

Rethinking coastal margins



**The implementation of managed retreat options in New Zealand,
the USA, Australia, and the UK**



National
Science
Challenges

RESILIENCE
TO NATURE'S
CHALLENGES

Kia manawaroa
– Ngā Ākina o
Te Ao Tūroa



Preamble

In December 2016, the Edge commissioned a review of approaches and case studies of managed retreat in coastal settings. Specifically, the aim of the review was to explore examples of managed retreat from developed country settings and identify the factors that have shaped the outcomes of managed retreat initiatives. The review was designed to support discussions related to adaptation strategies to be considered in development of the Hawke's Bay Coastal Strategy. The review has not been developed as a how-to-guide to undertaking managed retreat and does not constitute a legal opinion on managed retreat in New Zealand.

1.0 Introduction

Coastal hazards threaten low-lying infrastructure and private property in New Zealand (MfE, 2014; PCE, 2015). Sea level rise is expected to exacerbate coastal erosion, increase the frequency and magnitude of flood events, and enhance the potential for saline intrusion of groundwater (Rouse et al., 2016; PCE, 2015; MfE, 2008). Eagerness to live near the coastline has left some communities vulnerable to natural coastal processes, with many areas experiencing erosion or inundation due to wave-overtopping during storms (Bell et al., 2007). Long-term coastal erosion has exacerbated the hazard risk in many regions including Thames-Coromandel, Napier, North Otago, and Taranaki (Forsyth, 2009; Blackett et al., 2010; PCE, 2015; TCDC, 2016; Utiger, 2015).

In New Zealand, local government is responsible for controlling land use to avoid or mitigate the effects of coastal hazards (Reisinger et al., 2015; Hart, 2011) with responsibilities split between regional and local councils.¹ Pursuant to the Resource Management Act 1991 (RMA), when planning for coastal hazards, decision-makers must consider the effects of climate change,² and ensure all policies align with the New Zealand Coastal Policy Statement 2010 (NZCPS).

Hume and Blackett (2007) describe a global movement toward management approaches that seek to control human activities rather than nature. The NZCPS reflects this shift, and signals central government's intention to depart from a past preference for hard protection structures (see Tinker, 2014; Hume and Blackett, 2007; Reisinger et al., 2015). The NZCPS promotes the restoration of natural protective barriers such as dunes and sand barriers, and encourages the adoption of managed retreat for existing development located in coastal hazard areas (Fletcher et al., 2013).

Managed retreat has gained currency as a contemporary coastal management option in response to the increasing complex situations faced by communities and governments about how to respond to increased risk of flood and erosion hazard and who is responsible for managing and mitigating risk. Discussed alongside a suite of other planning interventions (including zoning, setbacks and soft barriers) that seek to accommodate coastal change, managed retreat options are an increasingly important suite of tools to support local decision making.

Managed retreat promotes the landward relocation of existing and planned development in coastal hazard areas (Neal et al., 2005). As a consequence, the hazard risk is reduced or removed entirely, and the coast is left to naturally migrate. While the costs associated with managed retreat may be substantial, they may reduce the on-going costs associated with other management approaches (Tinker, 2014). In addition, retreat provides opportunities to re-vision coastal spaces and the connection of coastal communities. Such visioning can include consideration of the enhancement of public access, recreational space, landscape value, and ecological functioning (Fletcher et al., 2013; Reisinger et al., 2015).

¹ Key statutory functions of regional and local councils are outlined in ss 30 and 31 of the RMA.

² Section 7(i) RMA.

2.0 What is managed retreat and managed realignment?

Definitions of managed retreat stress the “conscious”, “deliberate”, “coordinated”, and “precautionary” nature of managed retreat (Fletcher et al., 2013; Niven and Bardsley, 2013; Cooper, 2003; SOLGM, 2016; Turbott and Stewart, 2006). Along these lines, Reisinger et al. (2015) define managed retreat as:

...a long-term, strategic decision to allow the shoreline to migrate inland in response to sea-level rise and attendant erosion, and proactive management of the removal of affected assets, rather than protecting the existing shoreline.

In practice, **managed retreat anticipates the removal or abandonment of hard protection structures, decisions to stop maintaining such structures, restrictions on land use, and the removal or relocation of at-risk infrastructure** (SOLGM, 2016). The nature and value of affected assets may influence the appropriateness and feasibility of managed retreat in any given context (Turbott and Stewart, 2006). Expensive infrastructure and high-density development is likely to reduce the feasibility of managed retreat (Reisinger et al., 2015) regardless of whether relocation may be the most sustainable and resilient long-term outcome. Turbott and Stewart (2006) provide the following examples to illustrate when retreat may be most viable:

- i) where the costs of maintaining defence structures exceed the value of assets being protected or the costs are too great in the long term;
- ii) if a community is unable to meet ongoing maintenance costs;
- iii) when defences are ineffective, or;
- iv) where hazards progress rapidly and there is no time/ or it is not viable to construct defences.

In the UK, the terms managed realignment and managed retreat are used interchangeably, though in practice, managed realignment appears to encompass a far greater suite of management tools (Esteves, 2014) and includes a greater focus on the managed restoration of coastal margins and including the use of naturalized ecosystems as part of a soft management approach.

While these definitions reflect the notion that managed retreat is a planning instrument to be canvassed with communities and options explored for rational future action, for many communities the reality of retreat is a decision that has been shaped by a hazard **crisis**. Contemporary coastal management work seeks to develop strategies to help communities **anticipate** hazards and develop short, medium and long-term sustainable approaches.

2.1 Options for managed retreat

Options for managed retreat tend to be largely a set of land use controls that shape practice and location at the coast. These practices may be accompanied by financial incentives or controls to support or influence land use practice.

Land management tools commonly employed include:

- **Development setbacks and building restrictions**
Setback zones are used to restrict development within areas threatened by coastal hazards, or to inform trigger points for relocation of buildings (Ramsay et al., 2012). Regulations commonly restrict new development seaward of setback lines, but can also limit re-development. Hypothetically, setback zones could also be used to push existing infrastructure and private properties back from the coastal hazard area (Scouller, 2010).
- **Relocatable development**

Buildings may be required to be relocated away from hazard risk within a property boundary or relocated to another pre-planned site.

Rules or consent conditions that require new buildings to be relocatable are used in a number of district plans in New Zealand (MfE, 2008). The Ministry for the Environment (2008) advises local authorities to include conditions to facilitate future relocation including: erosion trigger points, a timeframe for relocation to be undertaken, specified building materials, a detailed relocation strategy, property title covenants registering any consent conditions, and registering any hazard risk on the notice of land title.

There are some concerns that relocatable buildings do not adequately mitigate coastal hazard risk (Forsyth, 2009; MfE, 2008). The Ministry for the Environment (2008) has suggested that relocation requirements should only be transitory and encouraged the development of a more robust managed retreat strategy.

