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Managed retreat and experimentation: realising opportunity in the Ōtautahi Christchurch residential red zone, Aotearoa New Zealand

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ABSTRACT

Managed retreat is becoming a prominent issue both nationally and internationally. This is due both to the threat of rising sea levels and the growing incidence of extreme weather events, but also reflects the increasing propensity for placing human assets in harm's way. We analyse how this observation plays out in Aotearoa, and offer a simple model, informed by our intergenerational perspective and mātauranga Māori. This model has three features: retreat, relocation, and re-imagining. It enables us to explore the capacity for positive outcomes to further lower long-term environmental and social risks. We apply the model to the Ōtākaro Avon river corridor in Ōtautahi Christchurch, formerly known as the residential red zone, created during the Canterbury earthquake sequence of 2010-13. We discuss what can be learned from the decade-long history of adaptation in the corridor as an exemplar for emerging areas of managed retreat elsewhere. By means of a thought experiment, we explore the potential of the area for provision of affordable, climate-resilient housing.

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Introduction

Managed retreat is a well-known concept internationally but it has only recently come into regular use in Aotearoa New Zealand, notably during media coverage of damaging environmental events in the North Island in 2023. The country does however have one of the largest examples of managed retreat to be found anywhere in the world in the Ōtautahi Christchurch red zones, which were vacated due to land damage in the wake of the Canterbury earthquake sequence of 2010–2013 (Cloke et al. 2023). Red zoning has probably been a more recognised phrase here, and as elsewhere there has been some controversy over the use of 'managed retreat' as a term, although we argue that this reflects loose conceptualisation. Often this is due to treating the issue in a de-situated way as something that might or has recently occurred, without the benefit of sufficient perspective over time. So the purpose of this article is to draw on our lived experience as Ōtautahi

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residents to assess some of the complexities of processes of retreat as they have occurred, as well as the opportunities that might be provided in the face of the growing need for climate adaptation.

In the first part, we explore why managed retreat is becoming a prominent issue both nationally and internationally. This is not only due to the threat of rising sea levels and the growing incidence of extreme weather events, but as with any environmental hazard reflects the increasing propensity for placing human assets in harm's way. We consider how these observations play out in Aotearoa, and offer a model of managed retreat that emphases not only loss but also generative potential. After an outline of our intergenerational positionality and methodology for approaching the topic, we apply the model to the Ōtākaro Avon river corridor, formerly known as the residential red zone. We build the argument with a case study of the opportunities that this area is providing as an exemplar for emerging areas of managed retreat elsewhere. We develop it by means of a thought experiment, an interdisciplinary device used to explore the logical consequences of an idea: in this case, how the provision of affordable, climate-resilient housing might be integrated with processes of retreat.

Managed retreat as process and concept

There are many potential causes of managed retreat, but the most apparent stems from the continued growth of urban populations in risky places worldwide (Reimann et al. 2023). For example, around 800 million people live in 570 coastal cities where – under a high emissions scenario – sea level is projected to rise by at least 0.5 metres by 2050. This renders these locations susceptible to storm surge, erosion and saltwater intrusion (UCCRN 2018). Climate-induced sea level rise is exacerbated in places that are subsiding, due to high levels of groundwater abstraction and sediment compaction (Ohenhen et al. 2024). Subsidence of 2–3 metres has occured in Asian cities such as Bangkok and Jakarta, with even more in parts of Tokyo (Nicholls et al. 2021). Out of 82 major Chinese cities nearly half are measurably subsiding (Ao et al. 2024). But the risk is widespread, including in European countries where there is a long history of adaptation, like Denmark and the Netherlands (Sturman and Quénol 2024) and in American cities where the extent of environmental hazards is well-established, such as along the coastlines of the Gulf and Eastern Seaboard states (Spanger-Siegfried et al. 2014; Hauer et al. 2016).

Where there is high demand for property insurance and the value of assets at risk is high, the rising frequency of severe weather occurrences (in particular) is having a disproportionate impact on the global insurance and re-insurance industries (Swiss Re 2024). In the United States for example, data from the National Oceanic and Atmospheric Administration reveals that billion-dollar disasters are becoming much more common, with extreme weather damage totalling over $165 billion in 2022. This reflects where people live as much as the incidence of such events: 40 percent of Americans now reside in coastal counties, which make up only 10 percent of the landmass. However another third live in the wildland-urban interface, the fastest growing land use type at increasing risk of 'climate-fueled wildfires' (Hill 2023). These figures indicate that processes such as retreat should not be attributed to natural events alone, but rather to social and economic investment in hazardous places, where the risk in many cases is

supercharged by human-induced climate change (Rentschler et al. 2023). It is therefore unhelpful to refer to the occurrence of environmental hazards as 'natural' when human behaviour is so clearly implicated (Pawson 2011).

The most widespread forms of coastal adaptation globally have been visible, hard engineering strategies like sea walls, groynes and raising structures (Moser et al. 2012; Dedekorkut-Howes et al. 2020). Ironically, these can increase the level of risk by encouraging an illusion of safety and further concentration of homes and infrastructure in coastal areas and on flood plains (Ericksen 1986; Haasnoot et al. 2021; Kennedy 2024). Development in risky areas often continues due to a lack of political will to call a halt, or to introduce building codes for more resilient properties (Sierra 2023). But where such codes do exist, for example in parts of Florida, they can have perversely inequitable effects of 'upscaling'. The rebuilding of modest structures becomes impossible due to the inadequacy of insurance payouts to cover the high cost of complying with code. They are therefore replaced with expensive versions by high end developers, thereby adding considerably to potential levels of loss. Despite known and tangible risk, the amenity value of such locations continues to drive increased levels of investment, at the same time as people resist moving to safer places (Stodola 2023).

