tax" was rejected from detailed consideration because it is likely to be outside local governments existing powers, and would be unpopular.

The option of buying at-risk properties and then leasing them back to property owners in the form of a lease-for-life could be used to reduce the initial purchase price. However, the cost will still be substantial for high value shorefront property and also any situation where the lease-for-life was of short duration. This option may be feasible for lower value properties outside the current risk area, but within the long-term risk area, provided that a relatively long lease-for-life can be negotiated. However, this option still represents a subsidy to hazard affected property owners, as the residual purchase price is a loss that the council (ratepayers) must bear. The overall effectiveness of this option will be limited by uptake rates.

9.5.2 Regulatory options

Regulatory options use rules or other legal instruments to force retreat. The costs of regulation usually fall on the person subject to regulation. There are some exceptions to this. For example transferable development rights alter the distribution of costs and benefits of retreat within society, and all regulation has a policy development cost to ratepayers.

Use of transferable development rights to provide an incentive for relocation is unlikely to be financially attractive in most cases because of the relatively high value of front property in relation to the value of property further from the shoreline. However, this should remain an option for case-by-case consideration. Further consideration could be given to the use of transferable development rights as partial compensation as part of a system of regulated retreat.

Another non-traditional regulatory option is to purchase shorefront land, covenant it and then resell it. The covenant would include conditions similar to those used as conditions of consent. Given that shorefront property is currently increasing in value, and that existing coastal hazard covenants do not seem to affect market prices, this may be a relatively low cost way of inserting control over existing titles. It has an additional advantage in that it can be implemented as an administrative decision rather than requiring the cost and delay of the statutory rule making process. The feasibility and effectiveness of undertaking this on widespread basis is uncertain but should be investigated further.

District plan rules are already in use in some districts to prevent further subdivision and ensure that buildings are relocatable within some coastal hazard areas. In some cases, relatively thorough design controls are used to ensure the buildings are truly relocatable. Conditions of consent and covenants are also in use to provide a mechanism for enforcing retreat. Experience with these mechanisms is relatively new and there have been no erosion episodes of a scale that required enforcement of building relocation or removal conditions. The intent behind these rules is genuine, but doubts remain over the long-term effectiveness of these relocation controls for the following reasons:

- These rules do not apply to existing uses of the land, which results in a piecemeal and gradual application of relocation to existing settlements. This effectively thwarts any overall process of retreat and may make any formal adoption of a policy or managed retreat lacking in an effective means of regulatory implementation.
- Some of the standard conditions of consent have clauses that appear to allow property owners put off or negotiate their way out of relocation or removal.
- The installation of hard protection works is usually not prohibited.
- Existing protection works have not been removed where they exist.
- Additional protection works have been constructed in some cases.
- The debate over the acceptability of hard protection works has not been resolved in most of these communities.
- The councils may not have formally committed themselves to a process of retreat.
- In some cases the councils are considering granting consent to protection works, or are actively involved in the provision of them.
- Individual property owners are still actively seeking protection works in some areas.

- There is no evidence that the market value of properties subject to relocation conditions has reduced to reflect the potential impermanence of land.
- In practice, it may be difficult to organise relocation of more than a few buildings at short notice when a severe episode of erosion occurs.
- Regional councils also have a function to exercise control over use of land subject to coastal hazards. There are three important differences to the powers of regional councils in comparison to those of district councils:
 - Regional councils cannot control subdivision whereas district councils can.
 - Regional councils can control existing uses whereas district councils cannot.
 - Regional councils can control protection works on both the land and the coastal marine area, whereas district councils can only control protection works on land.
- Control of the use of the land in coastal hazard areas has traditionally been considered a district council function, though there is no real statutory basis for this distinction under the RMA. To date only one regional council has made rules controlling activities in coastal hazard areas, and in that case only controls new buildings (including replacement buildings).

The effective division of regulatory roles between cooperative regional and district councils needs to be reconsidered if a strategy of managed retreat is to be implemented.

- To be effective in achieving managed retreat, regulation must include two key elements:
 - A prohibition on hard protection works that applies on land and in the coastal marine area.
 - Regulation of relocation for both existing and new buildings on land subject to coastal hazards.

It is suggested that a more effective division of regulatory roles between councils would be for:

- District councils to continue their control of subdivision and the non-hazard related effects of land use.
- Regional councils to control both existing and new uses of land subject to coastal hazards for hazard avoidance and mitigation purposes only.
- Regional councils to control protection works in both the CMA and on land.

Some district councils have accumulated considerable practical regulatory expertise in this area. Therefore an alternative would be to make regional rules and transfer (by mutual agreement) the role of administering the rules to the district councils. This would also facilitate a “one stop shop” approach to administration of regulation.

Consideration could also be given to altering the form or rules, so that they:

- set a finite term to the use of the land within coastal hazard areas

- include covenants that prevent installation of protection works and complaints about the hazard.

Both of these require further research.

Making a prohibition on the use of hard protection works, presupposes that there has been a robust process of debate and consultation on the issue of the acceptability of hard protection works. Individual consent processes for protection works are not an effective forum for this type of debate because the cumulative effects of armouring cannot effectively be assessed in a one-off situation.

The issue of what circumstances it is appropriate to use armouring on shorelines needs to be resolved before the option of managed retreat is considered. It needs to be addressed on at least a regional basis and possibly also a national basis, to ensure that the values of the coast to non-residents are adequately incorporated into decision making.

9.6 Infrastructure and reserves

Infrastructure and reserves are important community assets that need to be taken into account when considering managed retreat.

Roads and reserves parallel to the shore are particularly vulnerable to erosion.

Adopting a policy of managed retreat will require acceptance of allowing coastal esplanade reserves to erode in order to maintain natural coastal systems. Reserves policy and management plans may need to be altered to that effect.

Coastal settlements with a road on the seaward side of existing residential development are problematic, as decisions about retreat need to consider the road, other infrastructure and dependent development collectively.

Utility networks and reserves that run perpendicular to the shore are generally less vulnerable to hazard and would facilitate retreat.

Redevelopment of existing areas may provide opportunities to alter existing utility networks and reserves to a shore perpendicular layout.

Long-term infrastructure and urban development planning by councils needs to provide for the process of retreat. This can include gradually and progressively altering the pattern of development to a shore perpendicular layout over time.

9.7 Long-term implications

Where retreat can take the form of relocation on existing sections, the costs are relatively low (in most cases) and shifting buildings landwards will generally reduce risk.

However, there is insufficient information to determine the number of properties on which relocation is physically feasible and the extent of any hazard reduction benefit that may arise. More research is required to assess the overall contribution that relocation on existing sections can make to retreat. This is important to determine the overall relevance of methods of retreat that rely on relocation of buildings.

Ultimately, as shorelines retreat, properties will need to be abandoned completely. Investment would need to be relocated inland as indicated in Figure 1. Also, infrastructure will be increasingly affected. Given that the land value of shorefront land is approximately two thirds of capital value, the abandonment of sections to the sea has a high cost, even if buildings can be relocated to other sites.

The high cost of land abandonment means that managed retreat is not necessarily a low property risk option, unless it can be implemented in a way that alters market expectations about the value of shorefront property and redirects investment elsewhere over time.

There are no short-term low cost solutions. However, in the long-term, change can be applied gradually over time. This suggests that the emphasis of managed retreat will need to change over time from one of building relocation towards methods that:

- control the progressive abandonment of properties.
- alter the layout of network utilities, reserves and development to facilitate retreat.
- encourage market expectations of the future value of shorefront land that more accurately reflects its remaining useful life.

10 Conclusions and Further Research

10.1 Extent of risk and long-term management

The information on coastal hazards held by the councils indicates that there are substantial areas of existing development at-risk from coastal hazards in the Waikato, Auckland and Bay of Plenty Regions. For example, there is approximately NZ\$1 billion of residential property at-risk on the Coromandel Peninsula alone.

Not all of these properties are currently being affected, but many are subject to risk from coastal hazard events or episodes that could occur at any time. Other properties are subject to risk from processes that could give rise to a hazard in the longer term (refer section 5.2).

If managed retreat was either adopted as a general strategy, or forced by coastal processes, then the physical extent and cost of retreat would be large in the long-term.

Conversely, the potential cost and wider effects of works required to protect these properties in perpetuity would also be high.

Further, the issue should not be seen as a series of isolated local problems.

On a positive note, the time frames over which the coastal processes and hazard events occur are relatively slow in every day human terms. This provides time, in most (but not all) cases for communities to strategically plan management of the hazard and avoid a situation of “crises” management.

It is recommended that:

- Councils should actively engage with central government on strategies for management of both natural coastal systems and coastal hazards, so that the national interest in both is articulated.
- Councils formulate strategies for management of coastal hazards in a way that recognises the potential scale of the problem in the long-term. This applies to either a strategy of managed retreat or a strategy to hold the line of the shore.
- Councils work together to develop strategies and means of implementation for managed retreat. This could include nationwide sharing of ideas and current practice experience.
- Councils continue their efforts to collate information on coastal hazards and response to those hazards on a consistent regional basis.

10.2 Socioeconomic factors

Overseas research and historical New Zealand experience with coastal hazard events indicates that retreat is unlikely to be viewed favourably by the majority of property owners within at-risk areas. But retreat may be more acceptable to the wider community.