- **Restriction of building after hazard event**
Such controls may restrict redevelopment if properties are damaged by a set percentage as a result of a storm event (Randell and Deboer, 2012). The size and nature of redevelopment may be restricted (Randell and Deboer, 2012).
- **Rolling easements**
Titus (2011) defines rolling easements as:³
a government regulation that prohibits shore protection or a property right to ensure that wetlands, beaches, barrier islands, or access along the shore moves inland with the natural retreat of the shore.
- **Abandonment**
Cost of risk and land is such that owners choose to abandon property. Such actions may require subsequent demolishing of buildings, costs of which may fall to local government where owners are not traceable.

Financial tools include:

- **Bonds** to support cost of relocation/ removal of buildings can help ensure the costs of relocation or removal of affected properties do not “fall on the public purse”.
- Market based **private insurance premiums** may increase in areas of high risk and discourage development. In some instances, insurance protection may be declined for properties classified as high risk.
- **National insurance programmes**, e.g. the USA, National Flood Insurance Program (NFIP) (Siders, 2013). Under the NFIP insurance is conditional and is only offered if communities sign up to the programme and agree to enforce specific flood management standards. While such measures aim to reduce hazard risk, the NFIP has been criticised as incentivising development in hazard-risk areas, and the enforcement of building standards has been limited (Siders, 2013; Hayat and Moore, 2015). While the NFIP has encouraged some property owners to relocate following a natural hazard event (McGlashan, 2003), many communities have redeveloped in the same location (Hayat and Moore, 2015). Hayat and Moore (2015) argue that the NFIP needs to incentivise relocation by creating financial incentives for property owners to relocate following events, if not prior.
- **National project funding** e.g. Pathfinder fund in UK for voluntary property acquisition as part of Shoreline Management Planning priorities.
- **Relocation packages and assistance grants**. These grants may be central or local government funded to fully or partially support the relocation of individuals and

³ Titus (2011) at page 41.

communities away from coastal risk zones e.g. North Riding, Yorkshire; Grantham, Queensland; Texas (roll-back easement schemes)

- **Buy-out schemes.** Acquisition (voluntary or state-led) is another mechanism used to facilitate retreat in the US. Large scale relocation programs have been launched to mitigate hurricane and flood risk. Centrally or locally funded compensation for property buy-out and relocation. e.g. Staten Island and Louisiana after hurricane events; Twin Streams project (Auckland).
- **Buy and lease schemes**
As part of the United Kingdom Pathfinder grants (see section 2.3.3 for details) East Riding and North Norfolk tested the feasibility of buy and lease-back schemes (DEFRA, 2012). However, none of the plans were considered viable in practice, because of the high costs of (a) property purchase and (b) legislative requirements to upgrade properties to a rental standard (DEFRA, 2012).

2.2 How is managed retreat implemented in New Zealand?

In New Zealand, managed retreat has been implicitly incorporated into policy and planning controls that limit new and existing development in coastal hazard zones (Hart, 2011). In fulfilling key legal obligations under *inter alia* the RMA, NZCPS, Local Government Act 2002, and Building Act 2004, local authorities have implemented a number of anticipatory planning controls, which conform to the intent of managed retreat. Examples include: **development setbacks, hazard zones, relocatable buildings, relocation plans** (including trigger points), and **bans on further development or protection works** (Fletcher et al., 2013; Hanna, 2016). Local authorities typically implement such measures through policies, plans, and the imposition of resource consent conditions. Attempts to constrain private property rights through land use controls are contentious, and often result in public resistance (eg. Hayward, 2008, KCDC). Under the **Public Works Act 1981** land can be acquired for public works on an agreed or compulsory basis, and compensation is required (LINZ, date unknown). However, the applicability of a direct acquisition in the context of managed retreat is uncertain.

The New Zealand Coastal Policy Statement (NZCPS 2010) explicitly refers to managed retreat twice. While no definition is provided within the NZCPS, a general meaning can be gleaned from the wording of the instrument. For example, Objective 5 encourages managed retreat as a “response” for “existing development” affected by coastal hazard risk. Policy 25(c) describes managed retreat as the “relocation or removal of existing structures, or abandonment in extreme circumstances”. In addition, Policy 27(1)(a) implicitly requires consideration of managed retreat for decisions involving “significant existing development” at risk from coastal hazard. The NZCPS reflects earlier guidelines published by the Ministry for the Environment (MfE) (2008), where managed retreat is defined as “any strategic decision to withdraw, relocate ... or abandon private or public assets that are at risk of being impacted by coastal hazards”. High-level policy is silent as to how relocation or removal should occur and the guidelines currently do not explicitly acknowledge that the coastal environments still require management beyond the abandonment of structures.

The implementation of managed retreat is at various stages of consideration across New Zealand. In some regions, policy promotes managed retreat as one of a number of potential management approaches to adopt, for example, the Auckland Unitary Plan 2016 considers “managing retreat by relocation, removal or abandonment of structures” (Policy 10.2.2(b)), and “designing for relocatable ...structures” (Policy 10.2.2(d)), yet no detailed strategy has been developed. Other districts such as Waitomo (discussed below) have gone a step further, and committed to a policy of managed retreat for certain coastal areas, but have not currently developed a formal strategy for how this will be implemented in practice. There are a few examples where authorities have defined a method, or actually implemented managed retreat on the ground.

2.3 International examples

This section presents an overview of the direction and examples of mechanisms used by central and local authorities in the United States of America, Australia and the United Kingdom to implement managed retreat. Further details about site-specific case studies are provided in section 3.0.

2.3.1 The United States of America

In review of case studies it is apparent that efforts to implement managed retreat approaches are gaining momentum in the USA. According to Flavelle (2016), the White House intended to establish “an interagency working group on community-led managed retreat and voluntary relocation” (Flavelle, 2016). At present, the White House has not publically announced such an initiative. Approaches to managing community risk to flooding, erosion and coastal inundation are managed differently by states and local authorities. Tables 1 and 2 provide greater detail about the individual efforts in different states.

2.3.2 Australia

Australian national coastal policy promotes “planned retreat”⁴ for mitigating coastal hazard risk, particularly in vulnerable areas (Australian Government, 2009). However, no detail is provided to guide states, regional and local government in implementing retreat.

At the state level, Western Australia and Queensland have adopted an “avoid - ... retreat – accommodate – protect” hierarchy for managing coastal hazard risk, which prefers retreat over accommodation and protection measures (WAPC, 2012; State of Queensland, 2013). Further, the South Australian Government has acknowledged the potential for planned retreat in policy guidelines (URPS, 2014). Notwithstanding these policy developments, there has been little (if any) development of detailed strategies for implementing planned retreat.

In New South Wales (NSW), recent state-wide reforms of coastal policy have restricted previously comprehensive planned retreat policies at the local government level (discussed below). The reforms are on-going and raise uncertainty about the potential for future implementation of planned retreat policies.

2.3.3 United Kingdom

In England, the Department for Environment, Food, and Rural Affairs (DEFRA) oversees the development of policy for flood and coastal erosion risk management (Esteves, 2014). In a complementary role, the Environment Agency is responsible for developing planning instruments, including Shoreline Management Plans (SMPs) to implement Defra’s policies (Esteves, 2014).

