

SUSTAINABLE COASTAL DEVELOPMENT: PROTECT OR RETREAT?

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ABSTRACT

Most coastal cities will, at some stage very soon, have to confront the decision about whether to protect their shoreline or retreat from it. The devastating effects of sea level rise and increased storm frequency and severity causing coastal erosion are becoming a regular feature of news reports. The images of coastal houses being battered by the sea must be giving coastal property owners cause to reflect on the (in)security of their investment, and increasing the demands on local administrators to take action.

Hard protection (walls, groynes, reefs) is expensive, vulnerable to damage and usually has adverse downstream effects. The costs of protection must be weighed against the value of the protected property and infrastructure. Many small cities built on the coast have limited financial resources available to protect their coastal boundaries.

In New Zealand many local authorities are grappling with this dilemma. By identifying hazard zones where future development must be restricted, they are being criticised and challenged in court for adversely affecting property values on the basis of uncertain future predictions.

So what mechanisms are available for sustainable coastal development? This paper explores development restrictions, tenure restrictions and sustainable solutions for dealing with property at risk of loss by sea erosion. It concludes that city administrators must work closely with coastal communities and property owners to decide on appropriate interventions.

Keywords: coastal development, precautionary principle, land tenure, community engagement, Dunedin.

1 INTRODUCTION

This paper reviews some of the issues which arise when making decisions about responses to sea level rise hazards. First, land and rights in land are not as permanent as many believe. The increasing coastal vulnerability of land in the face of climate change needs to be factored into all response plans. The precautionary principle provides some guidance for planning. However, the implementation of the principle is often confused in implementation and contested in court. Local authorities are learning that while decisions and policies need a clear scientific basis for support, the support of the community may be even more important for policy success. The process of providing accessible information to community stakeholders, highlighting the cost and effects of the range of possible options and engaging the people in the decision is crucial. All decisions will have their costs – high investment in defence structures now will place a high public financial burden on current taxpayers and uncertain future burden for repair and maintenance. On the other hand, commitment to retreat now will place a high private cost on current landowners but will remove future expenses. The need for compensation for financial loss therefore arises: to what extent should the burden be placed publically or privately, or should an insurance-type compensation scheme be established. Local and central government both seem reluctant to accept responsibility for this decision which does little to help affected proprietors.

The example of South Dunedin is briefly explained to demonstrate the complexities of the policy framework. Here there have been a series of sea walls in place for over 100 years, but the costs of maintaining walls is increasing and it is well understood that rising sea levels and increasing storm events make retreat seem like a more appropriate response. The



precautionary principle, the uncertainty about the permanence of the land, the need to get owners and occupiers involved in coastal plans are all affecting the programme of action on this coast.

2 INSECURITY OF TENURE

There is a strong tradition and expectation that property is so important to the western capitalist system that it should be almost sacrosanct, untouchable, and that it should be absolutely protected from physical and economic loss, and from state and environmental taking. John Locke and the framers of the US constitution more or less explicitly asserted that the sole purpose of government is for the protection of life, liberty and property. It was suggested that the central function of government must be the regulation and protection of private property [1].

A fee simple title has an unlimited time span, so the expectation is that it will last forever. However, land is not permanent; it gets inundated, washed away, destroyed by seismic events, it may get twisted and distorted and it may become unusable due to natural or induced deterioration. The protection of land and security of land titles is merely a function of government policy.

Coastal property is the focus of this paper, but the physical loss of land and the loss of property value is by no means confined to the coast. The value and productivity of land is always affected by economic and environmental conditions. The example of ghost towns demonstrates that value in land depends on ongoing use. When land and resources are no longer demanded, they lose value and may be abandoned. When resources are depleted, land values that were dependent on those resources drop. When environmental conditions change, then land and property values change. The changing shape of land due to accretion and erosion also demonstrates that land can be lost or gained. Usually there is no legal or financial remedy for the loss of land or value.

Investment in property is usually the most important (and highest value) financial decision people make. It may be assumed, therefore, that all purchasers take adequate care with that decision. Some decisions may be made on the suitability for comfortable residential use, but some may be made on the expectation of significant capital gain. The latter decision is speculative, a gamble in the market, that demonstrates a short-term vision about the market cycle and the durability of the land. That decision should be no more secure or protected than an investment in the stock market or even an investment at the casino.

It is not for the government to support the investment in land and what may have been a speculative purchase and economic investment. Property does not, and should not, have specific protection against falling value or loss of opportunity to use [2]. Central or local government should not bear any responsibility for supporting property values. The government's land regulation decisions should reasonably be made on the basis of environmental and fiscal responsibility: maintaining respect for ecological systems; being realistic about the costs and benefits of interventions; and proceeding with caution. There are, however, still frequent calls for government to provide compensation for land loss, especially when a policy of managed retreat is proposed.