Retreat is the most controversial and least popular adaptation option, often generating opposition from residents fearing displacement (Torabi and Dedekorkut-Howes 2021). But the combination of the growing value of assets in risky places, as well as the increasing incidence of hazardous events, has brought both 'managed retreat' and 'insurance retreat' to the fore. The latter may be partial, such as increased premiums and excesses (the dollar figure that the holder of an insurance policy must contribute before the insurer pays out), or total, when insurers decline coverage (Storey et al. 2020). Whilst insurance pricing is a useful signal of environmental risk, an equitable response requires government engagement (Shaw 2023). Use of the term 'managed retreat', denoting an intentional policy, rather than ad hoc retreat in response to disaster, is however relatively recent. A comprehensive review a decade ago of coastal flooding risk in the southern and eastern United States, mentioned 'coordinated' retreat only in passing towards the end (Spanger-Siegfried et al. 2014, p. 48). An assessment of coastal areas at risk in Aotearoa by the Parliamentary Commissioner for the Environment, after barely using the term, said that 'little thinking has been done on how to implement a managed retreat strategy' (PCE 2015, p. 80). This reflected community reaction at the time, as illustrated by property owners on erosion-prone coasts in Kapiti, north of Wellington, and in the Christchurch suburbs of New Brighton and North Beach, resisting attempts to have hazard details attached to information about their properties (Peet 2018).

In Aotearoa, as internationally, use of the term managed retreat has however become more prominent in the last decade. It was reviewed from a legal perspective by Harker (2016), and is now appearing far more frequently in media sources. After only a handful of articles before 2022 in the *New Zealand Herald*, Auckland's metropolitan daily newspaper, there were nine that year, rising to over 50 in 2023. This followed the devastation caused by flooding in the city in late January and by Cyclone Gabrielle throughout the North Island a fortnight later. Local insurers, which had been pointing to the dangers of living in risky locations for some years (Jones 2015), have begun to raise the matter of insurance retreat (Ricketts 2023; Stock 2023; Ingoe 2024). The Environmental Defence Society initiated a review programme leading to three reports on aspects of managed

retreat, and the inadequacy of existing measures, in preparation for the then Labour government's climate adaptation legislation.[1] These were published in February (Peart et al. 2023), May (Peart and Tombs 2023) and December (Peart, Tombs and Marshall 2023). For the same reason, the Ministry for the Environment (2023) produced its own issues and options paper on managed retreat and funding in August, as did the government's Expert Working Group on Managed Retreat (2023). These reports reflect the growing need for clear policy responses in the face of disastrous events (OECD 2024).

The common themes in these sources echo the calls of local body politicians in affected places for improved national direction with respect to climate adaptation (Almeida 2023; Daalder 2023; cf. Hanna et al. 2018). These include that existing powers ('an unsatisfactory patchwork') are inadequate to support managed retreat (Ministry for the Environment 2023, p. 48), and that a framework of roles and responsibilities is lacking at central or local levels to guide decisions and processes of managed retreat (cf. Treasury 2023). In this regard, the Expert Working Group set out ten principles including a proactive and precautionary approach based on the best evidence (2023, p. 11; cf. Boston 2017). Māori communities and workplaces will be among those disproportionately affected, and the Expert Working Group recognised the need for an adaptation system to be te Tiriti-based in order to be just. But although the reports mention specific examples of risk or retreat, it is not easy to get a sense of the range of causes (or scales) of the issue, the varied nature of places affected, and the different processes followed in attempts to resolve matters of governance and compensation. For this reason, Hanna et al. (2021) refer to 'managed retreats' in the plural. Table 1 compiles details of prominent examples from the North and South Islands, some recent and some of longer standing, but for all of which some form of managed retreat is now a recognised way forward.

Each of the reports recognises, as does the wider literature, that the term 'managed retreat' is problematic. It is often criticised as a 'top-down' or engineering term, implying compliance or even military intent, whilst omitting from consideration the people and communities most affected. Maldonado et al. (2020) prefer 'community-led relocation', although the Ministry for the Environment (2023, p. 13) uses 'community-led retreat'. The Environmental Defence Society shifted from 'managed retreat' to 'managed relocation' between its first and second reports (Peart and Tombs 2023). Other terms that have been mooted include 'just retreat' (Thaler 2021) and 'transformational retreat', focusing on positive societal or environmental outcomes (Peart et al. 2023). In line with a Tiriti-based approach, the Expert Working Group (2023, p. 83) suggests empowering language in the form of 'te hekenga rauora', where te hekenga refers to an indigenous history of migratory movements, and rauora, or abundance, could denote the opportunity 'to reduce inequity, improve housing stock, restore ecosystems and create resilient communities'. Such wording seems unlikely to gain wide currency, but it does perform the critical task of conceptualizing managed retreat from the perspective of those affected, in an anticipatory time frame and with a greater degree of intentionality than ad hoc responses have often allowed.

All of the reports considered above point out that for Māori communities with deep ancestral ties to the land, the issue of retreat is especially fraught (Newton 2024). But Te Ao Māori also provides some guidance. With a non-linear concept of time, the past and future are seen as important as the present. People carry the past with them into the

Table 1. Examples of managed retreat situations in Aotearoa, 2024.

Auckland
Cause: Floods, 27 January to 1 February; followed by onshore floods, landslides due to Cyclone Gabrielle, 13–14 February 2023
Description: 700 category 3 properties where risk to life cannot be mitigated
Resolution: property buyouts based on 50/50 cost sharing council/Crown; almost $2 billion cost share agreement also covers roads, bridges and flood protection
Sources: media and https://www.aucklandcouncil.govt.nz/recovery-extreme-weather-disasters/property-categorisation-resolution/Pages/category-3-property-buyout-information-auckland-council-government.aspx

Bay of Plenty: Matatā and Maketu
Cause: Matatā debris flow in 2005; Maketu anticipatory planning in face of storm events and sea level rise
Description: 27 homes destroyed, 87 damaged in Matatā
Resolution: messy, prolonged in Matatā; iwi-led, community plan in Maketu including provision for retreat based on tikanga Māori
Sources: media, Hanna C, White I, Glavovic B. (2018); https://maketuclimateplan.iwi.nz/wp-content/uploads/2023/11/Maketu-Climate-Change-Adaptation-Plan-He-Toka-Tu-Moana-Mo-Maketu.pdf