In 2005, DEFRA developed a policy entitled “Making Space for Water” to reduce the risk to people and their property from floods and coastal erosion, while delivering environmental, social and economic benefits (Esteves, 2014). The policy identifies managed realignment as the preferred approach for managing flood risk in rural areas (Esteves, 2014). National coastal policy identifies the need for plans to identify “opportunities to facilitate the relocation of development” where future flood risk is deemed unsustainable (PPG, 2016).

Across Wales and England, 22 SMPs describe how particular stretches of coastline are to be managed to address flood or erosion risk (UK Government, 2009). Managed retreat approaches typically fall within the scope of managed realignment in SMPs, but some identify retreat as a fifth policy option independent to the other four.⁵

⁴ In this context, planned retreat has the same meaning as managed retreat in New Zealand.

⁵ For example see: SMP2 North East, River Tyne to Flamborough Head, England.

Managed realignment

A number of large managed realignment projects have been undertaken within estuarine settings to improve ecosystem functioning and provide flood protection (Esteves, 2014). Projects at Abbots Hall (Essex), Medmerry (Sussex), Steart Wetland (Somerset), and Humber Estuary (Lincolnshire) involved the planned breach of historic coastal protection structures to enhance the formation of saltmarsh habitat (McAlinden, 2015). The land purposely flooded was mostly vacant farmland, and consideration of property relocation was not necessary (McAlinden, 2015).

(a) England

Many coastal communities face the prospect of inevitable retreat due to soft cliff and shoreline erosion (Barkham, 2015). While retreat is implicit in adoption of non-intervention policy within SMPs, it is not necessarily planned and there are few examples of managed retreat in the form of strategic community relocation prior to the launch of a “Coastal Change Pathfinder Programme” in 2009. As a result of the programme, 15 local authorities received £11m to explore coastal adaptation approaches (DEFRA, 2012).

While compensation is provided for managed realignment projects that result in compulsory acquisition of property or land (UK Government, 2011), pursuant to the Coast Protection Act 1949, no compensation is provided for loss of property that occurs as a result of coastal erosion (Barkham, 2015). First, assistance schemes that provided funding to affected owners in North Norfolk and East Riding are at odds with the UK Government’s position not to provide compensation for loss caused by coastal erosion (DEFRA, 2012). This point raises issues of social justice, because vulnerable property owners in areas beyond the scope of Pathfinder funding are not likely to receive any assistance, and as the DEFRA report (2012) emphasises, people may lose their homes for a variety of reasons and not receive funding.

Overall, it is evident that financial incentives were the primary driver of successful relocation efforts, for example in East Riding, North Norfolk, and Scarborough. However, the Pathfinder scheme was time-limited, and never intended to be permanent, yet councils who facilitated relocation efforts by providing funding and grants to affected property owners raised community expectations (DEFRA, 2012). This has the potential to lead to tensions with property owners who are not provided funding in similar situations in the future.

(b) Wales

In 2011, the Welsh Government devised a *National Strategy for Flood and Coastal Erosion Risk Management* and set aside £150m for a coastal risk management programme to support local government implementation of SMPs (WAO, 2016). Managed retreat features as a preferred future management option for a number of coastal areas. However, a recent audit of the Government’s coastal risk strategy identified gaps in relation to the implementation of managed retreat policy (WAO, 2016). The audit found that the public have a limited understanding of what managed retreat is, and called for the Welsh Government to develop options within the national strategy to help councils prepare communities for managed retreat (WAO, 2016). In particular, the report recommended greater consideration of the financial and legal arrangements necessary for relocation of people and assets away from flood risk (WAO, 2016).

3.0 Approaches to implement managed retreat

The following table (Table 1) summarises a number of approaches used to implement managed retreat in new and existing developments and identifies examples of these approaches. Further details on the examples are provided in Section 4 (Table 2).

Table 1. Common approaches used in new and existing developments to facilitate managed retreat.

New Development	
Development setbacks and building restrictions	Australia: Setback zones (Mariani et al., 2012), prohibitions on new development within high-risk areas (Peel and Godden, 2009), and construction conditions (Gibbs, 2011), are used across most Australian states to avoid or reduce coastal hazard risk. For example, in Queensland , the Redland Shire Council prohibits development within 100-year flood zones (Peel and Godden, 2009).
Relocatable development	<p>Ohiwa, Eastern Bay of Plenty (NZ): In relation to a resource consent application for the development of a house on the Ohiwa Spit (within an identified coastal hazard zone), the council imposed the following restrictions: the dwelling had to be constructed out of timber on driven piles, regular erosion monitoring, the identification of an erosion trigger point (30m from boundary to toe of dune), a plan for removal within three days of the trigger being breached, and a prohibition on hard works (Batchelar and Barry-Piceno, 2012).</p> <p>Papamoa/ Whakatane, Eastern Bay of Plenty (NZ): Developers must provide and maintain an alternative vacant building site for future relocation (Batchelar and Barry-Piceno, 2012; MfE, 2008).</p> <p>Western Victoria, Australia new development located within coastal hazard areas must be relocatable within 24 hours by crane at a price not exceeding \$10,000 (Gibbs, 2011).</p>
Existing Development	
Development setbacks	Development setbacks are widely utilised across the USA , with 14 states adopting state-wide coastal setback lines (Simpson et al., 2012; Randell and Deboer, 2012). Most states permit existing use rights analogous to New Zealand, but some have enacted laws to curtail such rights following coastal hazard events. For example, Georgia, Maine and Rhode Island prohibit redevelopment if properties are damaged by a set percentage (50-80%) as a result of a storm event (Randell and Deboer, 2012). Other states including Florida, South Carolina and Alabama restrict the size of redevelopment (Randell and Deboer, 2012).

Relocatable development: Retreat within property boundary	Cooks Beach: example of retreat within property boundary (relocation of existing building).
Retreat to other sites (individual houses, public assets)	Mokau (Waitomo): Relocation of private assets Okariha (Sunset Beach), Port Waikato: Relocation of public assets Muriwai (Rodney): Relocation of surf life-saving infrastructure
Relocation of whole community	Grantham (Australia)
Restricting building after hazard event	Staten Island, New York, USA.
Land use controls	Byron Bay (Australia) Nags Head (North Carolina, USA)
Rolling Easements	California, Hawaii, Maryland, Maine, South Carolina, Rhode Island and Texas (USA) have employed rolling easements to control development and facilitate retreat (Cox, 2012).
Buy-out schemes	Mississippi, New York, Grand Forks, North Dakota, Soldiers Grove, Wisconsin, Goleta beach, Santa Barbara, and Pacifica state beach California: There are a number of examples of buy-out schemes in the USA that have been established in response to extreme hazard events e.g. hurricane or significant flooding events. These approaches have tended to be triggered in reaction to actual and future risk to communities. These schemes have tended to require federal funding as key to their implementation.

4.0 Examples of efforts to implement managed retreat

The following table (Table 2) details a range of examples where managed retreat has been considered or implemented. These examples highlight the range of approaches that are commonly used along with some of the context specific limitations.