Historical New Zealand examples of communities affected by coastal hazard events indicate that only a small percentage of shorefront property owners voluntarily relocate in advance of a coastal hazard event. Historical retreat has most often occurred after people have been forced off their properties by coastal processes. This indicates that government (either local or central) will need to be actively involved if retreat is to be implemented.

Experience from parts of the USA coastline with a long history of property loss to erosion indicates that shorefront property continues to attract a premium up until the time of irretrievable property loss.

Current market values for New Zealand coastal property in well-publicised coastal hazard risk areas continues to increase in value inline with other shorefront property. In addition, land values in shorefront property are generally higher than the value of the buildings on the land. This is leading to an increase in the value of assets at risk. It also means that people are likely to be increasingly reluctant to retreat from coastal processes if it involves abandonment of investment.

It is possible that there is a link between the expectation that protection long-term protection works can be provided, and the market confidence in property values within at-risk areas.

If shorefront property values continue to increase at current rates, the cost to benefit ratio of undertaking protection work to hold the line of the shore will become more favourable over time. This assumes construction costs do not increase at more than the general rate of inflation. However, the Buffalo Beach Coastal Erosion Management Strategy, 2005 indicates that the cost/benefit ratio of managed retreat improves over a longer term.

Therefore a comparison of holding the line shoreline with managed retreat, will need to have specific regard to the long-term feasibility and costs of maintaining protection works, which extends beyond the normal period over which individual structures are costed. It should also consider the wider costs of protection works on the environment, and economic activity, that is dependent on beaches.

There is relatively little information on how New Zealander's value the naturalness of the coastline, and their views on management options for coastal hazard risk.

It is recommended that:

- Further debate, consultation and research should take place on the perceptions of New Zealander's about the value of coastlines, coastal hazard risk, and the acceptability of various responses to coastal hazards. This should involve the wider New Zealand community as well as shorefront residents.

There is a long and well-established tradition of attempting to hold the position of the shoreline with protection works. Retreat would involve a major change in perceptions about the coastline, the value of coastal property and acceptable responses to coastal hazards.

This change would require a long-term strategy for implementation of retreat. It may take several generations to establish retreat as a "normal" response to coastal hazards,

and to build up effective implementation strategies, corporate experience and community acceptance. A stepwise process may be necessary. A long-term strategy will need to incorporate the following elements.

- A good understanding of the value of natural shore systems to the community including non-residents and the general economy.
- Regulation to prevent the loss of shoreline systems to hard protection works
- Relocation of buildings on existing properties where feasible.
- Control of the progressive abandonment of properties.
- Alteration of the layout of network utilities, reserves and development to facilitate retreat.
- Encouragement of market expectations of the future value of shorefront land that more accurately reflects its remaining useful life.
- Incorporation of retreat into urban development/growth strategies and infrastructure planning.

10.3 Methods for implementing retreat

10.3.1 Information

Provision of coastal hazard information about properties will not of itself cause property owners to relocate or retreat from coastal hazards. Neither is it likely to decrease property values. Therefore reliance on this method alone would be ineffective.

10.3.2 Relocation

Relocation of existing at-risk buildings within existing properties is potentially one of the more cost effective forms of retreat. However, it is not known for what proportion of existing at-risk properties this is feasible. It is important to clarify this with further research because it affects the overall cost of retreat, and the relevance of different methods of implementing retreat.

For example, if most at-risk buildings can be safely and effectively relocated within existing sites, then the general cost of retreat will be relatively low (in the medium term). However, if there is insufficient room on existing titles for relocation, then the overall cost of retreat is much higher as the value of use of the titles is reduced substantially, becoming either a loss to individuals, or society if compensation is provided.

Also, if most at-risk buildings can be relocated on-site then the emphasis of regulation should be on requiring relocation of buildings and building designs that are easy to pull back. However, if on-site relocation is generally not feasible then the regulatory emphasis may need to be on building removal and building designs that are easy to disassemble, demolish or clean up after damage. There may be little practical value in insisting that buildings be “relocatable” if there is no room for relocation on existing sites, as the residual value of a building removed from a site may be relatively low.

It is recommended that:

- Further research is undertaken to assess what proportion of at-risk properties are physically suitable for on-site relocation of buildings.

10.3.3 Regulation

Regulation is likely to be an essential tool for implementation of retreat. Rules can take a variety of forms.

Some councils have gained valuable experience with rules to controlling development in at-risk areas. However, this existing regulation has developed incrementally and has not necessarily been developed within an explicit context of managed retreat.

It would be timely for both regional and district councils to collectively review existing regulatory practice with the aim of determining what form of regulation would be most effective within the context of an explicit strategy of managed retreat.

It is recommended that:

- Both regional and district councils collectively review regulatory practice. This should address three key areas:
- What form of regulation of land use would be most an effective within an explicit context of managed retreat?
- The relative roles of regional and district council regulation.
- Integrating control of hard protection work construction within a strategy of managed retreat.

10.3.4 Property rights

The system of fee simple title to shorefront property does not reflect the potential impermanence of the underlying land. Land is valued as though it has permanent utility of use, when that may not be the case. This is the main barrier to the implementation of retreat and retention of natural shoreline systems.

Successful implementation of managed retreat will require a change in perceptions about the permanence of the land. This effectively involves a change to a system of land use or tenure that had a fixed term of use (i.e. they operate as a long-term lease or have an effect similar to a lease). Various ways of potentially implementing this have been briefly assessed in this report and are summarised below.

The first group of options alters property titles and ownership directly, and accordingly compensation is payed through initial purchase by councils. Because initial purchase is very costly, these options are more viable in circumstances where a reasonable proportion of costs can be recovered during the remaining useful life of the property. Therefore these options will be very costly where property is at immediate risk, but could be less costly where the risk is long-term.

One option is to purchase existing fee simple titles and convert then into medium to long-term leasehold, with terms to reflect the likely remaining useful life of the land. However, existing New Zealand residential tenancy law focuses on rentals with only short duration security of tenure. This may not permit the type of long-term lease that would give the security of tenure necessary for the lease to have sufficient value to substantially offset initial purchase costs. Special legislation may be required to give effect to this option. This requires further investigation in terms of legal, financial and market feasibility.

The option of purchasing and renting properties (under existing law) was investigated (refer section 7.4). However, in most places current shorefront market rental rates are low relative to the value of value of shorefront land, and would be insufficient to offset the initial purchase cost even over a long period of time. Even if future market rental rates do reach an equilibrium with general property values, it is likely that it will still be

costly to purchase and rent shorefront property. This is because market rental rates do not place a comparable premium on a shorefront location. It is possible that market rental rates are low because existing law does not offer security of tenure. Therefore existing rental rates may not be a good indicator of the value of a long-term lease with reasonable security of tenure.

The option of a lease-for-life was briefly investigated (refer section 7.4) but the scope of this project did not extend to detailed analysis of this option. This option may be affordable in situations where the lease-for-life can be assigned a relatively long term, but will not suit circumstances with a very immediate risk. Given that approximately one third of the east coast at-risk properties are subject to long-term risk from sea-level rise over the next 100-years, the feasibility of this option warrants further research.

The following options would use regulation to alter the term of land use. As the underlying ownership remains private, compensation is not paid.

Regional rules could be used to create an express term of use (refer section 7.4). This could be done by rules that set an express term on the duration of residential/commercial land use on properties at-risk. The term would relate to the estimated remaining useful life of the land. Use of rules with an express term of use has not been done before, and while there does not appear to be anything expressly preventing this, the legal viability of such rules requires further investigation.

In practice, setting a reasonable term of use may be quite complex, given scientific uncertainty and the tendency for coastal hazards to occur as episodic events. Terms that did not reasonably relate to risk could give rise to a claim that they render land incapable of reasonable use under Section 85 of the Resource Management Act 1991. Any such rules would need to be made by a regional council so that they can apply to existing uses. This option warrants further investigation.

Covenants are another regulatory tool that could potentially be used to register a term of use on the title of a property (refer section 7.4). The option of purchasing properties, covenanting and selling them also needs more detailed investigation.

A firmer approach to regulation of hard protection works would reinforce the potential impermanence of shorefront land. As indicated in section 5.5, property owners have a strong expectation that hard protection works will be permitted and a lot of faith in their effectiveness. An express prohibition on hard protection works would send a clearer signal about the potential impermanence of land. This presupposes analysis and consultation on options.

It is recommended that more detailed investigation take place into:

- The law relating to leasing of land for long-term residential purposes as a potential mechanism for areas at long-term risk.
- The feasibility of lease-for-life as an option for areas at long-term risk.
- The legal feasibility of regional rules that set an express term for residential land use, and the practical scientific feasibility of estimating the term.
- The administrative feasibility and long-term effectiveness of the purchase-covenant-sell option.
- The effectiveness of existing rules controlling hard protection works within an explicit context of managed retreat.

10.4 Compensation issues

The issue of private property owner compensation will arise within any strategy of managed retreat. This is a complex legal and political issue that is beyond the scope of this project to resolve. Clear direction from a national level may assist with this issue.

However, as purchase of at-risk properties is a potential method for implementing retreat, this has been briefly considered. It also gives an indication of the cost of full compensation.