Hawkes Bay
Cause: onshore floods, landslides caused by Cyclone Gabrielle, 13–14 February 2023
Description: 287 category 3 properties
Resolution: property buyouts based on 50/50 cost council/Crown; $556 million cost share agreement also covers roads, bridges and flood protection
Sources: media and https://www.hbrc.govt.nz/assets/Document-Library/Fact-Sheets/Negotiatedfundingoutcomes-factsheet-V03.pdf

Kapiti coast
Cause: an urbanised coast and inlets at risk of coastal flooding long term
Description: anticipatory action to identify hundreds of properties at risk heavily resisted ten years ago; ongoing resistance
Resolution: community and iwi engagement in coastal adaptation plan development
Sources: media and https://www.takutaikapiti.nz

Westport
Cause: recurrent coastal and river flooding, July 2021, February 2022
Description: 2000 evacuees in these events
Resolution: Crown funding for flood wall; council funded infrastructure for 700 homes on higher ground; no funding for individuals
Sources: media and https://bullerdc.govt.nz/your-council/key-projects/resilient-westport-package/

Franz Josef
Cause: extreme flooding risk from Waiho river, confined by stopbanks but 15 metres above land either side
Description: infrastructure at risk, plus farmland to the south and the tourist township of 500 people, with 700 000 annual visitors, to the north
Resolution: recommendation to remove stopbanks on the south side to relieve pressure on those on the north side; funding unresolved
Sources: media and Beagley R, Gardner M. (2023).

South Dunedin
Cause: low-lying suburb subject to rising groundwater levels
Description: houses and streets vulnerable to heavy rainfall and rising sea level
Resolution: anticipatory South Dunedin Future Programme between city and regional councils: 100-year adaptation plan including property buyouts properties to facilitate nature-based solutions
Sources: media and https://www.dunedin.govt.nz/__data/assets/pdf_file/0014/1021505/sdf-context-summary-report.pdf

Christchurch
Cause: seismic movement during the Canterbury earthquake sequence, 2010–2013; ground deformation due to liquefaction and subsidence equivalent to decades of sea level rise
Description: substantial coastal, flood plain and some hill districts red zoned in 2011, 8000 households affected
Resolution: households incentivised to move with Crown buyouts, at cost of over a billion dollars
Sources: Regenerate Christchurch (2019); Cloke P, Conradson D, Pawson E, Perkins HC. (2023)

future, their ancestors ever present in both the spiritual and physical realms (Rameka 2016). This is reflected in the kinship relationships of whakapapa and the use of pūrākau built up by ancestors as an intergenerational knowledge base. This understanding of time differs from Western linear concepts which lack the intergenerational

grounding of mātauranga Māori. As the climate and environment alters, the past can provide opportunities and guidance for the future through mātauranga and in kinship relationships (Bailey-Winiata 2021). This intergenerational thinking is reflected in the priority given to the participatory interests of future generations who will directly experience the challenges and potential of a changing climate.

Taking these perspectives into account, we consider it more helpful to reconceptualise 'managed retreat' in the form of a flexible model, rather than to embrace alternative wordings when the term itself is in wide international, and media, circulation. Moore (2020) argues that 'true managed retreat efforts should include three common features'. These are what he calls 'unbuilding', 're-establishing' people in safe places, and 'the re-use of newly acquired public lands for projects that further lower risks'. These features, which should be regarded as components of a process, rather than as stages, can be labelled as first, 'retreat'; second, 'relocation'; and third, 're-imagining'. In this formulation, 'retreat' is unavoidable where mitigation measures cannot protect against the hazard, although as with 'relocation', it depends whether this is the product of community engagement or is experienced as being by fiat. The third feature, corresponding to rauora, comes from envisaging the sort of opportunities that can arise once framed within a longer-term outlook. Just as hazardous situations are accentuated by environmental and social processes, such opportunities are both environmental and social (Joseph 2013; Siders and Mach 2021; White et al. 2023). This model therefore identifies the potential for positive outcomes, shifting the negative connotations of retreat towards intergenerational hope.

The case of south Dunedin (Table 1) illustrates one potential pathway incorporating the three features of the model. Following flooding of this suburb in 2015, a plan of 'speedy retreat that bulldozed over rights of people most affected' (Williams 2024) was proposed but rejected. It has been replaced by a longer-term process named South Dunedin Future (2024) that anticipates council purchase – with some government assistance – of about 60 homes (1 percent of the area's housing stock) per year, through gradual voluntary sale. This is designed to forestall collapse of the local property market, enabling purchase of the most flood-prone properties as well as poor quality housing at lower risk where denser, modern alternatives can be developed. Wetter areas will be made available for water mitigation measures, such as wetlands and retention ponds.

Plans such as this depend on a clear articulation of how costs are to be shared between central and local government, as argued by the Treasury (2023) and the Expert Working Group (2023). They agree that a reliance on central state funding alone is not sustainable, although this was the method necessarily adopted, in the face of earthquake disaster, in the creation of the red zones in Ōtautahi Christchurch. As Table 1 shows, these red zones are an order of magnitude larger than other areas of actual or potential managed retreat in Aotearoa. We now draw on the Ōtautahi experience since 2011 to illustrate how the features of the model of retreat have played out here, focusing on the potential for 're-imagining' new futures in the face of climate change. This was an opportunity that was not readily apparent at the time given the urgency of red zoning.

Positionality and methodology

Our interest in analysing the red zone landscapes of post-earthquake Ōtautahi is grounded in our academic, practical and community-based experiences. We have

sought to clarify our perspectives on the future of these places through means of the model outlined above, and as the generative possibilities for future use have become clearer over time. Our home town has now had a decade's worth of experience with both 'retreat' and 'relocation', but has struggled with the third element of the model, 're-imagining'. This is despite being a city that in the wake of the earthquakes became renowned – in its downtown area in particular – for prefigurative, experimental urbanism (Cretney 2019; Cloke et al. 2023). But the potential for equivalent action in the red zones was for long hindered by a lack of the anticipatory governance necessary to deliver forward-thinking initiatives. Our work is therefore motivated by a desire to explore this third feature of our model of managed retreat, exploring potential and realisable futures at the intersection of what the land allows and what its people see as meaningful and attainable.