Table 2 Examples of efforts to implement managed retreat

Grantham, Queensland	<p>Following an extreme flood event in 2011, Lockyer Valley Regional Council (LVRC) implemented the first planned relocation policy in Australia (NCCARF, date unknown). The town of Grantham was severely affected by the flood and 130 houses were damaged (Sipe and Vella, 2014). LVRC adopted a voluntary relocation strategy.</p> <p>To facilitate relocation, LVRC purchased approximately 1000 acres of land at higher elevation, to mitigate future flood risk (NCCARF, date unknown). The relocation policy included a voluntary land swap offer, infrastructure development, and planning requirements were set aside to streamline the process (NCCARF, date unknown; Sipe and Vella, 2014). To further facilitate relocation, eligible residents were offered grants (from state funding) to the value of \$32,550 (AUD) (Sipe and Vella, 2014). Property owners were responsible for construction costs, which were typically covered by insurance (Sipe and Vella, 2014). Land swaps were balloted, and the community was kept informed by attendance at weekly workshops and assigned case-managers (Sipe and Vella, 2014). The Council retained ownership of the flood risk area to ensure future development was prevented (Sipe and Vella, 2014). More than 70 affected property owners participated in the initial relocation bid, with relocation and further development continuing as part of a wider “strengthening Grantham” campaign (LVRC, 2013).</p>
Byron Bay, New South Wales	<p>Byron Shire Council (BSC) was the first local government in Australia to introduce a planned retreat policy in the late 1980s (Niven and Bardsley, 2013). The policy applied to new development, and mandated the relocation of properties when coastal erosion reached certain threshold distances (20m or 50m) (Niven and Bardsley, 2013).</p> <p>Niven and Bardsley (2013) have criticised the implementation of the retreat policy on the basis that development controls were applied inconsistently, and erosion trigger points were inadequately enforced.</p> <p>In 2009, a storm caused significant damage to properties at Belongil Beach (Gibbs, 2011; The Northern Star 2011; Roche and Goodwin, 2012). A sandbag wall that had been constructed by the Council in 2001 was structurally compromised as a result of the storm, and at risk of collapse (Roche and Goodwin, 2012). An affected property owner, John Vaughan, advised the BSC that he intended to undertake works at his own expense to protect his property from coastal erosion (Roche and Goodwin, 2012). In response, the BSC obtained an injunction to stop Mr Vaughan, which he subsequently challenged in court (Roche and Goodwin, 2012).</p>

Prior to the hearing, the BSC accepted that it was obliged to maintain and repair the existing protection works, and that Mr Vaughan was entitled (but not obliged) to do so (Gibbs, 2011). The Court subsequently approved consent orders to this effect (Gibbs, 2011). Following the decision, the NSW Government amended state-wide legislation to allow emergency coastal protection works (in the form of sand bag walls) whenever there was an “imminent threat” to property (Gibbs, 2011).

Property owners initiated further litigation against a proposed planned retreat policy which prohibited beachfront owners from taking steps to protect their properties, and gave council power to order demolition of houses deemed at high-risk of storm damage (Munro, 2011). The policy never came into effect. Community resistance to planned retreat escalated, and in 2011, 10 property owners launched a \$100m lawsuit against the BSC, alleging they had suffered loss as a result of historic decisions to construct coastal protection works (BSC, 2016a). The owners also challenged the proposed planned retreat policy, on the basis that it devalued their properties (Munro, 2011).

Mounting pressure from affected property owners led to the BSC relaxing its stringent planned retreat policy, and property owners were allowed to retain existing protection works, and seek permits to construct such works at their own expense (BSC, 2016a).

The NSW Government is currently leading a significant reform of its coastal management legislation (Stokes and Berejiklian, 2016). Further, Byron Bay’s Coastal Zone Management Plan is under review (BSC, 2016b). As part of the review process, BSC has considered the **possibility of adopting planned retreat in the form of a “public-private model”**, whereby landowners who purchased beachfront properties before 1988 would be compensated with public funds for losses associated with planned retreat, and purchasers after 1988 would be required to bear their own losses (BSC, 2016b). The public/private split reflects the fact that purchasers after 1988 were explicitly informed of the coastal hazard risk prior to purchase (Roche and Goodwin, 2012). Adoption of the “public-private model” was associated with estimated costs of \$31m to private land owners and \$12m to the public sector, with greater private costs if setbacks were adopted at the same time (BSC, 2016b). The BSC has also considered the possibility of a public buy-out, but consider the costs unjustified (BSC, 2016b). Based on draft plan preparation materials it seems probable that implementation of retreat will be outweighed in favour of seawall construction, groynes and beach nourishment (BSC, 2016b).

This case study demonstrates the **impact of community resistance to planned retreat policy**. Community initiated opposition and subsequent litigation led to relaxation of state wide prohibitions on protective structures and eventually undercut local decision-making. The importance of historic coastal management decisions in implementing contemporary managed retreat is also highlighted. Past council decisions formed the basis of litigation, with affected property owners often relying on historic protection works to argue that the council was liable for contemporary loss.

Community resistance has led to planned retreat proposals being reconsidered at other NSW locations including Port Macquarie, the Greater Taree area (Schliebs, 2016), and Clarence Valley (Young, 2015).

Mokau Spit, Waitomo

Mokau Spit is located on the west coast of the central North Island, at the south-west limit of Waikato region. State-led subdivision of Mokau Spit was undertaken in 1956 despite the local council raising concerns about cyclical erosion (Warne, 2015; WDC, date unknown). Within three years, coastal erosion threatened existing development (Turbott and Stewart, 2006). Turbott and Stewart (2006) provide a summary of central government's initial response. In the early 1960s, **11 sections were revested in the Crown**, and affected **property owners were compensated to varying degrees** (Turbott and Stewart, 2006). Original purchasers received a full refund, subsequent purchasers received 50% of what they paid, and tenants received nothing (Turbott and Stewart, 2006). Land use has persisted despite the erosion risk, and episodic storm events have forced reactionary retreat (Berry and Vella, 2010). Since the initial development, 12 sections have been lost to the sea (Turbott and Stewart, 2006), and **homes have been removed** (Warne, 2015; Ewing, 2013) or **set back** (Turbott and Stewart, 2006) by affected property owners in an uncoordinated, ad-hoc manner. Contemporary demand for property on the Spit remains despite the risk. In 2013, an affected property owner was forced to remove a holiday home from a section that had been purchased only a year earlier (Ewing, 2013).

In response to the pressing hazard risk, Waitomo District Council has explicitly adopted a policy of managed retreat (WDC, 2014). Yet precisely how managed retreat is to be implemented remains unclear, and no strategy has been publicised.

In anticipation of managed retreat Waitomo District Council has carried out emergency works to maintain access to affected homes (WDC, 2014). The explicit aim of the works is to ensure relocation remains feasible, and the Council has stressed that the works are only temporary (WDC, 2014). WDC has also diverted storm water drains (Rilkoff, 2014). Relevant land use controls attempt to facilitate retreat (Berry and Vella, 2010). **Relocation of properties within hazard areas is a permitted activity**, and **new development is prohibited** (Berry and Vella, 2010). In addition, the **construction of hard coastal defence structures is prohibited** (Berry and Vella, 2010).