3 TENURE RESTRICTIONS

The identification of vulnerable land can trigger government policy to impose tenure restrictions on such land. Short term occupation licences, fixed term leases, variable term leases terminating at some determined hazard event, or rental tenancies should all be within the scope of local government to enforce as development consent conditions. Clearly, tenure conversions such as these can be portrayed as a reduction of rights, and could trigger



compensation claims. However, the legitimate regulatory functions of local government allow for some compromise of property rights in exchange for development consent. For example, since the Resource Management Act 1991, any subdivision of land adjoining a river, lake or the sea is encumbered by a requirement to set aside an esplanade reserve adjoining that water-body for conservation, recreation and public access as a condition of consent. The fact that this amounts to a compulsory acquisition of a strip of land and the removal of riparian rights to the adjacent water, from private title into public ownership is never seriously objected to and no compensation is payable. The legitimate and over-riding public interest takes precedent over the maintenance of property rights on vulnerable land.

4 PROTECTION FROM SEA LEVEL RISE

There is certainty that the sea is rising and will continue to do so for the foreseeable future. There is uncertainty about how fast and how much the sea will rise, and what we should do about it. Coastal development has uncertain effects on the coastal environment, including disruptions of natural coastal processes by coastal structures, and coastal processes have uncertain effects on structures and human occupation of the coastal hazard zone.

On undeveloped land, coastal changes do not normally pose a serious concern. Coastal processes can be left uninterrupted without any significant loss of high value property or public infrastructure, while coastal amenity and natural character is maintained. But on highly developed coasts, coastal communities and property owners are already dealing with coastal hazards. The hazards exist in built up and developed land, often “not because the sea has encroached on the land, but because the land has been allowed to encroach on the sea” [3]. Public infrastructure and private property within the dynamic coastal zone produces a contest between ecosystem integrity and human activity.

People immediately affected by sea level rise and coastal vulnerability tend to look for short-term remedies that focus on hard protection measures. By their very nature, hard protection structures intrude into the coastal hazard zone and beach dynamics are disrupted. “Any structure that prevents the exchange of sand between the onshore deposits of sand and the subtidal deposits of sand will disrupt this natural function” [3].

In cities with limited resources and low value infrastructure, the construction of protective works may not be feasible. Innovative adaptation methods are required. We need to reassess our technological dependence and consider behavioural and attitudinal changes as part of our initial responses to environmental hazards.

5 PRECAUTIONARY PRINCIPLE

There are many differently constructed statements about the precautionary principle (see, for example, IUCN [4]). The Rio Declaration on Environment and Development (1992) [5] is regularly cited as the clearest statement of the precautionary principle: *Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation* (Principle 15).

The Earth Charter [6] states Principle 6: Prevent harm as the best method of environmental protection and, when knowledge is limited, apply a precautionary approach.

- a. Take action to avoid the possibility of serious or irreversible environmental harm even when scientific knowledge is incomplete or inconclusive.
- b. Place the burden of proof on those who argue that a proposed activity will not cause significant harm, and make the responsible parties liable for environmental harm.



- c. Ensure that decision making addresses the cumulative, long-term, indirect, long distance, and global consequences of human activities.

The precautionary principle is applied when a decision is required about a response to environmental degradation and when the effects of that response are not fully known or understood, then to proceed with caution. In most formulations of the precautionary principle we are referring to human activities doing damage to the environment. In coastal development, the situation is about the natural environment doing damage to the human activities and occupation.

The precautionary principle recognizes that delaying action until there is compelling evidence of harm will often mean that averting the threat is too costly. Invoking the principle promotes action to avert risks of serious or irreversible harm to the environment in such cases. The principle therefore provides a fundamental policy basis to anticipate, avoid and mitigate threats to the environment.

5.1 Implementing the precautionary principle

In New Zealand, the precautionary principle is recognised as a key planning guideline, but there is some uncertainty about its implementation. A New Zealand Treasury paper on Risk Management [7] states the need to avoid environmental damage “where there is a high degree of uncertainty and the effects of policy decisions are possibly irreversible”. The Sustainable Development Programme of Action [8] states principles for decision making including “addressing risks and uncertainty when making choices and taking a precautionary approach when making decisions that may cause serious or irreversible damage.”