The land was badly damaged during the earthquake sequence, subject to deformation and subsidence particularly in central and low-lying eastern districts of the city. This mirrored the impact of rapid sea level rise under climate change (Regenerate Christchurch 2019, p. 38). Climate change has long been recognised as an intergenerational issue. It was identified as such by article 3 of the United Nations Framework Convention in 1992, although there is 'no legally binding instrument at international level that commits States to the protection of future generations' (Mary Robinson Foundation 2013, p. 1). There is also a lack of intergenerational collaboration in research and writing on the subject, although the global Climate Overshoot Commission's first report (2023) was written with input from a youth engagement group (Levitan 2023). Academic articles describing such engagement are however few in number.[2] In one, Whitehouse and George (2017) promote 'intergenerativity', meaning forms of co-production leveraging the benefits of different intergenerational perspectives for a common end. Kennedy and Gislason (2022, p. 2) argue that inclusion must meet 'the needs of the youth involved', and should respect 'the place-based experiences of individuals'.

We aim to enter this methodological gap, drawing on our own situated experiences. We have been engaged with initiatives seeking a place in a re-imagined Ōtākaro Avon river corridor (OARC), the largest of the red zones (Figure 1). These include the Ōtākaro Living Laboratory (designed to act as a focus for research and experimentation in the area) and the Waitākiri Eco-sanctuary (promoting a fenced, predator-proof area for iconic wildlife).[3] During and after the earthquakes, Eric was co-leading university courses that provided students with opportunities to contribute to recovery through community-based research in the city and in the river corridor (Pawson et al. 2022). He was also involved in the process of OARC regeneration planning, including community and reference group assessments of future options. In 2010, at the start of the earthquake sequence, Thomas was at primary school and his home in Brooklands, a coastal suburb, was red zoned. 'Living through the earthquakes and in a red zone, I witnessed first-hand the devastating impacts that going without basic needs, like a warm dry home, had on Christchurch's youth. This included their mental health and future opportunities' (Blakie 2023). He is now focused on means of equitable urban development, advocating for young people, and being of Ngāi Tahu whakapapa, engages the perspectives of mana whenua. He has led youth audits in Ōtautahi and as a UNICEF Aotearoa Young Ambassador participated in COP28 in Dubai in 2023.

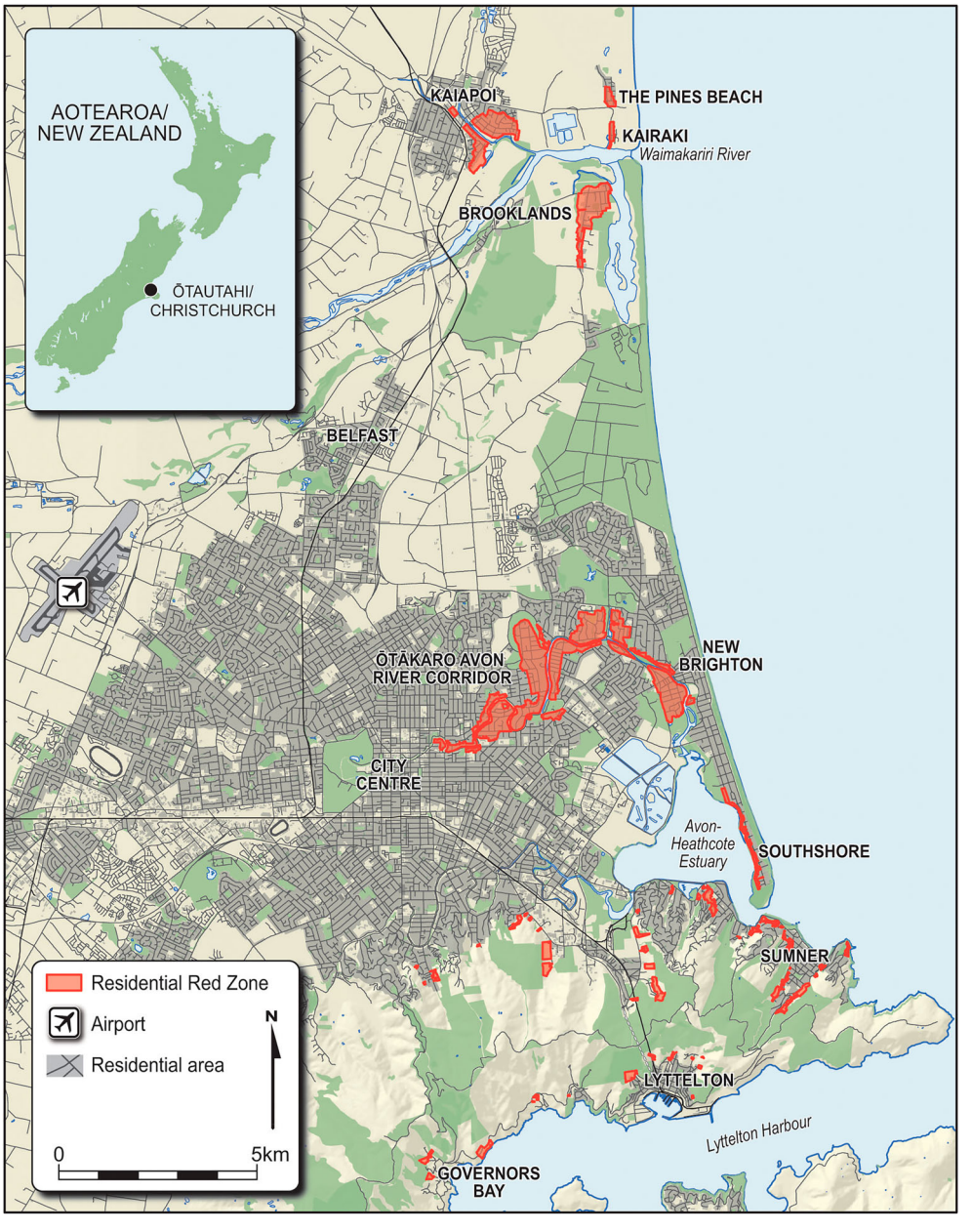

Figure 1. Ōtautahi Christchurch red zones.