However, policy does not accurately reflect practice. Over the last 20 years, affected property owners have made various attempts to "hold-the-line" culminating in the construction of a 9 m boulder barrier in 2006 (Warne, 2015; Thomas, 2015). Despite Environment Waikato issuing stop notices, enforcement has been largely ineffective.

More stringent rules may eventuate in light of the recently enacted Waikato Regional Policy Statement 2016. Councils must identify "when it is appropriate to require existing development along the coast to be relocated" and to "include provisions for this relocation" within regional plans (Policy 6.2.4.b, WRC, 2016). However, the policy is high level, and details for implementation are left for councils to consider as plans gradually come up for renewal.

Thames, Coromandel

40-50 houses have been **setback** over the past decade as a result of **rules constraining the redevelopment process** (Reisinger et al., 2015).

Muriwai, Auckland

Muriwai Beach is located on the west coast of the North Island, to the south west of Auckland City. Consistent erosion at a rate of 1-1.5 m per year eventually threatened the Muriwai Surf Life Saving Club, a public car park, and access road (Blackett et al., 2010; Tinker 2014). Initial attempts to halt the erosion through the construction of a sea wall, rock armour, and gabion baskets failed and the Auckland Regional Council (ARC) eventually consulted an external advisor to **engage the community on possible management options** (Blackett et al., 2010). As a result of lengthy negotiations between the community and relevant councils, a **graded managed retreat strategy was adopted** (Hart, 2011). The implementation process was assisted by the fact that all stakeholders shared the same desire to **retain the natural character of the beach** (Blackett et al., 2010). It was agreed that affected **assets would be relocated when certain erosion trigger points were reached** (Blackett et al., 2010; Hart, 2011). The ARC adopted a “whole of park” approach, and selected a site for the surf club relocation based on “long term functionality” (ARC, 2008). The relocation project was jointly funded by Rodney District Council (\$150,000), the ARC (\$590,000), and the Muriwai Surf Club (~\$4m) (Ong, 2010). The ARC provided the land for the relocation and the new Surf Club was opened in 2013 (ARC, 2008; Muriwai Surf Club, date unknown).

**Sunset Beach (Okariha),
Port Waikato**

Sunset Beach (Okariha) is located on the west coast of the North Island, and comprises a section of the Southern mouth of the Waikato River (GHD, 2014). Significant erosion has occurred along Sunset Beach since 2008, threatening community assets including a hall, recycling station, toilet block and carpark owned by Waikato District Council, and the Sunset Beach Surf Life Saving Club (GHD, 2014). A lookout tower utilized by the Surf Club has been relocated three times during this period because of the retreating shoreline (GHD, 2014; Polley, 2016).

In response to the coastal erosion threat, Waikato District Council commissioned an **assessment of possible adaptation options** (GHD, 2014). Appropriate assessment criteria were determined from meetings held between key stakeholders including iwi, environmental groups and local authorities (GHD, 2014). **Managed retreat was recommended by the independent consultant as the most appropriate response to existing and future erosion risk** (GHD, 2014; GHD, 2015).

Options for managed retreat were informed by community engagement. A community workshop, discussion forums, and surveys were used to gather information about what the community valued, and how those values could be given effect in the retreat process (GHD, 2015). From community feedback, **specific trigger points were identified** for initiation of the managed retreat process (GHD, 2015). Final recommendations for retreat involved **relocation of the community hall** to undeveloped greenspace owned by Waikato District Council, and the **development of a car park requiring acquisition of private land** (GHD, 2015). There was general consensus that erosion risk did not warrant relocation of the Surf Club (GHD, 2015).

Waikato District Council’s process for identifying possible retreat options is proactive, and shows promise. By discussing how retreat will be implemented with the community in a timely manner, potential barriers are identified before it is too late to adapt plans. For example, although the recommended retreat option for the car park involves the acquisition of private land, through the community engagement process it became apparent that affected property owners would resist selling their land

(GHD, 2015). It is unclear how Waikato District Council will address this issue when trigger points are reached and retreat is initiated.

**Project Twin Streams,
Waitakere, Auckland**

Waitakere City Council (WCC) implemented a **large-scale voluntary retreat plan** (Project Twin Streams) to address storm water challenges and flood risk occurring as a result of development near the Waitakere Stream (Hart, 2011). The project was **funded by a \$38.2m Infrastructure Auckland Grant** between 2003 – 2012, and almost 50% of this funding was used for riparian planting (Project Twin Streams, date unknown). 98 full property purchases and 83 part-purchases were identified as necessary for the projects' success (Atlas, 2011).

A key objective of the Project was for the Council to **purchase affected properties without recourse to compulsory acquisition** under the Public Works Act 1981 (PWA) (Atlas, 2011). However, the **principles underpinning the PWA were relied on**, and property owners were made aware that WCC could acquire land if owners were unwilling to sell (Atlas, 2011). While this method has been described as valuable for “demonstrating the need for public work” (Atlas, 2011), it is possible that such explicit reference to the PWA may influence owners into selling.

The **community engagement process**, extensive support materials, and implementation strategy were planned before contact was made with affected property owners (Atlas, 2011). Affected owners were informed on an individual basis by a mix of technical experts and mediators to ensure their concerns could be addressed. Negotiations for sale and purchase were carried out on a **'case-by-case'** basis and all **reasonable expenses were paid by the Council** including legal, valuation, and relocation costs (Atlas, 2011). **Negotiations for sale price were based on market valuation at the time the Project was publicly announced**, and therefore avoided any consequential drop in value (Atlas, 2011). The Council assisted with all aspects of the relocation process including finding appropriate rental properties for affected owners (Atlas, 2011). Houses were eventually removed and any surplus land outside of the hazard zone was re-sold (Atlas, 2011).

The Council adopted a flexible stance during negotiations, assisting owners to relocate special items of significance including trees and placenta (Atlas, 2011). Overall, 78 properties were removed or relocated, 78 part-properties were purchased, and 67 covenants were created to ensure access for riparian planting (Atlas, 2011).

**Nags Head (North
Carolina, USA)**

North Carolina implements a variety of land use controls to manage coastal erosion risk. Since 1979, all **hard defence structures have been prohibited** along the Atlantic coast (Novack, 2016). As the shoreline receded, private dwellings and associated structures ended up on the beach face, hindering public access (Novack, 2016). In 1988 a town called Nags Head enacted legislation to address this problem (Novack, 2016). Removal orders could be issued for any properties located on the beach that were identified as being at risk of structural collapse or likely to cause harm (Novack, 2016). The regulations were challenged subsequently by affected property owners in 2009 and were deemed unenforceable (Novack, 2016). In order to relocate the properties, Nags Head authorities were forced to settle with owners outside of court (Novack, 2016).