Overall the high cost of coastal property makes the option of purchase of at-risk properties generally unaffordable (see section 7.3). There may however, be isolated exceptions. Also, purchase of individual properties may lead to a general expectation of compensation, and support market investment in properties that are at-risk from coastal hazards. Therefore any requests for public purchase of at-risk properties needs to be carefully considered in the wider context of the problem and effects on market perceptions of the value of at-risk properties.

In those situations where existing buildings can be moved back on existing sections, managed retreat is potentially a low cost option for managing coastal hazards. However, even in these situations, relocation is likely to be resisted and would require proactive intervention by councils. Property owners may expect councils to compensate them for the cost of relocating buildings, even if there is no obligation to do so. While the per-site cost of relocating buildings is relatively low, the cumulative costs will still be significant (unless costs can be recovered by a purchase, relocate and sell option as discussed in section 7.2).

Where relocation of buildings is not feasible, then some titles will be lost to the sea as part of the process of retreat. This has a high cost to society because coastal land, and shorefront land especially, has a high value. This cost cannot be avoided unless market perceptions about the value of at-risk land change in the future. This applies whether or not some form of compensation is paid, as compensation simply alters the distribution of costs within society.

The relatively long time frames over which coastal processes operate provide communities with an opportunity to adjust their expectations about the future value of land on retreating coastlines and reduce expectations for compensation for loss of land. This opportunity should be used to maximum advantage.

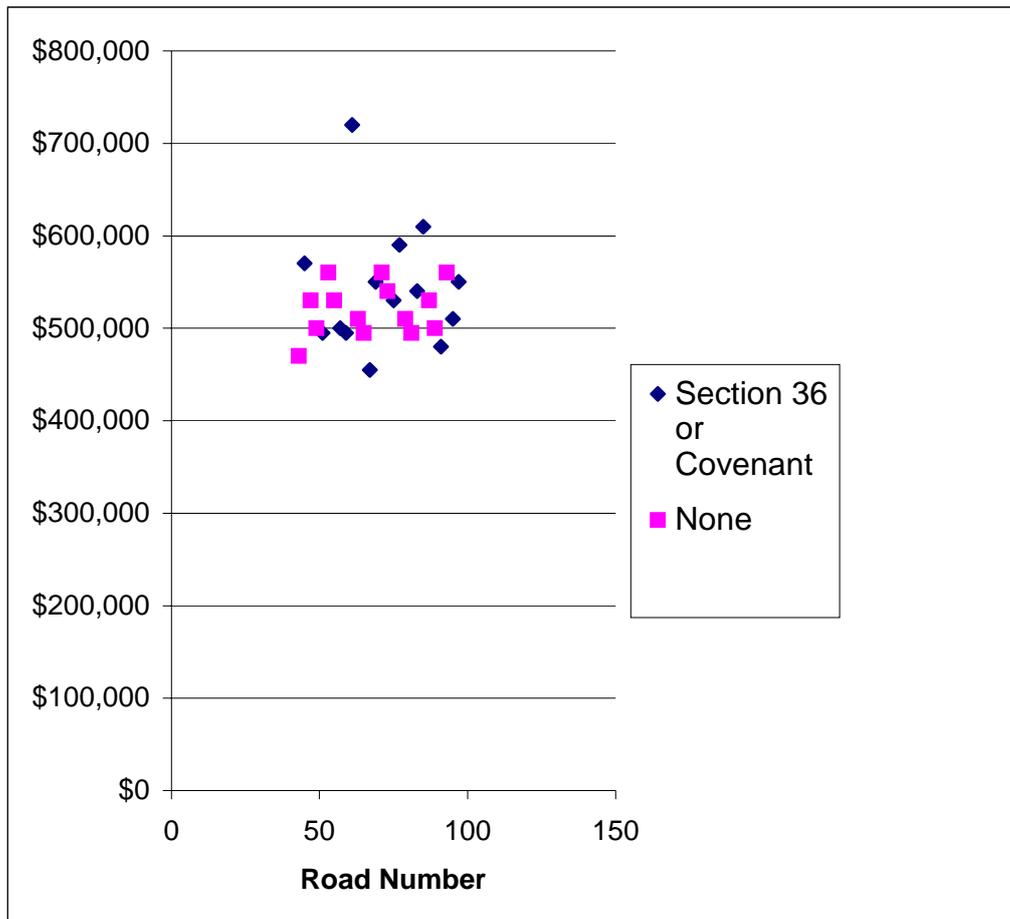
Appendix I: Shaw Rd Waihi Beach Values

This data was obtained by Environment Bay of Plenty and relates to properties to be on a part of Waihi Beach, Bay of Plenty. There are two key points. Firstly, the coastal hazard has been well known and widely publicised for several decades at least. Secondly some of the properties are subject to section 36 notices under the former Building Act 1991, or hazard related conditions of consent or covenants. There is no observable difference in value between those titles with hazard related attachments and those titles. Property values (as of 2005) in this area have more than doubled since 2002.

Shaw Road	Legal	Notice	Date Notice Registered	Other	Cv (2002)
43	Lot 110 DPS35465	-			\$470,000
45	Lot 111 DPS35465	S36(2)	2002	S108 Cov	\$570,000
47	Lot 112 DPS35465	-			\$530,000
49	Lot 113 DPS35465	-			\$500,000
51	Lot 114 DPS35465	S36(2)	2002	S108 Cov	\$495,000
53	Lot 115 DPS35465	-			\$560,000
55	Lot 116 DPS35465	-			\$530,000
57	Lot 117 DPS35465	S36(2)	1994		\$500,000
59	Lot 97 DPS1263	S36(2)	2001	S108 Cov	\$495,000
61	Lot 98 DPS1263	S36(2)	1997		\$720,000
63	Lot 99 DPS1263	-			\$510,000
65	Lot 100 DPS1263	-			\$495,000
67	Lot 101 DPS1263	S36(2)	2004		\$455,000 \$330,000
69	Lot 102 DPS1263	S36(2)	1994		\$550,000
71	Lot 103 DPS1263	-			\$560,000
73	Lot 104 DPS1263	-			\$540,000
75	Lot 105 DPS1263	S36(2)	1998		\$530,000
77	Lot 106 DPS1263	S36(2)	2002	S108 Cov	\$590,000
79	Lot 107 DPS1263	-			\$510,000
81	Lot 108 DPS1263	-			\$495,000
83	Lot 109 DPS1263	S36(2)	1993		\$540,000
85	Lot 110 DPS1263	S36(2)	2002		\$610,000
87	Lot 111 DPS1263	-			\$530,000
89	Lot 112 DPS1263	-			\$500,000
91	Lot 113 DPS1263	S641A(1)	1991	S36(2), S108 Cov - 2000	\$480,000
93	Lot 114 DPS1263				\$560,000
95	Lot 115 DPS1263	S36(2)	1992		\$510,000
97	Lot 116 DPS1263	S36(2)	1992		\$550,000
1 Edinburgh The Loop	Lot 117 DPS1263	S36(2)	2003		\$660,000
8	Lot 43 DP37326	S641A(1)	1990		\$720,000
10	Lot 44 DP37326	S641A(1)	1990		\$730,000
12	Lot 45 DP37326	-			\$550,000
14	Lot 46 DP37326	-			\$530,000
16	Lot 47 DP37326	-			\$520,000
18	Lot 48 DP37326	-			\$500,000
20	Lot 49 DP37326	S641A(1)	1992	S36(2), S108Cov 2002	\$530,000

Shaw Road	Legal	Notice	Date Notice Registered	Other	Cv (2002)
22	Lot 50 DP37326	S36(2)	1999		\$530,000
24	Lot 1 DPS6534	-			\$550,000
26	Lot 2 DPS6534	S36(2)	1996		\$530,000
28	Lot 3 DPS6534	-			\$530,000
30	Lot 4 DPS6534	S36(2)	1998		\$600,000
32	Lot 5 DPS6534	S36(2)	1999		\$620,000
34	Lot 6 DPS6534	-			\$530,000
36	Lot 7 DPS6534	S36(2)	1993		\$930,000
38	Lot 8 DPS6534	S641A(2)	1992		\$660,000
\$25,435,000					

The following graph plots the values of properties with and without restrictive hazard related covenants.



Appendix II: Wainui Beach Protection Works

The following extract is from the Gisborne District Council 2004 – 2014LTCP, Volume II Part III.

“Background, History of Special Rating Area

Attempts to control erosion at Wainui Beach by the use of protection structures go back many years. At first these were private and individual works, but at two stages public bodies attempted to provide integrated schemes. In the 1960’s the Cook County Council provided a set of groynes perpendicular to the foredune. In the late 1970’s the East Cape Catchment Board incorporated the best of the existing works along with new works into more comprehensive scheme. A new set of gabion baskets was provided along the beach from near the Haumanuatua stream southwards to about Lloyd George Road and a log and rail wall from that point to Tuahine Crescent was incorporated. Most of the older groynes were removed at that time, while some of the more useful ones were retained. The capital works were paid for jointly by Government subsidy and adjoining property owners, and a special rating area, termed the Wainui Beach Foredune Protection Scheme, was set up to maintain the works based on capital value. This operated successfully until 1994.