We use these experiences and a range of other sources to uncover alternative visions and possibilities for the Ōtautahi red zones. Available documentation includes the Ōtākaro Avon River Corridor Regeneration Plan (Regenerate Christchurch 2019), the development plan derived from this and now incorporated in the city's District Plan, as well as media archives. We conducted a series of interviews with relevant parties, including a former mayor who leads a open discussion group about city issues (Moore 2023); a former Minister of Climate Change (Shaw 2023); a property analyst well

informed about the city's housing markets (Blackburn 2023); a property developer who proposed an affordable housing exemplar in part of the river corridor (Henderson 2023); the chair of the board of a New Zealand bank knowledgeable about finance and insurance issues in hazardous areas (Irvine 2023); a Māori academic concerned with the long history of the red zones (Reid 2023); a civil engineer who led the team responsible for the production of the regeneration plan (Kerr 2023), and two of his former colleagues who were central to the engagement and design phases of that process (Mene 2023; Nicholson 2023).

The regeneration planning for the river corridor, which was undertaken with intensive community consultation, does envisage a range of imaginative futures. Amongst these, it makes provision, but without elaboration and as yet unrealised, for some experimental housing suited to changing climate conditions. Taking affordable, resilient housing as a key intergenerational issue, we have sought to explore some realistic parameters for this by means of a thought experiment. One definition of a thought experiment is 'a mental exercise in which [an] idea is put to the test without actually conducting an experiment', the purpose being to 'explore the logical consequences of … the idea' (APA 2018). To do this, we draw in particular on the interviews and on elements of housing experiments for social need underway elsewhere in Aoteroa that might be adapted to suit conditions in the river corridor. A realistic thought experiment however depends on knowledge of context, to which we now turn.

The Ōtākaro Avon river corridor

The impact of the Canterbury earthquake sequence was profound in and around Ōtautahi Christchurch (Cloke et al. 2023), as the city sits on thousands of metres of saturated gravels that make up the Rokohouia delta of the Waimakariri river. The delta had provided an abundant food source for mana whenua Ngāi Tūāhuriri in its network of streams, wetlands and lagoons (Reid et al. 2024), but during urbanisation it was drained and developed. Earthquake damage from liquefaction to underground infrastructure and building foundations was severe in the city centre (which has since been substantially rebuilt) and in eastern suburbs nearer the delta edge. Subsidence over much of these areas was of half a metre or more in the Ōtākaro Avon river corridor (Orchard 2017; McDowall and Denee 2019, pp. 32–33). This was the equivalent of several decades of sea level rise in one or two hits, as regular flooding of former streets of Bexley shows (Figure 2). Damage from the 22 February earthquake in 2011 was so severe that, after initial hopes of engineering solutions, the corridor was red zoned along with other badly affected areas (Figure 1), and a Crown offer arranged to buy people out of their properties. These actions constituted the first two of the features of the model of managed retreat discussed above.

The process set in train was not however referred to as managed retreat, and the term does not appear in the subsequent regeneration plan for the corridor (Regenerate Christchurch 2019). Red zoning was one outcome of a city-wide geotechnical assessment undertaken by the Canterbury Earthquake Recovery Authority (CERA) after its establishment as a limited term, special purpose government agency in 2011. All residential properties were allocated to one of three zones based on levels of liquefaction risk; the red zones were a fourth category where seismic damage was too great to maintain

Figure 2. 'From red zone to green zone': incipient wetland after heavy rainfall in red zoned Bexley, October 2021. Photograph: Eric Pawson.

residential functions (Pawson 2022). The buy-out offer was at the previous government valuation (a regular process undertaken for property taxing purposes), which reflected the height of the real estate market in 2008, before the global financial crisis. This was considered by the National-led government at the time to be sufficiently generous to enable people to relocate expeditiously, although without any guarantee of being able to replace like-with-like (Cloke et al. 2023). The buyouts were not 'voluntary', despite being described as such by the Ministry for the Environment (2023, p. 20), nor were they compulsory: the process could be described as one of 'bluster, threat and persuasion' (Nicholson 2023). There were over 8000 households in all the red zones, a scale exceeding any other area of, or in prospect of, retreat in Aotearoa (Table 1). In the river corridor alone there were over 5500. Only about a hundred declined to move and few of them remain a decade later.

As house sections were cleared by CERA between 2012 and 2015, they were grassed over. But trees and larger shrubs remained as a visible palimpsest of former suburban lives (Bowring 2021) (Figure 3). When the agency was disestablished at the expiry of its term in 2016, there had been no decisions about what to do with the vacated land. So there was no framework within which to consider 're-imagining' as the third feature of the model of managed retreat, despite long-held community interest in a range of new initiatives (Cloke et al. 2023). However the Greater Christchurch Regeneration Act of 2016 brought into being several new agencies. These included Regenerate

Figure 3. Abandoned red zoned street in Avonside, October 2018. Photograph: Eric Pawson.

Christchurch, one of whose roles was to create a regeneration plan for the river corridor, which now stood full of memories but empty of functions. The manager of the new agency's red zone team soon found that useful precedents for re-imagining such areas were lacking: the work done in the United States after Hurricane Sandy (Ovink and Boeijenga 2018) 'for instance was not "real" in that it was based on design charettes but not founded in anything deliverable. But we needed to produce something that could be made real' (Kerr 2023).