Texas

Texas has enacted a policy of **rolling easements** to manage prolific coastal erosion at rates of 1.5-3 m per year (Siders, 2013). The Texas Open Beaches Act 1959 (TOBA) grants public access rights to the portion of the beach extending from mean low tide to mean vegetation line (Siders, 2013). As the **beach erodes, the easement rolls landward**. In giving effect to the easement, the Texas General Land Office has strong enforcement powers, and can prohibit or remove structures that end up within the beach area due to erosion (Siders, 2013).

In anticipation of resistance from affected property owners, TOBA contains stringent disclosure requirements for all real estate transactions involving property or land affected by the easement (Siders, 2013). Part of the mandatory notice requirements include an explicit warning that litigation will be initiated if property ends up seaward of the easement boundary (Siders, 2013).

To facilitate managed retreat of properties within the easement area, a 'structural removal initiative' was developed in 2006 and funded by the Coastal Erosion Planning and Response Act (Esteves, 2014). Property owners can seek compensation up to \$50,000 (USD) for costs associated with relocation (Siders 2013; Esteves, 2014). 16 properties have been relocated without recourse to the courts since it was established (Esteves, 2014).

Hurricanes constrain the enforcement of rolling easements (Siders, 2013; Esteves, 2014). Rapid erosion and subsequent roll back of easements has been the subject of much litigation in Texas (Siders, 2013; Esteves, 2014). In 2011, an affected property owner challenged the legality of removal orders issued after Hurricane Rita (Siders, 2013; Esteves, 2014). As a result, the Texas Supreme Court ruled that easements should not be affected by sudden erosion events, but only reflect gradual erosion associated with typical coastal processes (Siders, 2013; Esteves, 2014). The Supreme Court raised concerns about the enforceability of relocation orders issued under TOBA because the easement was not explicitly created in the statute (Siders, 2013). Following the case, some affected properties were purchased by an Emergency Agency (funded by taxpayers) and removed (Esteves, 2014). In addition, TOBA was amended to provide for temporary suspension of the landward rollback of an easement following a Hurricane or large storm event (Esteves, 2014).

Mississippi

A **staged coastal improvement programme** aims to **relocate 120 km of existing coastal development** over a period of 30-40 years (Story, 2013). 15,000 properties are expected to be relocated in two stages (Story, 2013). Highest risk properties will be purchased by the state to prevent future development in vulnerable areas, and wider relocation will be triggered by a Hurricane event (Story, 2013). It is unclear how relocation will occur in practice, or where funding will come from for the project, but other large-scale Hurricane responses have been funded by Congress (eg. *Louisiana Road Home Policy*).

New York

A **buy-out scheme** has been proposed for high-risk areas in New York (NYG, 2013). The scheme applies to properties that were substantially damaged as a result of Hurricane Sandy in 2012, but includes properties that are susceptible to future hazard risk

	(NYG, 2013). A consistent formula is used to calculate compensation, and owners are offered an incentive to relocate within their county (NYG, 2013). The proposal is to be funded from a USD \$30B aid package delivered by Congress (NYG, 2013).
Grand Forks, North Dakota	802 sections were purchased in response to flood damage at a cost of \$171m (Siders, 2013). To facilitate relocation away from the flood-risk zone, the town entered into an agreement with private developers to help finance the construction of 180 homes in safer area (Siders, 2013). Initially, the new houses were priced too high for those that had received compensation, and prices were substantially reduced before selling (Siders, 2013). However, overall the project was successful in reducing the number of homes vulnerable to a future flood event.
Soldiers Grove, Wisconsin	A proactive relocation project was initiated and driven by the community who were concerned about future flood risk (Siders, 2013). The town initiated the relocation process by purchasing vacant land, but required federal assistance, which led to significant delay (Siders, 2013). Eventually, following a flood event, federal funding was secured and 36 businesses, 22 homes, and 3 public assets were relocated (Siders, 2013). As a result, the community was protected from severe flood incidents in 2007 and 2008.
Goleta beach, Santa Barbara, California:	Public infrastructure including: gas, water, sewer and a bike path have been relocated inland as a result of coastal erosion (Chang, 2012). A similar project was undertaken at Ventura, California, where a bike path and parking lot were moved inland at a cost of \$4.5m (FHA, 2015). Initial attempts to relocate infrastructure in Ventura were unsuccessful, as stakeholders were unable to agree on a plan of implementation (FHA, 2015). A second working group was established in 2001 and agreed on a plan of managed retreat, with financial backing (USD \$1.5m) from the California Coastal Conservancy, federal government (USD \$1.5m) and local authorities (USD \$672,500) (FHA, 2015).
Pacifica State Beach, California	Pacifica State Beach, California, implemented a small-scale collaborative managed retreat policy to relocate at-risk infrastructure away from coastal erosion over a 10 year period (Kershner, 2010). In 2002, the California Coastal Conservancy and Pacifica Land trust purchased 2 homes and surrounding hazard prone land for \$2.2m (Kershner, 2010). A restaurant was subsequently purchased and relocated in land (Kershner, 2010). The coastline was replanted to stabilise erosion, and the vacant land was left undeveloped for public use (Kershner, 2010). Storm driven cliff erosion in 2016 has resulted in additional threats to private property and resulted in the managed demolition and removal of buildings.
East Riding, Yorkshire	East Riding Council developed financial assistance packages to incentivise relocation and rollback of properties within identified coastal risk zones (ERC, date unknown). Relocation packages provided full funding for property demolition and site construction, limited funding for relocation expenses (£1000) and a nominal hardship grant (£200) (ERC, date unknown). Different levels of funding were available depending on risk level and the financial situation of the applicants (DEFRA, 2012). In addition, an adaptation package provided funding for rollback of existing properties , where applicants could obtain funding to cover planning costs, but not costs associated with the purchase of new land or construction of new property (ERC, date