In the winter of 1992 a period of accelerated erosion took place, as a result of persistent southerly storms. Some of the existing gabion baskets were damaged or destroyed, especially south of the Stock Route and south of the Wainui Stream. Disagreements emerged between Council and landowners as to the best way to control the erosion. Some rock revetments were built on an emergency basis both by the Council and some landowners. Resource consent applications were made to validate these works and to build further works. The Department of Conservation became involved as a submitter against the consent applications. Reports were prepared by various experts, Dr Jeremy Gibb and Dr Paul Komar recommended against the types of protection works being advocated on behalf of residents, on the grounds that they would be largely ineffective and could further damage to the beach. Council’s Solicitors cautioned against further involvement with the protection works citing the existing and proposed works were considered ineffective for their purpose. Following a number of earlier reports, on 12 December 1997, the Council resolved to discontinue all beach works within the framework of the Wainui Beach Foredune Protection Scheme. (No rates had been levied since 1993/94).

Through 1992 to 1999 there were a series of Environmental Court and High Court hearings and appeals as the applications by residents and the Wainui Property Protection Committee to construct foreshore protection works, were not consented to. The most recent appeal led to mediation and the setting up of a joint working party with Gisborne District Council, Department of Conservation and local residents.

In July 2000 the Gisborne District Council resolved to reactivate the Wainui Beach Foredune Protection Special Rating Area initially as a “one off” rate for 2000/2001 works. This was in response to a favourable poll of property owners. The joint working party to determine the range of options for beach management at Wainui, then led to the “Wainui Beach Open Days” in March 2001. From respondents to the “Open Days” a Wainui Beach Management Strategy Committee was formed and this Committee has sought to identify the preferred management strategy for Wainui Beach.

The management strategy committee considered the findings and opinions of the many professionals who have studied Wainui Beach, as well as the opinions of the local residents and community, as expressed through the Beach Open Days, the Management Options Survey, the draft Strategy document, consultation meetings and subsequent questionnaires and submissions.

The Wainui Beach Management Strategy was adopted by Council on 14 August 2003 and within that, the Wainui Beach Foredune Protection Scheme Rating Area is identified as necessary to provide for:

- 1. Maintenance of identified existing foredune protection structures that will remain in place.*
- 2. Provision of 5% to 10% of the capital cost of new revetment works south of Wainui Stream.*
- 3. Ongoing planting of the foredune and incipient dune with beach grasses and suitable sand binding shrubs.*

4. 50% of the cost of the Beach Scraping Trials and the Beach Drainage System pre-feasibility study.
5. A contribution towards the trial of Geotextile Sand Cushions at the Stock Route area.

Council continues to be involved in the Wainui Beach Foredune Protection Scheme for the following reasons.

1. *The Wainui Beach Foredune Protection Scheme activity is undertaken at Councils discretion, in response to requests from the residents of the foredune area.*
2. *Council acknowledges it is important for this to be a publicly co-ordinated activity...*

...How Capital Works Funded Note that this project would be funded by a loan and paid for by:

- a. *Beachfront property owners -88% or approximately \$361,000.*
- b. *Wainui Beach Foredune Protection Rating Area - 6% or approximately \$24,000.*
- c. *GDC Roading (Lloyd George Road end) - 2.6% or approximately \$11,000.*
- d. *GDC Parks & Reserves (Tuahine Crescent Reserve Accessway) - 0.9% or approximately \$4,000.*
- e. *General Rates -2.5% or approximately \$10,000.*

Renewals as described in 7.1 above will be funded 100% by the property owners(s) that benefit from this work.”

Appendix III: Further Evaluation of Relocation

Relocation of Buildings Within Existing Properties.

Version 1: Owner Funded.

Version 2: Local Government Funded

Version 3: Local Government Purchase, Relocate and Resale.

Description:

Buildings at-risk from coastal hazards are relocated landward on the same properties. This includes relocation of on-site effluent treatment systems and other services. Existing protection works, could be depending on circumstances, left in position, removed or relocated landward. Three versions of this option can be considered depending on the source of funding. In version one, the property owner pays for the cost of relocation, either with cash or commercial loan. In version two, local government pays the cost of relocating the building within the property.

In version three, local government purchases the property at market value, then pays for relocation of the building, then sells the property at market value. This option may also include altering property boundaries, public reserves and public infrastructure if this would result in a lower risk or a better return on investment.

<i>Assessment Point</i>	<i>Analysis</i>
Legislative policy and statutory compliance	<p>As with all retreat options, this involves a change in the way of thinking about development on the coast. Therefore it would require a policy commitment (see analysis of commitments).</p> <p>It is unlikely that this option would work on a purely voluntary basis. It is likely that rules would be required to prevent the construction of hard protection works, and also to require that homes be relocated once a set trigger level of erosion or damage is reached. However, if a voluntary approach is adopted for all three versions then there are no additional legislative requirements. Compliance costs could arise as follows.</p> <p>In version one, the cost of relocating buildings, combined with loss of proximity to the sea, will probably deter most property owners. Other options involving both illegal and legal seawalls may be preferred. This could result in additional compliance costs.</p> <p>Version two would have additional compliance costs in that verification would be needed to ensure adequate relocation before payment of invoice.</p> <p>Version three would have no additional up front compliance costs, unless boundaries were relocated, in which case, subdivision consent vesting costs would be incurred.</p> <p>All three versions would potentially suffer from seaward development creep after relocation. This would require monitoring and enforcement. District plan rules and consent processes would need to be robust. Version three may provide an opportunity to relocate property boundaries landward to widen the area of public reserve, thus reducing opportunities for legal seaward development</p>

<i>Assessment Point</i>	<i>Analysis</i>
	<p>creep.</p> <p>If a mandatory approach is followed then the legal mechanisms by which this could occur are:</p> <ul style="list-style-type: none"> (a) designation and purchase of property, i.e. version 3. (b) regional rules that apply to existing uses. (c) district rules that apply to new uses. <p>These imply substantial policy development and commitment.</p> <p>District plan rules do not affect existing uses, so cannot be used to require relocation of existing buildings. There is a potential opportunity to use district plan rules to require relocation if properties are redeveloped, but this requires the development of rigorous set-back rules and an ability to clearly delineate between maintenance of an existing use, and a new use. Regional rules can control both new and existing uses.</p>
Beach Amenity Values	<p>Landward relocation of buildings is generally likely to result in an improvement in beach amenity values. Exceptions may occur when existing beachfront development has a particular amenity, recreational, historical, maritime or cultural value. If private title is retained, then erosion may have the effect of bringing the foreshore within private land, with consequent attempts to exclusively use that foreshore.</p>
Public Access	<p>Landward relocation of buildings will not affect public access, unless road access is also altered. If the land remains in private ownership, those owners will still have the legal right to exclude the public from the beachfront. Therefore versions one and two will reduce risk but will not necessarily improve public access to and use of the beach. Version three provides an opportunity to increase the area of reserve available for public use.</p>
Urban Amenity Values	<p>There will be a temporary adverse effect during the relocation process. The setback between the street front may increase or decrease depending on whether the road is seaward or landward of the houses. Version three provides an opportunity to alter the layout of urban areas.</p>
Public safety	<p>Relocation of houses landward would generally reduce risk. Exceptions may occur where shifting buildings land ward would result in them being located at a lower level – more vulnerable to inundation. Activities on the beach may be less visible to casual observation if houses are located further from the sea.</p>
Impact on council	<p>This option would require a general political commitment on the part of council to implement, particularly if it was mandatory. Relocation is unlikely to be a popular strategy with property owners. Version 2 would require council funding at approx \$50,000(Buffalo Beach Study).</p> <p>Version 3 requires council funding and involvement in property redevelopment. There is both a financial cost and risk element to this. Also, If relocation does not fully remove the coastal hazard risk, then subsequent property owners may hold the council to be at fault. Systems exist for setting a fair market price for property, but difficulties may occur in agreeing on current market value given expectations for rapid future gain in coastal property values. Council will inherit, temporarily at least responsibility for any protection works on former private property and will need to make a decision about whether to retain or remove them.</p> <p>Removal of existing protection works may create a liability issue in the future.</p>