The process developed was experimental and unlike CERA's regime, community-based, being 'step-by-step and iterative'. Over a two-year time frame, it linked the creation of 'a vision, objectives, broad options for land use, to more refined, spatially specific options for land use to go into a plan' (Kerr 2023). It was shaped by many points of public or stakeholder engagement along the way, including with iwi, school students and recent migrants, in addition to former residents and lobby groups, for example for ecological restoration and for an outsized rowing lake. Thousands of people came to an exhibition in the city centre of the high-level ideas that informed the final plan. Throughout the process, feedback was coordinated using an integrated assessment method (Mene 2023). There is a strong experimental ethos to the plan. One of its objectives is to 'establish a world-leading living laboratory, where we learn, experiment and research; testing and creating new ideas and ways of living' (Regenerate Christchurch 2019, p. 24). This encapsulates the potential for re-imagining as a component of managed retreat.

When the plan was officially approved (Regenerate Christchurch 2019), eight years had already passed since the initiation of red zoning, with no visible progress on the ground. In retrospect, the delay was the inevitable outcome of a failure of anticipatory governance. No authority for implementation was ceded to the regeneration agency by its shareholders (the government, or Crown, and city council), nor did it own the land. Not until the 'Global Settlement Agreement' concluding the Crown's involvement in the post-earthquake rebuild of the city was reached in 2019, was Crown ownership of red zone residential land transferred to the council, which already held the streets, river banks and reserves. The shareholding arrangement had avoided the long-running tensions that the Crown's rebuild of the city centre had earlier caused with the city council (Cloke et al. 2023), but also meant 'that with the production of the plan in 2019, all momentum was lost. And you shape a plan to the way it will be implemented: but we were effectively throwing the plan into a void' (Kerr 2023). There was no clear pathway forward, finance or governance arrangements.

This failure was all the greater as the plan was the product of the very processes of local generation and engagement that characterise the community-engaged ethos for managed retreat subsequently championed in the reports of the Expert Working Group (2023), Ministry for the Environment (2023) and Environmental Defence Society (Peart et al. 2023). But the plan does outline a framework that could help shape both the river corridor and the wider city under conditions of climate change, as sketched by Gundermann (2014, pp. 48–51). It depicts half of the 600 hectares in the corridor given over to a 'green spine' of wetland and forest restoration (Figure 4), a nature-based solution for hazard and

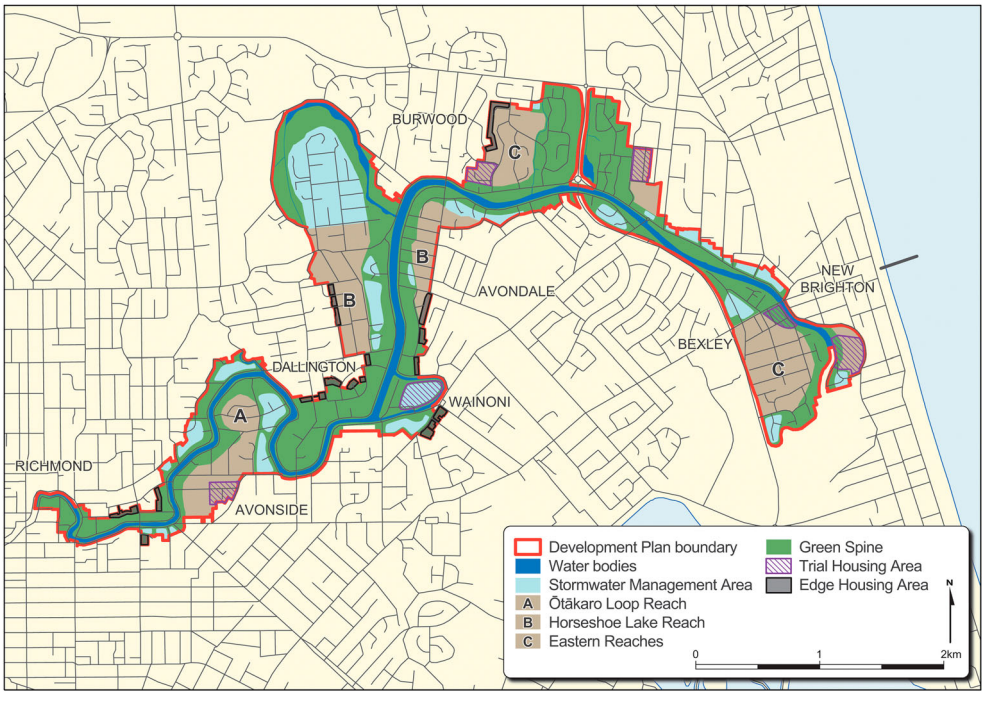

Figure 4. Ōtākaro Avon River Corridor development plan, showing edge and trial housing areas. Source: Christchurch City Council.

stormwater management, biodiversity enhancement and recreation, potentially yielding catchment-wide benefits (Nicholson 2023). Three extensive 'reaches' are positioned around this spine where a series of community – based and commercial recreational and social activities can be developed. These spatial allocations reflect clear environmental, social and cultural objectives (Regenerate Christchurch 2019, p. 24). The generative language of the plan is apparent: the term 'opportunities' appears 52 times, 'vision' 36 times and 'innovation' eight times.

The process of implementation since 2019 has been messy, although increasingly deliberative. The University of Canterbury assumed the role of 'honest broker' in sponsoring a workshop on governance options in May 2019, organised by the lead author. About 50 representatives of city organisations and community groups participated. Key speakers included the city's mayor and the upoko of Ngāi Tūāhuriri, the largest sub-tribe of Ngāi Tahu whose exercise of mana whenua, or customary and cultural authority, includes the city and river corridor. One outcome was a casebook of governance experiences, to inform what has and has not worked in specific situations elsewhere in Aotearoa. Insights identified include that co-governance with mana whenua (defined as a partnership in governance between Crown and/or councils and Māori) 'is a proven and essential model in the post-Treaty settlement era' (Pawson et al. 2019, pp. 3–4). A follow-up workshop was held in December 2021, after advice to the mayor from the previous National-led government's Minister of Treaty Negotiations, who had championed co-governance agreements in the management of environmental resources around the country (Finlayson and Christmas 2021).