In New Zealand, the planning and environmental legislation, the Resource Management Act 1991, provides an enabling process whereby property owners can do what they wish on their land as long as they can avoid, remedy or mitigate the adverse effects of the activity, or unless they are specifically restricted from doing so by local authority rules. The Act then imposes on local authorities the burden of proof (which may include uncertain or disputed scientific evidence) to justify their decisions. Local authorities should follow the precautionary principle in making decisions about responding to sea level rise threat.

Local authorities need to gather data – including ground elevations, sea level rise predictions, local circumstances, lessons from past events – and prepare hazard zone maps. Hazard zone maps are prepared with the best of intentions in an attempt to provide early warning to land occupiers, and guidance for planners and developers about building opportunities. However, evidence in New Zealand shows that zone identification can be very contentious. The major perceived effect of zoning decisions is that property values will fall, that land will become unmarketable, and the decision for intervention is therefore unfair on property owners. Care needs to be taken to ensure that the extent of hazard zones is not excessive, unreasonably long-term or too cautious. Regulatory intervention may amount to a statutory taking of property rights and the right to develop, and may have unintended outcomes. “By including areas of future potential hazard, the proposed setback becomes much wider and has a much greater impact on property use. In some cases, the resistance from landowners is so strong that proposed planning provisions are watered down or setbacks are discarded. This can result in a huge cost to councils with very little meaningful change in coastal erosion risk” [9].

The NZ Treasury observes that “lack of clarity [about the precautionary principle] can provide opportunity for legal challenge through the courts, where the principle may be interpreted differently from what was intended by the policy maker” [7]. The Coastal Ratepayers United engaged in such a challenge and won. In the *Weir v Kapiti Coast District*



Council 2013 case [10], the ratepayers were objecting to council hazard notices, the effect of which was expected to be a serious devaluation of their property and a restriction of the proprietors' options for future development. The Kapiti Coast Council was applying the precautionary principle by trying to restrict development within an identified hazard zone [11]. The court decided that the council was required to provide further evidence of erosion vulnerability; in other words, to provide more certain evidence of the sea level rise threat. While the council was trying to apply the precautionary principle to their policy implementation, the court was suggesting they should not act until they had certainty. Such litigation has the effect of making local authorities very cautious about acting in a way that may compromise property values and rights.

The residents also released a report on their version of the precautionary principle that, not surprisingly, stated "Private property owners have rights and they are responsible for decision-making regarding their property" [12]. They suggested that the local authority should not apply the precautionary principle to restrict them, but rather that ratepayers should only apply it for themselves when considering development options and that they can "choose a decision that best reflects their risk preferences" [12].

6 PARTICIPATORY PLANNING – ENGAGING WITH COMMUNITIES

Adaptation methods to manage the risk from coastal erosion regularly meet with resistance from property owners. It is at the individual property level where the public interest in the maintenance of natural coastal processes may come into conflict with the private interest of property protection [13]. Careful engagement with a wider community is necessary to demonstrate that short-term protection decisions often lead to the degradation of public values and of the natural character of the coastline.

Coastal property is often more highly valued than other property [14] and expectations for continued protection of private property and capital gains continue in spite of warnings about the hazards. Communities are frequently passionate about their coastal environments, and local authorities now recognising the need for community engagement with the science and effects of sea level rise. Engagement serves to focus the communities' attention on the consequences of coastal hazards, as opposed to the uncertainty or probability of their occurrence. Engagement promotes understanding of risk and provides a forum for community input to and endorsement of management methods and decisions. Appreciation of risk, and participation in decision-making leads to more effective policy making. Effective community engagement allows for explanations of consequences using past events elsewhere and examples of policy successes.

Planners need to be transparent about the components of uncertainty and how to address these in hazard assessment methods. This allows decision-makers, planners, scientists and communities to consider the degree of precaution that they will apply in dealing with uncertainties when deciding on the management method. The lessons from this approach apply broadly to locally focused community-led management. Effective and sustainable local management of coastal ecosystems is enhanced by policy makers, communities and scientists working together.

7 COMPENSATION FOR PROPERTY LOSS

If coastal storm damage occurs as a result of unforeseen and chance events of long return period, then property damage can often be restored; the relatively high cleanup and repair costs can generally be funded by normal insurance cover. But it is clear that the future climate change scenario includes sea-level rise and more frequent storm events of shorter return periods. Worst case scenarios of the past will be commonplace in the future. Insurance cover



is bound to be less available. Inability to insure will provide perhaps the strongest motivation for coastal property owners to withdraw from hazard zones. The homes in these areas will probably first become uninsurable and then uninhabitable, Commissioner for the Environment Jan Wright says: “It will be a slowly unfolding red zone” [15].