	<p>unknown). Finally, assistance grants were created to help owners adapt properties that were not at imminent risk from coastal erosion, to reduce their future risk vulnerability (ERC, date unknown). As a result of the scheme, 16 houses were relocated and 43 properties were demolished (ERC, date unknown). The fund remains available for affected property owners to seek assistance.</p>
<p>Happisburgh, North Norfolk</p>	<p>North Norfolk District Council obtained the largest amount of Pathfinder funding (£3m) (NNDC, date unknown). Happisburgh was experiencing severe cliff-top erosion, and 12 properties were identified as at imminent risk from coastal erosion (DEFRA, 2012). Pathfinder funds were used to establish a voluntary property acquisition programme. As a result, 9 of 12 at-risk properties were purchased by the Council and subsequently demolished (DEFRA, 2012). Relocation strategies were also developed for the rollback of a cliff-top caravan park, hall, and public footpath (DEFRA, 2012). In addition, redundant coastal protection works were removed (DEFRA, 2012).</p>
<p>Clayton Bay Cliffs, Scarborough</p>	<p>Knipe Point community comprised 56 properties situated on top of cliffs at Clayton Bay (DEFRA, 2012). A landslide in 2008 caused land to slump threatening 15 properties (11 of which were holiday homes) (Dillon, 2014). Scarborough Borough Council successfully obtained funds through the Pathfinder project to review possible options for community relocation (DEFRA, 2012). The Council's objective was to use funding to purchase replacement land for people at risk to build new homes on (Dillon, 2014). Council engaged with the community on potential relocation sites, and obtained an independent recommendation based on anticipated costs and benefits (DEFRA, 2012). The community members at risk did not agree with the recommended site, and agreed to raise private funds to overcome planning barriers at a site of their preference (DEFRA, 2012). The lack of available vacant development sites constrained implementation of the strategy, because a large site was needed to keep the community together, which was their preference (Dillon, 2014). The relocation site was purchased in 2015 (Siddle et al., 2015). It is not clear whether properties have been constructed at the new site, highlighting the extended time it has taken to address relocation of affected property owners.</p>
<p>Easton Bavents, Waveney, Suffolk</p>	<p>East Anglia has been described as the fastest eroding coastline in Europe (DEFRA, 2012). The Waveney District Council used Pathfinder funding to initiate a rollback scheme for Easton Bavents. The Council offered to pay for the demolition of nine at-risk properties and assisted with finding new land for relocation (DEFRA, 2012). In addition, affected owners were offered a contribution of £10,000-£15,000 to assist with purchase of new land, or construction costs (Potter, 2013). Some consideration of risk was made, with owners who had purchased prior to publication of the first SMPs, when information about coastal risk was not readily circulated, were granted slightly more money than those who had purchased properties after plans were published (Potter, 2013).</p>
<p>Fairbourne, Gwynedd</p>	<p>In 2013, following review of the relevant SMP, local government proposed a staged approach to decommission hard protection structures in the town of Fairbourne from 2055 (WAO, 2016). The revised SMP allows for a transition period, where seawalls will be maintained for 40 years before the shoreline will be allowed to naturally retreat (WAO, 2016). The plan was</p>

developed without public consultation, and caused significant outcry from the community (BBC, 2014). Land values plummeted, and new mortgages were refused on the basis of uncertainty (WAO, 2016). The community banded together and formed a lobby group “Fairbourne Facing Change” to engage with the Council, and threatened litigation (WAO, 2016). The Council subsequently formed its own stakeholder group, and initiated a series of meetings to address public concerns (WAO, 2016). As a result of the community engagement process, the Council and community group attend regular meetings, and maintain a “good working relationship” (WAO, 2016) and the two groups are working together to create a strategy for future approaches.

**Abereiddy,
Pembrokeshire**

An historic seawall was removed from Abereiddy Beach after **managed retreat** was identified as the best coastal management option for the area (McAlinden, 2015b). The seawall was prone to failing, and posed a hazard to beachgoers, but reconstruction was not considered economically feasible (McAlinden, 2015b). A thorough erosion assessment of adjacent shorelines was undertaken prior to the removal process, and scientists evaluated the likely response of the beach (McAlinden, 2015b). Subsequently, a **carpark has been abandoned** as the shoreline erodes, but no property has required relocation.

Medmerry, Sussex

Managed realignment in Medmerry, Sussex sought to reduce flood risk and resulted in 183 ha of new intertidal habitat, while the project at Abbots Hall, Essex, opened up 80 ha of land for flood inundation (McAlinden, 2015). Further, realignment often involves substantial engineering, planning, and funds. For example, at Medmerry, **managed realignment included the construction of a 7km floodbank, a 10km drainage ditch system, two rock armour revetments, a diversion channel, and various public facilities** (McAlinden, 2015).

5.0 Enablers and constraints that shape the implementation of managed retreat approaches

In reviewing examples of managed retreat and realignment it is clear that there are site specific parameters that are influential in the decisions made about planning process and outcomes. In particular, the legislative and governance contexts are important drivers of the decision-making processes undertaken and the ability to financially and socially support decisions. While coastal governance is frequently characterised by regionally or locally devolved level decision-making, the role of national or federal governments in providing policy direction and funding for managed retreat options is demonstrably influential. Beyond these political influences, there are a set of enablers or constraints that also shape how managed retreat is undertaken.

A number of factors identified as constraining or supporting the successful implementation of managed retreat are discussed below.

5.1 The nature and history of the risk

The historic and geographic context of a flooding or coastal hazard risk can play an important role in sensitizing awareness to ongoing hazard events. Newer residents in an area may have less familiarity with patterns of coastal change or conversely may have a greater sensitization to risk because of planning restrictions lodged on their property records. The scale and magnitude of risk also becomes a factor with large-scale events such as hurricanes having different impacts on community than slower onset erosion events. The nature and perception of risk is also influenced by past coastal management practice and expectations of ongoing protection.

5.2 Precedence and a change in shoreline management practice

Communities with a history of coastal protection can find a shift in shoreline management practice, from maintenance of existing hard structures to alternative options, confronting. For example, where councils carry out maintenance works on existing coastal defence structures, this often creates an expectation that they will continue to do so long-term, or that they are obliged to (Tinker, 2014; Barkham, 2015). Managed retreat proposals have been challenged in instances where local government seeks a change from historical defence of the shoreline (NSW, Easton Bawents).

Similarly, offering financial assistance to facilitate retreat in one area can create a precedent for those affected by similar circumstances elsewhere. Further, people might buy into a vulnerable area because they erroneously believe funding mechanisms will apply in perpetuity. Decisions to stop financial assistance are likely to be controversial and heavily resisted.

5.3 Whose decision it is to relocate structures?

As Hino et al. (2017) highlight, the context in which change occurs is important. In cases where relocation or removal of shoreline protection is government initiated there may be community resistance (e.g. Fairbourne, Wales; Byron Bay, Australia). Attempts to implement managed retreat may be challenged by affected property owners, resulting in delay, significant cost, and even policy reversal. For managed retreat to be successful, there needs to be a willingness from parties to work towards a solution. This is often not the case in practice. As Turbott and Stewart (2006) observe, “most oceanfront property owners have to be forced off their property by nature”. Retreat from beachfront property is associated with a loss of status (Reisinger et al., 2015), viewed as defeatist (Alexander et al., 2012), and is costly (Neal et al., 2005).

Home owners may be concerned by perceived uncertainty associated with managed retreat policy and possible adverse effects on property values, insurance, and mortgage opportunities. Consequently, it may be more difficult for those affected to relocate. In the case of the Twin Streams

Project, despite council purchasing affected properties at market value, owners found it difficult to buy back into the area they were previously located.

5.4 The process of community engagement

Commentators have stressed the need for local government to actively engage with communities before decisions are made (PCE, 2015; Reisinger et al., 2015). Inadequate or absent consultation has significantly constrained attempts to implement managed retreat. For example, in Fairbourne, Wales, managed retreat was adopted in a Shoreline Management Plan without informing the affected community prior resulting in legal challenges. Conversely, where communities were engaged and included in decision-making in an enduring and meaningful way (Port Waikato, Grantham, and Soldiers Grove), detailed strategies for retreat were developed. Of note, in the process of engagement strong lobby groups can control community engagement and decision-making, leading to private interests being favoured over the wider community (Hayward, 2008; Hume and Blackett, 2007; Blackett et al., 2010).