An attempt to incorporate co-governance as one of the objectives of the regeneration plan had earlier been rejected by the shareholders (Kerr 2023; Nicholson 2023). The Minister, in approving the plan noted that it had 'not incorporated some of the comments provided by Ngāi Tahu, particularly where these relate to future land ownership and governance', a move with which she concurred as lying outside the plan's scope (Woods 2019, p. 3). But following the second workshop, the city council moved quickly to set up a co-governance establishment committee, with equal numbers of representatives nominated by Ngāi Tūāhuriri and by the city council. By the end of 2023, this committee had promulgated a set of principles for assessment of community and commercial projects proposed in the river corridor (CCC 2023) and was working towards recommendations for a long-term governance structure. The principles broadly reflect the objectives of the regeneration plan, and with governance established there will finally be the means to bring to life the re-imagining of the river corridor, consistent with the plan and our model of managed retreat.

Housing experimentation

This section provides a short case study to illustrate one aspect of that re-imagining. The regeneration plan identified many ways to achieve this, including ecological restoration, flood and stormwater management and carbon sequestration. It also allowed for more experimental uses, including trial housing. Public opinion – as gauged through the engagement process – provided 'a sound evidential basis' for this on a limited scale (Kerr 2023). The housing allowed for is of two types, in spatially discrete areas. These are mapped in the development plan for the corridor (Figure 4). The first is for 'edge housing', confined to a

small number of places where existing housing faces away from, rather than into, the red zone. Here the intention is to build a row of houses with an accessway in front, thereby providing a porous connection and 'eyes on the street' between the red zone and surrounding suburbs. Given the location, these houses would require strong foundations and likely have to be connected to be affordable (Kerr 2023).

The second type is labelled as 'trial housing', for which the plan identifies six small blocks, one of which is also targeted as a stormwater management area. All are close to the edges of the red zone, outside the green spine, to allow for ready connection to existing services and infrastructure. The total area identified amounts to about four percent of the corridor, which recognises capacity limits of existing infrastructure such as sewerage (Blackburn 2023) as well as sensitivities of building houses in an area from which many former residents felt no choice but to move. Despite the cost to the Crown of acquiring red zone sections, they were transferred in the Global Settlement Agreement to city council ownership without charge. This minimises the price of entry: without land costs, experimentation is more affordable. And the small scale of the six blocks is appropriate for exemplar projects, which could take a variety of forms across the sites. The plan left open such questions as design, tenure and climate resilience.

In order to explore this opportunity further, we engaged in a thought experiment, an intentional, structured process of deliberation, to discern some possibilities for experimental housing formats (Blackburn 2016). It is increasingly recognised that twenty-first century cities will require housing that is better suited to climate extremes, built to withstand hazards, while mitigating climate change with efficient energy systems (Vince 2023). Housing is a key intergenerational issue in New Zealand, having become increasingly unaffordable (Barrett 2023), whilst much stock remains of poor quality (Howden-Chapman et al. 2021). Experience with experimental housing initiatives to remedy these issues, both overseas and elsewhere in Aotearoa, can inform options for the river corridor. Essential elements of such experimentation include appropriate design parameters, ownership structures, and attainable project delivery. These elements begin to shape a framework within which housing experimentation can be considered as part of a process of rendering more real the plan's rather vague enthusiasm for 'opportunities', 'vision', 'innovation' and 'possibilities'.

A thought experiment has been described as basically a device 'of the imagination' (Brown and Fehige 2023, p. 1). A practical way to anchor this would be for the responsible authority, in this case the co-governance entity, to instruct city council staff to invite expressions of interest (EoI) from a range of housing providers. In order to receive proposals that are alert to both the environmental context of the river corridor as well as the elements identified, some criteria, including design rules, will be necessary. An earlier example is those provided by the Crown to Fletcher Construction, the lead developer in the east frame as part of the Central City Recovery Plan (Cloke et al. 2023). These rules should be shaped to encourage EoI from or in conjunction with different types of provider, such as housing trusts, iwi, hapū, public housing agencies, tiny house associations, co-housing groups as well as commercial house builders. To do this, a well-designed brief is the critical step, shaped so that consortia of developers, designers and associated professionals can respond as teams. Financing of each exemplar would depend on whether the risk is insurable: banks will lend if that is the case (Irvine 2023). This places a premium on structures that are suited to the ground conditions

and climate resilient (they might be elevated, light, moveable or floating for example). Designs must also be affordable: the Whakaaturanga Kāinga demonstration exemplar for post-earthquake housing in the rebuild of the city centre twice failed as the architectural designs were too expensive to build or sell (Cloke et al. 2023).

Design will also be critical for social and environmental purposes: to create exemplars that are community-focused, with well thought-out public spaces (Henderson 2023), as well as contributing to, rather than detracting from, the ecological restoration of the corridor. New housing subdivisions in Aotearoa typically lack biodiversity (Freeman 2023): so in addition to housing that is climate resilient, affordable, and well designed, there is opportunity to showcase urban biodiversity potential through linking ecological and housing design. Showcasing, however, depends on wide public and professional awareness of the opportunity to build, inhabit and learn from exemplars. This suggests that any design competition should have a high profile, as illustrated for example by Singapore's Designing Resilience in Asia programme and annual Archifuture design challenge.[4] Design professionals are well used to such formats (the New Zealand Institute of Architects (2023) publishes competition guidelines), but one that is to capture the wider imagination would also involve youth and the wider public in specific capacities. This could be in gathering ideas to inform consortia proposals, or in responding to submitted proposals. This already happens with the programme of youth audits organised by Youth Voice Canterbury, who have worked for example with Kāinga Ora, the state housing provider, on some of its developments.