In New Zealand the Earthquake Commission (EQC) was established as a public and compulsory insurance scheme (compulsory, in that it required a levy to be added to all private insurance premiums) to compensate private property owners for property loss arising from earthquakes and other natural disasters. This covers for damage due to the random events of natural disasters that are beyond the power of individuals to anticipate or plan for. Premiums are paid alongside private insurance premiums, so qualification for compensation depends on having adequate normal household insurance. This has allowed for a relatively orderly programme of payouts to proprietors affected by the 2010 Christchurch earthquakes.

The Parliamentary Commissioner for the Environment (PCE) reported that a similar scheme could be established and funded by government to cover the loss of coastal property [11]. There is some logic to this, in that the natural consequences of disasters are unforeseen. On the other hand, the consequences of sea level rise have been observed and warned about for several decades, and the slow progression of effects provides time for occupiers of the coastal zone to withdraw. Also, the protection of a state guarantee or compensation is likely to encourage more speculative purchases, inappropriate development and a sense of economic security when land security is absent.

8 SOUTH DUNEDIN

South Dunedin has been the focus of much commentary and hazard investigation [11], [16]. From the beginning of European settlement of Dunedin in the 1840s, the southern housing area was reclaimed from very low lying wetland. The area was always intended to provide cheaper working class homes. Houses were basic timber constructions with floors built on low stone foundations (often now in contact with the groundwater). Many houses are well over 100 years old, and many have long outlived their design expectations. Many are, however, listed as heritage buildings as examples of the worker cottages provided at the time.

From a social point of view, the South Dunedin area incorporates the lowest socio-economic census blocks in New Zealand. A large proportion of houses are rented rather than owner-occupied. Public infrastructure is substandard; piping of foul and storm-water, access to fast broadband, recreational facilities, public transport, art, cultural and educational facilities are all lower than what has been provided in other parts of the city. Wealth, health and education standards are poor. If nothing else, upgrading the housing quality is essential to provided for warm, dry, safe and healthy housing.

Various hazards now directly affect this area [16]. Surrounding urban development has increased flood vulnerability by channelling storm-water runoff from adjoining hillside suburbs through this area. Old sewerage infrastructure struggles to cope with the required capacity. Ground-water levels are directly affected by the hydraulic pressure of the nearby ocean, such that in many areas water in a shallow hole in the ground will rise and fall with the tide, leaving many backyards permanently saturated. There are about 2700 homes in the South Dunedin area that are less than 0.5 m above MHWS [11]. It is expected that if a significant earthquake struck near Dunedin (like the earthquakes in nearby Christchurch), then much of the ground would be susceptible to liquefaction. As parts of the land were reclaimed from the harbour, recent subsidence investigations suggest that the land is also sinking towards sea level. Perhaps the most directly concerning issue is whether the rising



sea may breach the artificial barrier dunes (New Zealand's only dyke) and inundate most of the built-up land. Such vulnerability is examined in numerous reports from central government agencies, engineering consultants, and local government [11], [17], [18].

8.1 Interventions

South Dunedin is protected from the sea by an artificial dune (bund or dyke). On the adjoining beach, the St Clair foreshore, there has been a long history of a sea wall built to provide a promenade. This has been progressively extended seawards with upgrades and seaward extensions, the most recent being a concrete slab wall built in 2006 [19]. It had a design life of 50 years but has required almost constant repair and maintenance since construction. The provision of public space (car parking and paved walking space) took priority over maintaining beach amenity in spite of warnings about the vulnerability of the beach: "Any replacement wall which is further to sea than the existing wall, produces beach conditions that are likely to reduce the height of the beach and aggravate present problems. The most suitable solution for the beach is for the wall to move inland. As this will result in a significant amenity loss the solution is not pursued" [3]. The Hilton report continues: "Seawalls are not a long-term option for erosion protection on the exposed coast of St Clair because: (i) they do not address the causes of erosion, indeed erosion may be exacerbated; and (ii) they have a negative impact on beach amenity, access and aesthetics" [3]. The wall was built with several ramps and steps down to the beach, but now there is no beach left in front of the wall except at very low tide. The powerful in-shore wave pattern makes accessing the sea at that point very dangerous, and the ramp structures were destroyed within just a few years of construction. In short, the wall is there not to protect the beach but to protect property and infrastructure in the coastal zone.

The wall has precipitated major erosion beyond the wall end, and new geo-textile 'sand sausages' are required to protect the dunes and adjacent private property [19]. It may be expected that similar protection will be progressively required throughout the entire several kilometres of beach. The protection option commits authorities to continuing construction and maintenance costs.