<i>Assessment Point</i>	<i>Analysis</i>
Uncertainty	<p>Relocation only reduces the risk within the limit of land available for relocation on the section. Therefore it will not reduce risk completely in all cases. If in future, risk turns out to be worse than expected, then the relocated properties may still be at-risk. Conversely if in future the risk turns out to be lower than expected then there may be demand to develop seaward.</p> <p>Version 3 involves some financial risk with associated uncertainty in being able to fully recover purchase and relocation costs.</p>
Equity	<p>Within version one the costs of relocation will fall on property owners. The general public may receive some benefit from improvement in beach amenity values, though this will depend on circumstances. Property owners will receive some benefit from reduced risk but this will not be reflected in any increase in property values and therefore this benefit could only be realised if it prolongs use of the property. Some houses may be more or less costly to relocate, therefore the cost to individual property owners will vary, as will their ability to pay.</p> <p>Within version two the costs of relocation will fall on the rate paying community. The general public may receive some benefit from improvement in beach amenity values, though this will depend on circumstances. Property owners will receive some benefit from reduced risk but this will not be reflected in any increase in property values and therefore this benefit could only be realised if it prolongs use of the property. This approach may create an expectation of other works beneficial to private property owners.</p> <p>Within version three, there is some financial risk to the rate paying community. The general public may receive some benefit from improvement in beach amenity values, though this will depend on circumstances. Existing property owners will receive compensation for loss of property. However, should previous owners wish to repurchase a property later, there is no certainty that their bid will be accepted, or that they will be able to afford to do so. Some may regard this as inequitable.</p>
Natural Character	<p>Landward relocation of buildings is likely to result in an improvement in coastal natural character. An exception may arise if landward relocation resulted in a substantial increase in the elevation of the buildings</p>
Coastal Processes	<p>Landward relocation of buildings allows more room for coastal processes to operate without damaging buildings. However, property owners may still be reluctant to allow natural erosion of their land and may be reluctant to allow dunes to build up to the extent that this would block views.</p>
Coastal Hazard Types	<p>Landward relocation of buildings reduces the erosion risk to buildings. But will not alter the physical extent of erosion on private property, unless, under version 3, the width of public reserve is increased, or the relocation is combined with beach replenishment. The degree of reduction in risk will depend on the extent of relocation. A relatively small relocation, e.g. 10 metres may provide and immediate reduction in immediate risk from storm erosion, but would provide only temporary benefit if there is a long-term erosion trend.</p> <p>In most cases there will be no reduction in erosion risk to public infrastructure, unless under version three, public infrastructure can be relocated landward.</p> <p>Landward relocation of buildings will generally reduce storm surge risk and the risk from small tsunamis. An exception to this could arise if landward relocation resulted in the buildings being located in a low point between dunes, prone to ponding.</p>

<i>Assessment Point</i>	<i>Analysis</i>
	Landward relocation of buildings within a typical residential section is unlikely to make a significant difference to risk from a large tsunami, unless landward relocation resulted in a large increase in elevation above the sea.
Reversibility and future option values	<p>All versions of this option are reversible if the risk turns out to be lower than expected in the future. However, if within version 3, property boundaries are relocated landward and the public reserve is correspondingly increased, this should be regarded as a permanent change in use in practical terms.</p> <p>The future option of people to visit and use a beach is also retained if the reserve is extended. This option will not be retained if the land remains in private ownership, as those owners will still have the legal right to exclude the public.</p>
Tourism	To the extent that there is an increase in beach amenity values, public access and natural character, then there will be a benefit to tourism, but this is difficult to quantify. Landward relocation of beachfront accommodation may reduce its attractiveness to some visitors, though this will depend on the circumstances and is also difficult to quantify.
Construction, works and maintenance costs	<p>Relocation costs will involve the cost of physically shifting the building, reconnecting services, and re-landscaping of grounds. The costs of this will vary depending on the site and buildings involved. The Buffalo Beach Coastal Erosion Management Strategy, 2005 estimates relocation costs at approximately \$50,000.</p> <p>Where on-site effluent treatment is used. It is probable that both the treatment tanks and disposal field will also need to be relocated. A policy decision will need to be made as to whether structures such as swimming pools, hard courts, pavilions, decks etc...are allowed to remain. If not there will be associated relocation costs.</p> <p>If, within version three, boundaries are relocated, then there is a cost of subdivision and vesting.</p> <p>If public infrastructure is also relocated then this cost needs to be taken into account. This may be partly offset by reduced costs from coastal hazard damage in the future.</p> <p>Extraction of existing ad hoc protection work may be costly.</p>
Capital Costs	<p>Versions one and two do not require capital costs</p> <p>Version three involves purchase costs that will vary depending on location. This cost will ultimately be recovered by resale, but there is a potential finance cost, which may or may not be offset by capital gain.</p>
Income	<p>Any rental incomes will be lost during relocation. This may be offset in the long-term through pro-longed use of the property.</p> <p>There should be little net effect on rate income.</p>
Transaction and Administration Costs	<p>Within version one, transaction costs will be minor.</p> <p>There will be some administration costs associated with compliance in version two. Version three involves both transaction and administration costs for property development.</p>
Insurance Issues	Risk is reduced so access to and cost of private insurance not affected. Versions one and three may incur additional liability and property insurance costs to local government.
Private Capital	Long-term value is retained, but future rise in value may be limited by the area available for future redevelopment, which may in turn affect current purchase bids. Therefore it is unclear what effect a mandatory relocation option would have on immediate property values, due to perception of risk, and reduction of development potential. The full value of properties would not be realisable while

<i>Assessment Point</i>	<i>Analysis</i>
	actual relocation works were taking place.
Public Infrastructure Costs	Versions one and two would have little if any effect on public infrastructure costs. Version three has the potential to allow relocation of public infrastructure. If public infrastructure is relocated then this cost needs to be taken into account. This may be partly offset by reduced costs from coastal hazard damage in the future.
Physical feasibility/practicality	<p>The effectiveness in reducing risk is constrained by the area of land within the title for relocation. Most residential scale sections have relatively little room available for relocation.</p> <p>This is compounded by the trend to larger multi-room buildings and associated external structures, pools, decks etc...</p> <p>Calculation of available area needs to allow for relocation of on-site effluent treatment systems, if applicable.</p> <p>Other planning restrictions, e.g. yards, off-street parking etc... further restrict the available area.</p> <p>Machinery access may be problematic on some sections, e.g. those with without a street frontage.</p> <p>Some types of building may be physically unsuited to relocation, e.g. solid masonry.</p>
Conflict with other environmental objectives.	Relocation of buildings landward may conflict with district plan rules designed to provide setback of buildings from street frontages, to provide off-street parking and in some cases boundary to height rules designed to maintain daylight access.

Appendix IV: Standard Conditions for Development in the Western Bay of Plenty

1. THAT the dwelling be sited and constructed in accordance with the plans [and report prepared by [INSERT] dated [INSERT] as submitted with the application by [INSERT] dated [INSERT] except as modified by any condition of this consent
2. THAT the closest point of the dwelling be sited no closer than [INSERT] from the rear (sea) boundary of Lot [INSERT].

Note: In respect of condition 2 please ensure that your building contractor is fully aware of the distance stipulated in the above condition.

3. THAT the dwelling be designed and constructed so as to be readily relocatable to the satisfaction of the Principal Administration Officer.
4. THAT the consent holder submit to Council's Principal Administrative Officer or delegate for approval, final building consent plans and a building relocation strategy including a detailed schedule of how the structure will be constructed for relocation, the relocation process, equipment to be used, any site development restrictions to ensure that the relocation strategy will not be compromised and confirmation from a house removal company that the relocation strategy is practicable. No construction works shall commence until written approval to the strategy has been provided by Council's Principal Administrative Officer or delegate. Any costs incurred by Council with respect to reviewing the strategy shall be reimbursed by the consent holder.
5. THAT sufficient access be maintained on the property to allow for the relocation of the dwelling.
6. THAT earthworks, excavations, filling and removal of vegetation on the property seawards of the proposed dwelling be limited to minor activities consistent with normal residential use (e.g. gardening).
7. THAT the position of the building from the toe of the foredune be accurately measured to the satisfaction of the Principal Administrative Officer in the month of [INSERT] on a two yearly basis beginning in [INSERT].
8. THAT where the toe of the foredune comes within 8 metres of the building foundations (excluding decks and conservatories) the owner be required to relocate the building so that it is over 15 metres from the toe of the foredune. If it is not possible to achieve a 15 metre set back upon relocation, then the dwelling will have to be removed from the property.
9. THAT as an alternative to condition 8 the dwelling will not require relocation if the Principal Administrative Officer can be satisfied that the risk of further imminent erosion is unlikely and the applicant provides a report from a suitably qualified person detailing current and future predicted erosion/accretion, appropriate monitoring procedures and performance standards for when the dwelling will need to be relocated. Any submitted report may be peer reviewed by Council at the applicant's cost.
10. THAT conditions 3 to 9 shall be registered on the Certificate of Title of the property by covenant or suitable legal mechanism and this covenant will be prepared by Council's solicitors at the applicant's cost.
11. THAT an endorsement on the Certificate of Title in accordance with Section 36(2) of the Building Act 1991 be issued for any building consent on the property and registered on the title prior to any construction works being undertaken in respect of this consent.
12. THAT Council may review consent conditions 4 to 9 hereof by giving notice of its intention to do so under Section 128 of the Resource Management Act at any time commencing within the first six months of the consent being issued and thereafter every two years and within one month of the monitoring information being supplied in accordance with condition 6 of this consent. The consent conditions may be reviewed for the purpose of ensuring that an appropriate level of mitigation is provided to the dwelling to protect it against coastal erosion and inundation.
13. THAT the activity complies with all other relevant performance standards in the Operative District Plan."

Appendix V: A Hypothetical Infrastructure and Development Layout to Facilitate Retreat Over Time.

This appendix describes a hypothetical beachside development that is designed to facilitate retreat over the long-term.

Existing beachfront settlements generally do not follow this pattern and it is not feasible to rapidly change an existing urban area.

However, projected rates of long-term erosion from sea level rise or other causes are usually relatively slow in human terms (if not in geological terms). This means that there will be time, in most cases, for communities to adapt. It provides an opportunity to couple long-term urban development planning for retreat with the normal cycles of urban renewal. Elements of this hypothetical layout can potentially be built into gradual redevelopment of existing urban areas.