5.5 Resource constraints

In some instances, managed retreat is hindered where there is insufficient land available for relocation purposes. In the UK, relocation projects were delayed because some communities preferred to be relocated together, rather than split up. In addition, it is less costly for affected owners to relocate on-site, by moving their property landward. If space is not available, implementation requires greater investment. Planning controls have been made more permissive in some jurisdictions to facilitate the relocation of structures.

Financial limitations can also constrain implementation of managed retreat. Many successful examples of managed retreat involved substantial funding from central government. In the USA, large scale relocations were funded by Congress, and smaller relocations were facilitated by state grants. In Grantham, Australia, the Council purchased 1000 acres of land for relocation purposes, and the Twin Streams Project in Auckland utilised a \$38.2m infrastructure grant. These injections of financial support may also be supplemented by individual property owners (e.g. Grantham, through the use of insurance payouts). These successes were contingent on significant funding assistance from national or state-level governments.

5.6 Lack of national guidance

Internationally, no country provides detailed guidance on how local government should implement managed retreat. Further, there is no mandate requiring local authorities to adopt managed retreat policy. National policy is often permissive, and devolves implementation to those on the ground.

Such an approach has benefits, in that it is flexible, and enables local authorities to devise a strategy that suits the local circumstances (Willis, 2014). However, it also leads to inconsistency in interpretation and implementation across regions and localities (Blackett et al., 2010). In some of the examples outlined, central government and local government held divergent views of (a) whether managed retreat should be adopted (NSW) or (b) how hazard planning should be implemented (Christchurch). A lack of cohesion between scales of government creates inefficiency, strains local government resources, and constrains implementation.

5.7 Existing use rights and land tenure

Issues of land tenure and existing use rights may also influence the managed retreat approach taken.

In New Zealand, the effectiveness of district level rules to control land use within hazard areas can be constrained by existing use rights (Turbott and Stewart, 2006; MfE, 2008; Berry and Vella, 2010, Reisinger et al., 2015; Lawrence et al., 2015) and rules regarding existing land uses must be developed

by regional or unitary authorities before district councils can align their own planning controls (Lawrence et al., 2015).

Unlike New Zealand, private property rights are enshrined in the **United States** Constitution. If regulations aimed at managing retreat deprive an owner of the economic value of their property, the Government is required to pay “just compensation” (Novack, 2016). Property owners affected by regulations that prohibit or restrict development often challenge their enforceability, leading to extensive litigation with associated costs and delay (Siders, 2013; Novack, 2016). Regulators have some ability to circumvent compensation requirements by imposing temporary moratoriums on construction, and these have been utilised in the coastal hazard context to buy regulators time following Hurricanes (Siders, 2013).

5.8 Enforceability of regulations

If regulations do not translate to enforceable action, they are of limited value. Compliance with rules and conditions should be monitored. Allowing actions (such as illegal sea walls) that contradict rules undermines their effectiveness and is likely to constrain managed retreat attempts in the future.

5.9 Socio-economic factors

The value and nature of assets affected significantly influences the feasibility of managed retreat. Reisinger et al. (2015) observe that managed retreat is typically easier in regions with lower density of development and property values, particularly where compensation is being considered. This is particularly evident in New Zealand where successful examples of small scale managed retreat included the relocation of public assets on council land.

5.10 Socio-cultural factors

An understanding of the breadth of social and cultural values is important and goes beyond an economic valuing of property as assets. Of key importance is consideration of the complex values that individuals and communities attach to their places of residence and their wider community (e.g. Fairbourne, Byron Bay). These will vary by location and responses may be influenced by personal values and experiences as well a collective community set of values and experiences.

5.11 Who Pays? Financing relocation

Commentary and practice highlights a need to consider how managed retreat will be funded, and who will bear the cost (Lawrence et al., 2015). For existing development, options include affected owners and/ or central and local government. After significant events there have been cases where insurance pay-outs have helped support the relocation of properties (e.g. Grantham).

Private landowners are normally unwilling to retreat voluntarily, and most examples of successful retreat have been facilitated by *ad hoc* national funding. Yet such an approach raises issues of social justice. Some commentators argue that retreat should be funded by those who directly benefit (Tinker, 2014). This is especially so where people have purchased land after knowing about the risk involved. Conversely, other commentators argue that the community should share the costs because they indirectly benefit from retreat (Tinker, 2014), particularly in cases of enhanced community resource.

6.0 Summary

The examples presented in this review illustrate a number of options communities and governments have pursued to reduce the immediate and long term risk of coastal hazards. The pressures of changing coastal environments will increase the urgency of these decisions for many coastal communities. Local and central governments need to commit to formulating a strategic plan alongside communities in spite of the challenges these conversations present.

Managed retreat is a coastal management approach that is contextually dependent with the outcome contingent on a range of physical, social and governance conditions. The successful examples of larger scale relocations of communities tend to be reactive and crisis driven. Efforts to undertake more strategic (pre-emptive) relocation actions are less common and can result in a disconnect between community and local government short and longer term priorities, particularly where the movements have not been forced through extreme events. While the **managed retreat of public assets** have been undertaken to protect infrastructure at risk there may still be community resistance to a perceived loss of public space. Most examples of managed retreat that have gained traction have required a substantial amount of **public funding**. These approaches have included a mix of central and local government funds alongside private or insurance funding.

While many current examples of retreat being undertaken have involved property buy-out after a significant hazard event (e.g. Hurricane Sandy), such examples may unduly **emphasise a reactive approach** to managed retreat and **overlook** the work that is being undertaken to implement **longer term retreat plans** with communities. These **strategic retreat plans** may see decisions about properties and communities occurring in a staged manner over the next two to three decades. In this regard, it is important to identify most at risk sites and lower risk sites and build a commensurate staged approach to managed retreat. Alongside planning for longer term retreat options is the need to establish **managed retreat thresholds** (either frequency of flooding events or location of erosion relative to structures), alongside community, at which agreed actions will be triggered.

Several case studies of **anticipatory managed retreat** highlight community reluctance or refusal to consider these approaches as viable alternatives. Studies recommend **early and genuine engagement** concerning the hazardous nature of the coast, community values and the implications of the continual occupation of hazardous sectors of the coast.

A major constraint on community and local government willingness to explore managed retreat is the construction of viable options and how these are communicated. Considerations that are relevant to discussion of managed retreat actions include:

- a. *Thresholds to activate managed retreat.*
- b. *Where to relocate.* Should local government play a role in providing alternate options? What land is available? How do relocation sites meet community values and aspirations? How will land at new sites be allotted? What information are such decisions based on?
- c. *How to relocate.* Will managed retreat require total abandonment, full or part relocation and how will these be funded?
- d. *Timeframe over which retreat will take place (years to decades)?*
- e. *Funding mechanisms.* There are a spectrum of options that range from market forces to full subsidisation for managed retreat. There are decisions to be made about the financial viability and political willingness to support a change from past management practices.
- f. *Community engagement process.* Genuine participatory processes are required to work with communities on management options. The processes need to be inclusive of a range of voices and reflect local and wider community values.

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