8.2 Appropriate adaptation

Property should only be developed or redeveloped if it responds appropriately to identified hazards. For example, if land is low lying, any structures should be elevated above some minimum floor level to provide reasonable protection from future flooding. However, less incentive for development in private property, in servicing infrastructure and development restrictions may lock communities into the effects of gradual decline; deteriorating living conditions and reducing property values.

Dunedin City must decide how to act, but all the options will be difficult. "There will be ongoing anxiety about rising water levels and decreasing property values as council decides among the difficult options: protect; or retreat; or evacuate" [16]. The option of doing nothing and waiting to see what happens will merely add to the damage, the costs, and the adverse effects on the environment. Property rights will also be compromised. Further slow and persistent decline is likely if there is no proactive redevelopment planning done.

8.3 Community engagement

There is, however, a strong community rallying to its own defence against the onslaught of bad press and uncertainty about the future. Now the combination of the history and the



modern hazards just serves to exacerbate the vulnerability and make the residents feel increasingly set-upon.

Community decision-making requires a well-informed community, prepared to listen to expert reports and available data and then engage in constructive participatory processes. However, even with the best of intentions to engage the whole community, there is a risk of decision-making capture by the few – the less engaged sectors of the community may only get vocal and raise objections when they see adverse effects falling directly on them. From a planning perspective, pronouncements from the authorities about what might be best for South Dunedin (including retreat, relocation, restricting development) have met with significant resentment. The community (at least parts of it) have begun engaging with the issues, establishing community support groups and networks and have started to defend their position.

8.4 Development and design options

Dunedin City Council is currently preparing its latest city plan, which includes proposed responses to hazards including continuing with the protection that is in place at the moment. The hazard zones need to be identified and adaptation rules for new development need to be established: minimum floor levels for all new construction; new structures must be relocatable; and no increased residential intensification. Alongside these rule-based responses, the council is committed to further communication and engagement with the local community to seek further collaborative avenues for responses, including non-protection options and further adaptation plans. Dunedin City continues to engage planning and engineering consultants to scope available options, while still arguing with central government about who ought to fund action.

Students of urban design and planning at the School of Surveying have provided several innovative redevelopment designs, although as these evolved out of a design exercise, they were not always confined by pragmatic economic constraints. Design ideas include excavating canals, raising the level of residential land, creating new positive amenity open space and restoring wetlands, and relocating residents by orderly densification [20]. All these options illustrate how the adverse effects of sea level rise could be mitigated.

9 CONCLUSION

It is increasingly recognised that cities need to build in more resilience and more diverse and appropriate land uses. Intensely developed housing areas provide little escape from hazards, nowhere for flood waters to go, few overland flow paths and single use structures that are susceptible to total loss. Resilience is enhanced with diverse landscapes, mixed uses, housing, commercial, industrial, recreational and ecological and by retreat from vulnerable land.

Development restrictions can be imposed and triggered when consent applications are made to develop land, change land use or seek remedial works. However, these opportunities are reactive, relatively rare and a slow way to promote urban renewal. A proactive planned response is critically important and local authorities need to take the lead in initiating redevelopment projects. Local authorities should be investigating property purchases and establishing demonstration projects to show the viability of new development that avoids the adverse effects of and to the coastal environment. The Dunedin City Council has demonstrated the effectiveness of council led incentives for private development with the successful revitalisation of the historic warehouse precinct. Similar incentives have the potential to promote the proactive redevelopment of the vulnerable South Dunedin residential precinct.



Given the uncertainty of rate and amount of sea level rise, policy options must always be open to adaptive management. Collection of new data and observing the progressive effects of sea level rise need to be ongoing. Hazard zones and development rules may expand or contract, powers and responsibilities of central or local government may change, and other social, cultural, political and economic situations may change. We must act now, but always be reconsidering our responses.

It is not just the science of climate change and sea level rise that needs to be researched, understood and acted upon. Experience and evidence is now growing that public responses to climate change are just as important as the science. Policy and decision-making processes will make little headway without support from communities. Communities' experience and acceptance of adaptation is very dependent on experience of hazard. Exposure to hazard has a big influence on community values and acceptance of change. Sheltering the public from hazards leads them to believe they can always be so sheltered.

People immediately affected by sea level rise and coastal vulnerability tend to look for short-term remedies that focus on protection. Careful engagement with wider communities is necessary to demonstrate that short-term protection decisions often lead to the degradation of the public and natural values in the coastline. Long-term solutions will require cities to give way to nature.

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