The key features that facilitate retreat are:

- The main access road is not shore parallel and is laid out so that a link will be maintained to the outside world as erosion progresses.
- Minor roads and other associated utilities are laid out in a nearly shore perpendicular fashion to maintain connections to individual properties, and facilitate building removal as erosion progresses. Protection of these roads is not required to protect the associated private property (see 4.1.9.3).
- Public reserves are relatively deep (perpendicular to the shoreline) and some public reserve is maintained until the final stage of erosion.
- Major utilities such as sewage treatment are located in a position where they will be the last assets to be affected by erosion.
- The number of private buildings initially affected by erosion will be relatively small, making it physically and politically easier to establish a system of building removal. This will also reduce the likelihood of the wider community approving public expenditure on, or resource consents for, protection works as fewer will benefit from them.
- An optional feature would be a future high-density residential area. The development of this can be linked to removal of residential development closer to the sea using a transferable development right or other system.
- This layout also provides an option of localized protection structures such as offshore reefs at the nodes to prolong the final life as much as possible.

Another feature of this layout is that it maximizes the number of properties that can claim to be “beachfront”, although some will be further from the beach than others. There will be a greater proportion of sites that can fetch a beachfront premium. This may partially offset the loss of sites required to create the deep reserves.

The effectiveness of this layout could be enhanced use of property rights other than fee simple titles. For example, long-term leasehold with terms that related to the projected usable lifetime of the land.

The following figures illustrate the hypothetical layout as erosion progresses over the long-term.

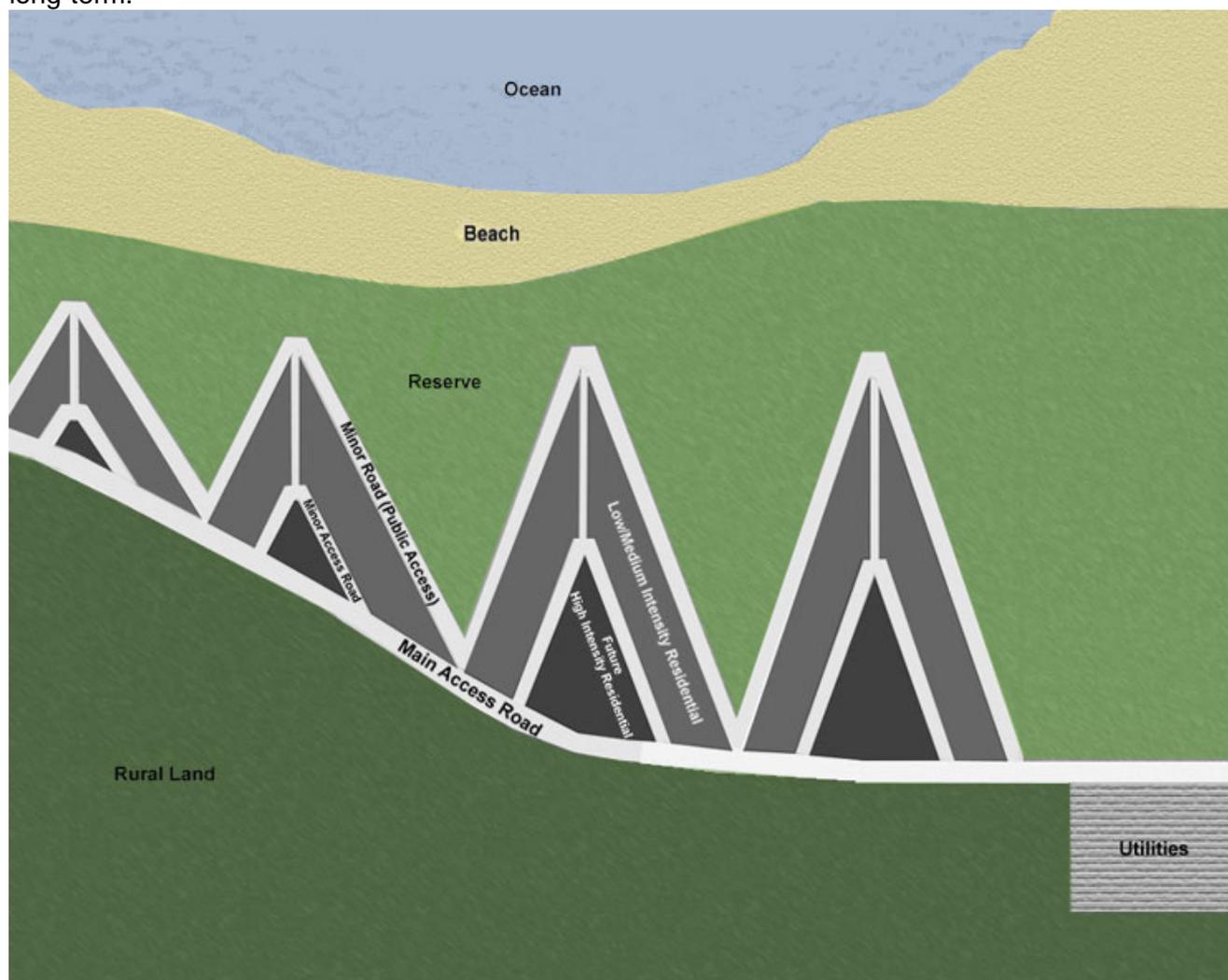


Figure A: Hypothetical infrastructure layout to facilitate retreat on an eroding beach. Beach at existing point in time.

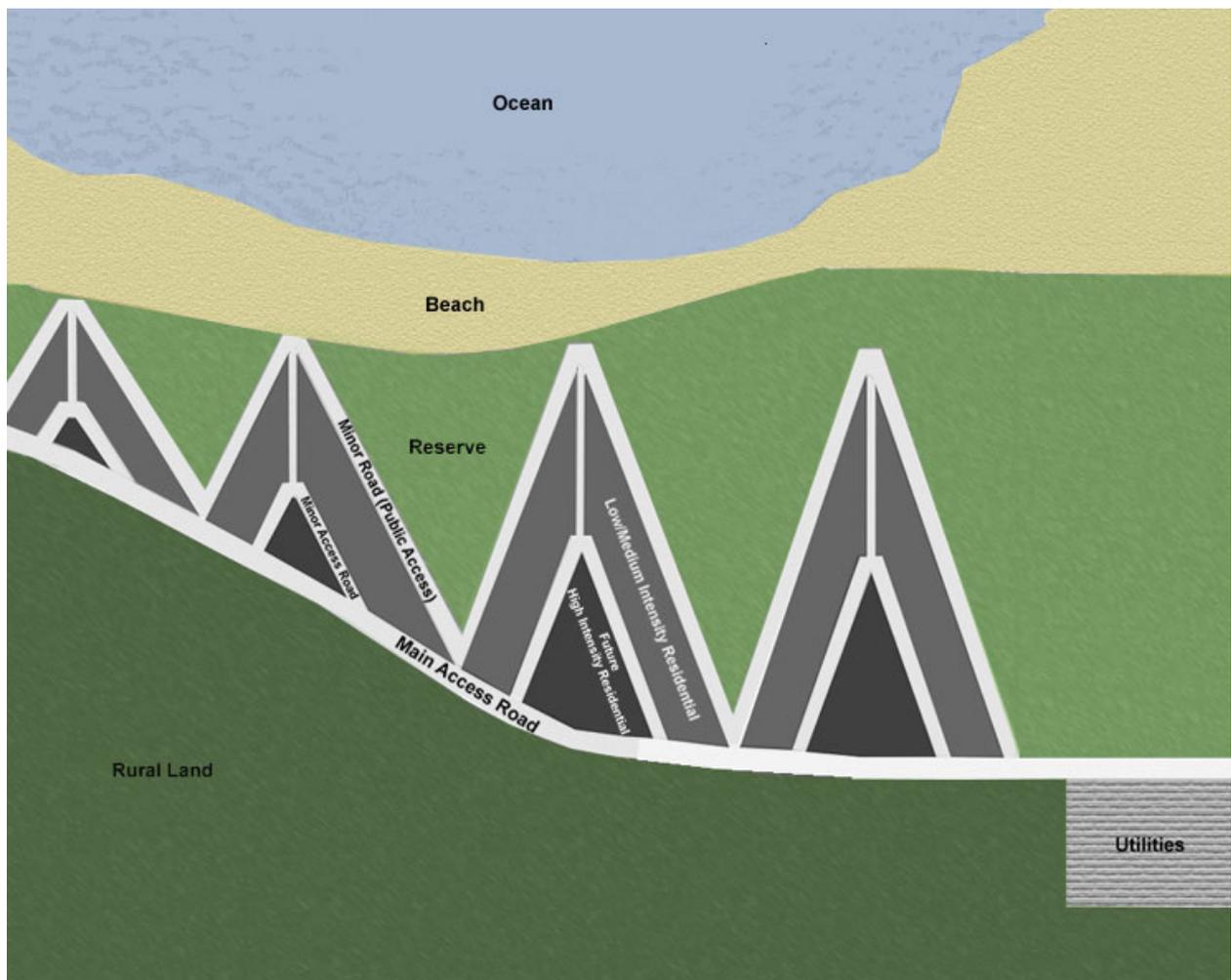


Figure B: Hypothetical infrastructure layout to facilitate retreat on an eroding beach. Erosion approaches front sections.