The foreword to the regeneration plan describes the river corridor as 'a place for trying new things, learning and sharing our knowledge with the rest of New Zealand and exporting our innovations internationally' (Regenerate Christchurch 2019, p. 6). It can also be a place that learns from innovative practices elsewhere, and good ideas that have already worked in Ōtautahi's post-earthquake rebuild. Share-an-Idea, the city council-run event in 2011 to gather suggestions for rebuilding the city centre, remains vivid in the memory of many citizens, simply because it was imaginative and inclusive (Nicholson 2023). There are many housing ideas under trial elsewhere in Aotearoa that could inform requisite design criteria for trial housing, and that use a variety of models of ownership and delivery. Examples include iwi-led papakainga and nohoanga schemes, housing trusts and not-for-profit developers, Fletcher Living's low carbon homes pilot, Kāinga Ora's housing system delivery project, and Simplicity's build-to-rent long term housing programme, in which the landlord is a Kiwisaver fund promoting long term tenancies of benefit to both parties.[5] This is an example of the sort of arrangement that would help to lock in long-term affordability in the trial housing areas, as are housing trusts that retain ownership of the land (Moore 2023).

Conclusion

The potential for housing experimentation in the Ōtākaro Avon river corridor to meet needs such as affordability, climate resilience, good design and biodiversity enhancement, illustrates that there are benefits to be realised from managed retreat once it is re-imagined for the longer term. Managed retreat is an issue of growing concern internationally and within Aotearoa, not only due to sea level rise, but also issues such as onshore flooding, liquefaction and seismic movement. Our article has sought to identify

some of the insights that have and could yet accrue from more than a decade's worth of experience with what may be one of the biggest areas of urban 'managed retreat' globally. Whilst acknowledging that the term itself is controversial, we have proposed a model which recognises that following retreat and relocation, of people and infrastructure, there are also opportunities for re-imagining the futures of such relinquished areas in ways that contribute to the social good and further lowering levels of ongoing risk. This model reflects experience in Ōtautahi, and is also consistent with emerging thinking, such as the Expert Working Party's (2023) proposal for te hekenga rauora.

The Ōtāutahi experience is nonetheless place specific. The emptying out of the city's red zones was a product of government intervention in the wake of devastating seismic events; this is unlikely to happen on this scale elsewhere when management of retreat can be more gradual. The state will also not always pay: 'a clear articulation of how costs will be shared across central and local governments' is required (Treasury 2023, p. 27). All the same, there are insights to be gained from Ōtautahi. The first is that the process takes time. It was five years after red zoning that a process of public engagement and planning began for regeneration of the Ōtākaro Avon river corridor, another three before the plan was approved. It will have been four or five years more before conditions are in place to make decisions about implementation. In part this has been the product of the politics of regeneration planning, which occurred within a void with respect to governance and financing. Choices about the future of other red zones like Brooklands are still to be made. Anticipatory forms of governance are not only weakly represented in Aotearoa (Boston 2017): internationally the Climate Overshoot Commission (2023) has identified an urgent need for the problem and possibilities of managed retreat to be framed within clearer understandings of the process and who is to be responsible for decision-making and oversight.

Second, it follows that these matters require identification of stakeholders and their intergenerational interests. In the engagement process in the Ōtākaro Avon river corridor, there was a concerted attempt to involve young people. The regeneration agency was also required by the 2016 Act to take account of the interests of mana whenua, whose perspective of 'walking backwards into the future' (Rameka 2016) suggests that attempting to maintain extensive infrastructure and fragile residential buildings at the edge of an unstable river delta was never wise. The co-governance agreement between Ngāi Tūāhuriri and the city council recognises this perspective with the assessment framework for projects stating that 'the Ōtākaro Avon River Corridor is a natural, dynamic river delta, which was traditionally used as a space for gathering and practicing mahinga kai … these underpinning aspects help us to understand the landscape, and give guidance for the future' (CCC 2023, p. 1). And it acknowledges, in line with many other co-governance initiatives around Aotearoa (Finlayson and Christmas 2021), that the re-imagining of the corridor is an intergenerational project, one likely to take fifty to a hundred years of investment.

Third, the process of managed retreat takes many forms, even within one country. Where it is possible to take a more gradual approach, then methods that engage local communities are likely to prove preferable to the centrally-led processes decreed *in extremis* in Ōtautahi, and echoed after the Auckland floods of 2023. Hybrid models such as that proposed in south Dunedin, led by the city council, rely on long lead-in times. More urgency may be leveraged through community-based methods, such as that led

by iwi in Maketu (Table 1). Overseas there are many cases of citizen-led climate assemblies; a recent example in Aotearoa focused on Auckland's water supply (Public Service Commission 2023). These may be a good way of defusing opposition to the need to retreat or relocate, but still require the means of finance and governance for long-term effect. Where retreat occurs quickly, due to the impact of extreme events such as cyclones and floods, then some form of centralised initiative and disaster funding support will be required, the more so in the face of growing reluctance by insurers to carry too much risk.

As the causes of retreat and relocation become more insistent, it will be necessary to have governance structures, policies and protocols in place to ensure that it is adequately 'managed' (Siders et al. 2019; Peart, Tombs and Marshall 2023). Management has to take care of the interests of property owners, but should also be shaped towards the long-term social and environmental good. The Secretary-General of the United Nations has warned of a coming exodus of people from coastal areas on a 'biblical scale' (Carrington 2023). The need for clear frameworks to handle this intergenerational issue is both stark and imminent. It will affect many people now alive but as in the Ōtākaro Avon river corridor could also provide the opportunity for hopeful experimentation and imaginative thinking that contributes to climate resilience and intergenerational welfare. This aspect of retreat has been widely overlooked, but our work has sought to outline ways in which this might be remedied.

Notes

1. The legislation was delayed by Labour's focus on revising resource management laws. A cross party Parliamentary enquiry has been established to advance it (Manch 2024).
2. It does not as yet feature in the *International Journal of Students as Partners* (set up in 2017), whilst the established *Journal of Intergenerational Relationships* barely mentions climate change, the short manifesto from Whitehouse and George (2017) being an exception.
3. www.otakarolivinglab.org.nz; www.ecosanctuary.nz
4. Details can be accessed at: https://designingresilience.com/post/dria-2022-competition-brief/ and: https://asd.sutd.edu.sg/archifuture/
5. See www.fletcherliving.co.nz/blog/lowco/; https://kaingaora.govt.nz/urban-development-and-public-housing/industry-hub/housing-delivery-system-project/; https://simplicity.kiwi/learn/updates/simplicity-living

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