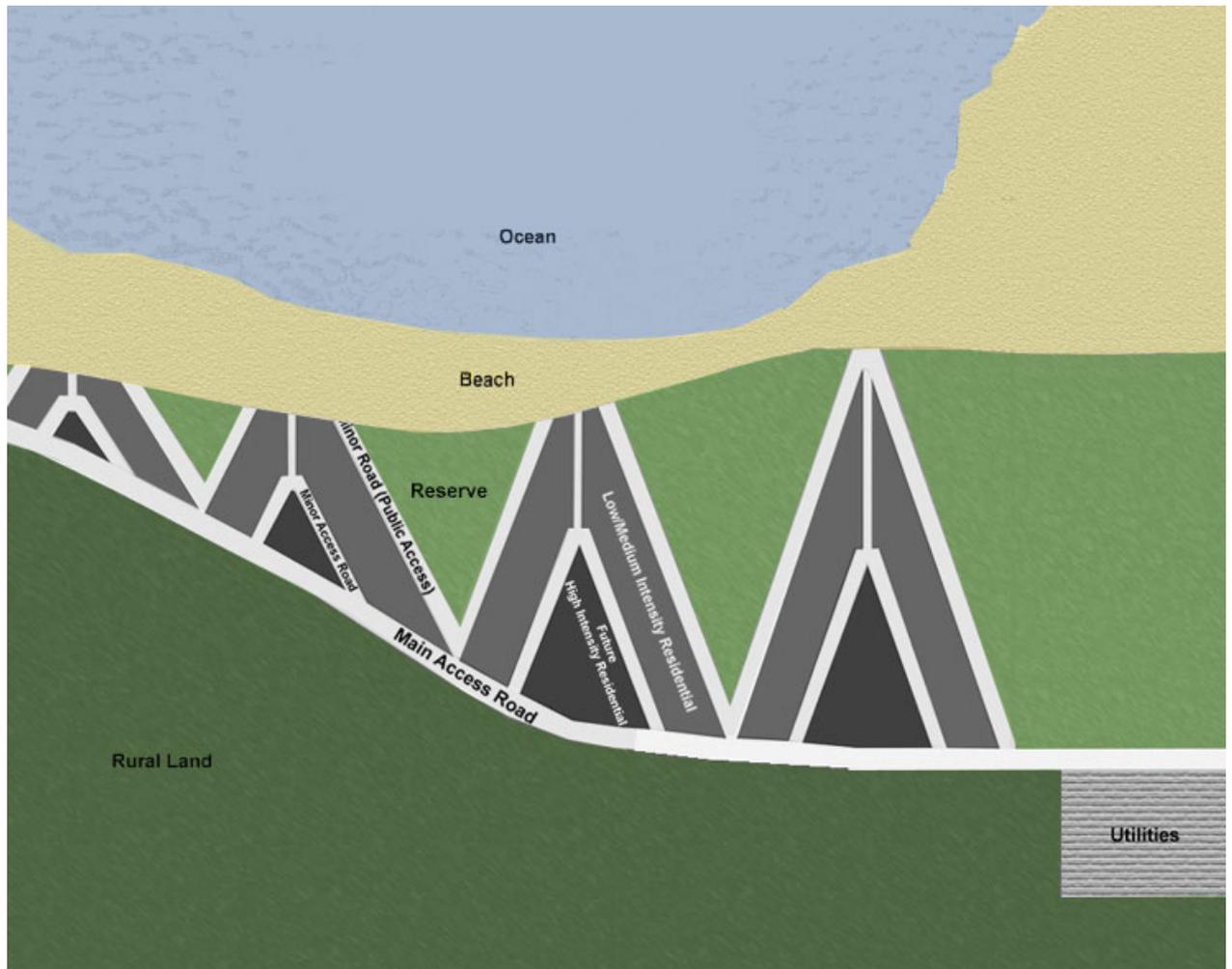


Figure C: Hypothetical infrastructure layout to facilitate retreat on an eroding beach. Erosion continues with progressive removal of buildings from sites.

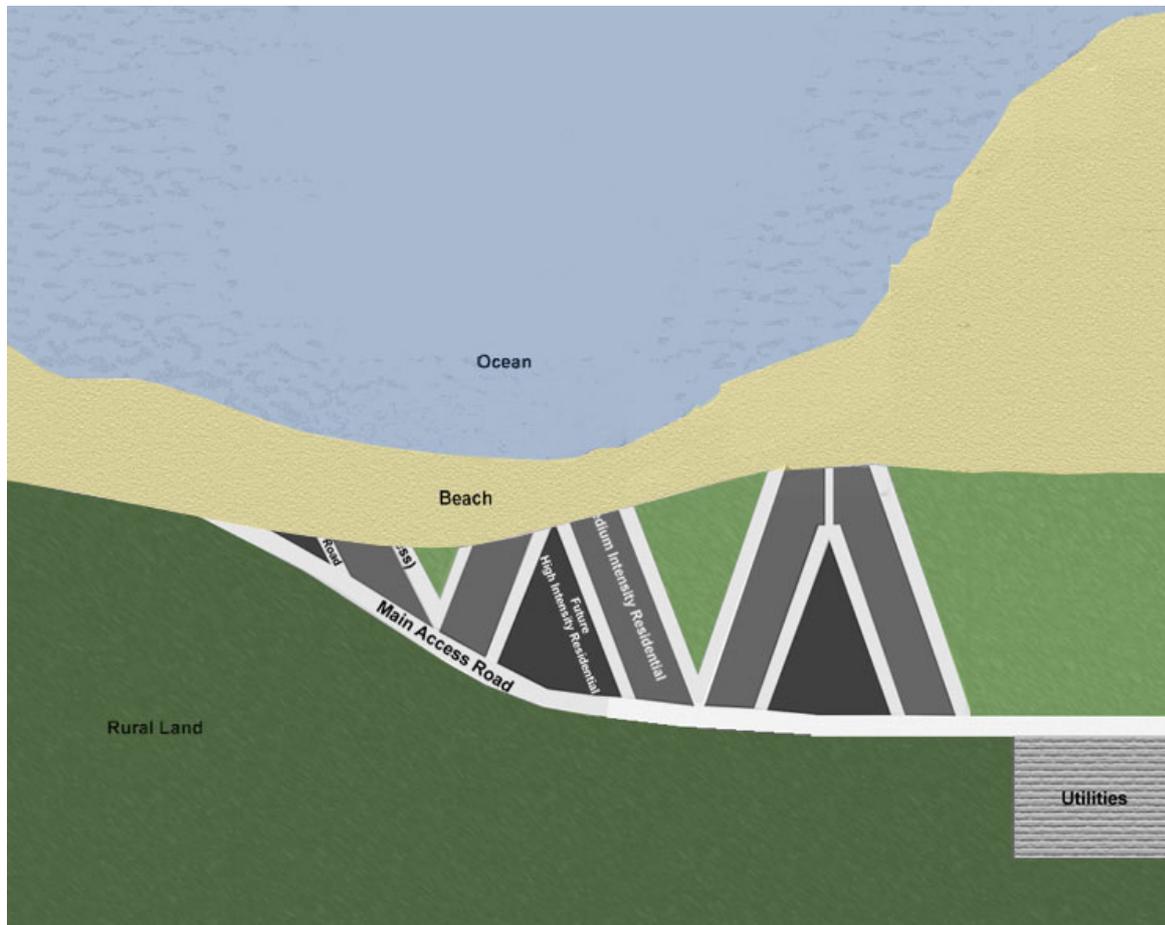


Figure D: Hypothetical infrastructure layout to facilitate retreat on an eroding beach. Erosion advances towards the rear of the settlement. Option of allowing retreat to continue or installing localized protection in areas of high-density development.

Appendix VI: Alternative Relocation Scenarios

Landward Relocation of Coastal Development Strip

In this scenario existing beachfront strip development is relocated to greenfield sites further inland. The implications are that new sites would need to be identified, possibly subdivided and allocated to at-risk property owners. Existing beachfront titles would be either abandoned or converted to public reserve. Roading and other infrastructure would need to be relocated too.

Urban Infill Retreat

In this scenario existing beachfront sites are relocated landward by subdivision and intensification of existing developed sites. The implications are that existing developed inland sites with room for subdivision would need to be identified, subdivided and allocated to at-risk property owners. Existing beachfront titles would be either abandoned or converted to public reserve.

Urban Intensification Retreat

In this scenario existing beachfront sites are relocated in the form of an entitlement for additional development on inland sites, e.g. apartment buildings. Existing beachfront titles would be either abandoned or converted to public reserve.

Lateral Retreat

In this scenario existing beachfront sites are relocated along the beach and grouped in a position where it is more cost effective to undertake protection work. This could include intensification to form apartment buildings.

Appendix VII: Transferable Development Rights

Use of transferable development rights (TDR) is relatively common in USA where it is mainly used for conservation purposes. There are particular constitutional reasons for the relative popularity of TDR in the USA, which do not apply in NZ.

Within a typical US TDR regime, environmentally sensitive areas (donor areas) are 'allocated' development rights. These development rights can be sold and reattached to land in areas zoned as being suitable for development (receiving areas). Authorities can be actively involved in facilitating and authenticating the transfer process. Most of these schemes focus on controlling new development, not existing development. Therefore they are not that relevant to the issue of managing existing development at-risk from coastal hazards, where the objective is to reduce existing development in the hazard area.

However, other variations on this concept also exist. For example, within Lake Tahoe Basin a TDR system controls both building and coverage, for catchment management purposes. Existing coverage can be transferred between properties and in some cases the transfer ratio results in a total reduction in coverage. This effectively sets up a trading market for transferable development rights driven by scarcity within certain regulatory constraints.

Use of TDR in NZ is uncommon. One example is that of Rodney District Council which, allows for subdivision rights to be transferred by linking amalgamation of property titles in a rural or conservation donor area (e.g. Muriwai) to additional subdivision rights in a countryside living - town receiving area (e.g. Kumeu). The objective is to control the pattern of subdivision in a way that is deemed to manage cumulative effects. The rules for this system took effect in 1995 but are not yet fully operative (Proposed Rodney District Plan 2000).

A financial incentive to transfer development arises in two ways. Firstly, lots within the receiving area are generally worth more than lots in the donor area. Secondly, lots can be transferred at a ratio of two new lots created in the receiving area for every lot extinguished in the donor area. Rodney District does not actively participate in facilitating such transfers and it is up to developers to identify and progress opportunities. Uptake to date has been relatively small. This is believed to be due a lack of suitable opportunities for subdivision in the receiving areas (Simmons, 2005).

Any New Zealand TDR regime developed under the Resource Management Act is potentially vulnerable to a theoretical criticism that it is not "effects based". This criticism needs to be considered in terms of effects on the donor area, the receiving area and in terms of cumulative effects.

If development in the donor area could have an adverse effect there is an obligation under the Act for local authorities to manage the effects without providing a development right. Conversely, if development of the donor area can be undertaken without causing adverse effects, then it should be possible to undertake that development without having to purchase that development right through a transfer process.

However, if the issue is one of managing cumulative effects over land or through time, then transferable development rights (TDR) may still be an effects based system of control, provided that there is reasonable correlation in practice with the cumulative transfer of development and the cumulative net change in effects.

There are also pragmatic considerations. District councils cannot control existing development in hazard areas (although regional councils may be able to), i.e. the RMA

is not purely effects based. Also society and the Courts may be reluctant to impose rules or conditions that have the effect of requiring owners to completely abandon existing development to the sea without some form of compensation. Equally, councils and ratepayers will not want to invest large sums in ratepayer-funded compensation of private interests. Under these circumstances a TDR may have initial appeal to decision makers. The question then becomes, will a TDR be efficient and effective in relation to other available alternatives.

A TDR to mitigate existing coastal hazards would need to provide a system that had the effect of removing at-risk development, and transferring that development right to properties further inland, or concentrating development into a more defensible position (see section 4.1.4).

Consideration needs to be given to whether a coastal hazard TDR system is to be a form of compensation, or whether it is intended to result in voluntary relocation.

If it is the latter, the TDR needs to provide a sufficient financial incentive to work (opportunities also need to exist and transaction costs need to be low). Creating sufficient financial incentive may be a major hurdle to the application of TDR to coastal hazards. As discussed in section 2.3 above, beachfront coastal property is more valuable than property a little further from the beach. Also, the existence of a known coastal hazard risk does not appear to have a detrimental effect on those property values unless significant actual damage occurs.

In situations where buildings could be relocated out of the hazard area but within the same property, then relocation of buildings may not have a detrimental effect on overall property values. Thus the value of the development right need not be that high to provide an incentive that would theoretically be worthwhile to undertake. For, example, the value of development right would need to offset the relocation cost, transaction costs, the cost of actually implementing the additional development right, plus an acceptable rate of return. These costs will vary, depending on circumstances. It may be possible that exemptions to existing rules controlling the size or use of buildings would provide a sufficient rate of return for the TDR to be attractive.

However, voluntary uptake may still be low because: property owners value an absolute beachfront location above all else, or because additional development of their property is not attractive to them. Allowing the development right to be on-sold and transferred to other properties may overcome the latter concern but depends on receiving areas being identified and agreed upon.

Allowing larger buildings or other uses on the site may have other adverse effects on the urban amenity values or natural character. The overall change in effects would need to be considered cumulatively. For example, relocating buildings further from the sea would generally reduce effects on natural character, which is a benefit that may offset the effect of allowing larger buildings.

In practice there may be limited opportunities to relocate buildings on the same property in a way that ensures any additional development on the property is risk free.

If existing development is completely removed from an at-risk beachfront property and that right is to be transferred to a property inland, then the lost development value of that beachfront development is an opportunity cost that will need to be more than recovered by the development value of the development rights at the receiving site.

For example, if the ratio of beachfront to rear lot land value is taken as approximately 1:4 as indicated in section ...above, then a transferable development right (TDR) would need more than that ratio just to break even. If transaction costs, development costs (at the receiving site), demolition and clean up costs (at the donor site) and a reasonable rate of return on investment, is included then the ratio may need to be

much higher. If the TDR gave a development right in the form of an entitlement to subdivide extra lots, then a lot of extra lots would need to be generated away from the beach in order to facilitate the removal of one lot from the beachfront

Even if these lots are away from the beach, the addition of extra residential lots may have adverse effects that cannot be justified as in terms of cumulative effects. To use a purely hypothetical example, if all the 670 properties currently at-risk in the eastern Coromandel open coast were to be removed by a transferable development right, then assuming a hypothetical 1:10 ratio, an additional 6700 lots would need to be created in the coastal environment, but outside of risk areas. This ratio could be lower if high value land on high ground with good sea views can be found in close proximity to a beach. Nevertheless, it is not clear what the net cumulative environmental outcome would be as it would depend a lot on the location of the additional lots. Also it is not clear whether this approach is the most effective or efficient relative to alternatives.

There may be practical problems in setting up a TDR system that maintains incentive because the value of beachfront land is rising much faster than most other land.

Another potential problem relates to the economics of scarcity. If a TDR system were set up, this could result in bidding up of the prices of at-risk beachfront properties. This would undermine the goal of reducing risk and also the viability of the TDR.

If overall development options were restricted to a finite amount by regulation or available land, then this would not be a problem as development values would be proportionate. However, property investors generally have wide geographic areas to choose from. Therefore in practice, a TDR regime could only operate efficiently with fairly strict delineation of donor and receiving environment development rights within broad geographic areas. Regionally based development policy has generally not reached this level of coordination within New Zealand yet, with the possible exception of Auckland Region.

It is possible that there are some premier beach locations in NZ (e.g. The Mount) where available options for subdivision have been used up, and in those locations transferable development rights (TDR) relating to redevelopment of existing land may be more feasible.

For example, first row properties in the Bay of Plenty from Mount Maunganui to Papamoa have market values ranging from \$6,000,000 to \$500,000 depending on the location, based on inquiries with real estate agents. Development has proceeded eastwards along this coast, with a secondary phase of redevelopment starting at the Mount involving apartment buildings and condominiums. Values are highest at the Mount end, reflecting the reputation of the location and the scarcity of properties. Planning rules also have the effect of confining high-rise coastal development to specific areas. Apartments range in value from approximately \$2,500,000 to \$500,000 within the Mount area depending on size and location. This suggests a roughly 1:4 value ratio for residential properties to individual apartments but this comparison is simplistic.

This raises the possibility of a form of retreat involving redevelopment that concentrates existing development within a smaller but built up area. This would effectively involve transfer of the existing beachfront development right to existing lots further from the beach, which could be redeveloped as apartment buildings or condominiums.

It is not clear what the profit after expenses is on development of apartments or condominiums is but the 1:4 ratio suggests that the relatively large (tall) apartment buildings may be necessary to offset the cost of purchasing the additional beachfront development right. Further, the practical difficulties of bringing together and actually implementing suitable development opportunities may be a substantial barrier.

Redevelopment of existing residential areas for apartments or condominiums is often controversial. Local communities concerned about local change and effects may be pitted against development. This may be less problematic where the new apartment buildings can be located to the rear of existing coastal residential strip development, or where the transfer process transfers the coastal strip to public ownership.

Also in the coastal context, construction of large buildings has potential for effects on natural character, which would need to be assessed in terms of the local context. The improvement in natural character resulting from removal of beachfront buildings may offset the effects of larger buildings if they are located further from the sea.

The long-term coastal hazard implications of larger buildings, albeit further from the shoreline, would also need further consideration.

More generally, it is possible that some beachfront property owners will choose not to participate in a voluntary TDR scheme. Further, the practical difficulties of bringing together and actually implementing suitable development opportunities may be a substantial barrier. As a consequence, actual relocation could be piecemeal. Some owners may opt to try and protect their property. Therefore a transferable development right (TDR) system is probably not a sufficient stand alone alternative to regulation of protection works and relocation, even if a viable economic incentive can be created.

Overall TDR should remain an option for detailed consideration at individual beaches, particularly where either: relocation is feasible on existing properties, or where there is demand for redevelopment it is necessary as part of a strategic retreat over time. However, the high cost of beachfront real estate indicates that TDR are unlikely to be a viable stand-alone mechanism in most locations. They may still have some value as a form of partial compensation.

TDR are more likely to be successful as part of a district or region-wide strategy to manage cumulative effects. Higher value central urban areas can then be included within the receiving area.

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