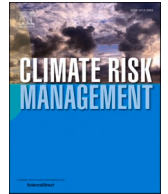




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Managed retreats by whom and how? Identifying and delineating governance modalities

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ABSTRACT

Managed retreat has become a compelling policy imperative as climate change exacerbates socio-natural hazard risks and imminent harm looms for exposed communities. Retreats may be initiated over different times and scales using various instruments by actors, from the state to the private sector and civil society. However, in the absence of a coherent strategic vision, guiding frameworks, and capacity to manage retreats, at-risk communities, their elected representatives, policy makers, and planners are compelled to embark on retreat governance experiments. Consequently, retreat is perceived as a 'high regrets' policy imperative with potentially adverse impacts for community wellbeing, as well as political and professional risks. To help translate managed retreat rhetoric into reality, this paper presents a governance framework that acknowledges the multiplicity of 'managed retreats.' Using examples from Aotearoa-New Zealand, we identify and delineate retreat modalities and clarify terminology, converging our framework with the international mobility literature to harness the valuable lessons from decades of human mobility practice.

1. Introduction

Humans have settled in dangerous locations, like steep slopes or along dynamic shorelines, creating the need to respond to socio-natural shocks and stresses whilst sustaining social, economic and environmental wellbeing. For many, the future will be characterised by more disruption and uncertainty, not just from the effects of extreme events, some of which may be compounded by climate change, but due to their cascading interactions with changes in, among other things, the environment, society and technology, community wellbeing, critical infrastructure, and investment patterns (Lawrence et al., 2020a). Protection and accommodation measures can mitigate some risk, but managed retreat may be necessary when residual risk is intolerable, risk reduction measures are not viable, or the adverse effects of intervention or inaction are unacceptable or irreversible. Determining what 'intolerable' and 'unacceptable' means in local contexts is central to this governance challenge.

To 'manage' means to direct, control, or administer, and, in this context, to 'retreat' is to withdraw people, assets and activities from dangerous locations. Retreat is often associated with defeat in a military sense, but it can also be interpreted as a process of regrouping, in order to heal and shift to a more liveable and safe locality (Koslov, 2016; Siders, 2019). In theory, managed retreat may be the most effective and sustainable strategy to reduce exposure to place-based harm, with added potential for long-term environmental and socio-economic co-benefits. In practice, however, enabling governance arrangements are emergent and there is often significant

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private and public reluctance to relocate. Retreat can be a vexing reality for people due to social fragmentation (De Vries and Fraser, 2012), strong place attachments (Agyeman et al., 2009; 2016), psychological impacts of uncertainty, loss and distress (Hanna, White, & Glavovic, 2020), compounding marginalisation or deprivation (Tubridy, Lennon, & Scott, 2020), and erosion of cultural, spiritual and historic identity and livelihoods (Bronen, 2015; Siders, 2019). Retreat requires difficult sacrifices depending on the context, and property owners, residents and land users will have different needs and experience different losses, requiring fit-for-purpose responses (Marchman et al., 2020).

While often discussed in the singular, managed retreat can take place in many different ways and encompasses a toolbox of instruments (Marchman et al., 2020; Neal et al., 2005; Siders et al., 2019). These range from the advisory provision of risk maps that inform individual choices to more state-oriented policy, regulation or displacement, and financial incentives (Hanna et al., 2019; Scott and Lennon, 2020). The delivery of managed retreat is similarly multifaceted, likely involving community engagement, social and cultural impact assessments, land use, infrastructure and asset management planning (for retreating and receiving locations), risk assessments, options' analysis, funding and investments, asset removal and recycling, land rehabilitation, monitoring and legal protections, and political alignment, among other matters. In this complex milieu, particularly given the paucity of tailored institutional frameworks and capacity, the application of managed retreat is often ad hoc, uneven, and plagued by controversy and uncertainties (Bronen, 2015; Buser, 2020; Hanna et al., 2020; Mortreux et al., 2018; Siders et al., 2019). While sporadic action has occurred (Doberstein et al., 2020; Hino et al., 2017; Pinter et al., 2019; Siders, 2019; Sipe and Vella, 2014), it takes significant effort to overcome the socio-economic, cultural and political risks that combine to create an 'uncertainty contagion' that inhibits action (Hanna et al., 2020). In this context, it is not surprising that managed retreat is difficult to achieve.

To reflect its multi-faceted nature, we argue that managed retreat should more accurately be addressed in the plural, as 'managed retreats'. Marchman et al. (2020) also recognise that framing 'retreat' in the singular may fail to recognise the nuance of specific contexts and approaches. Pluralising the term helps connote that this is a governance problem; there are many dimensions of retreats, each of which may have value in different circumstances. Fundamentally, managed retreats require a series of difficult decisions regarding who seeks to or should be relocated, why, when, how, where to, and at whose cost? Delivering managed retreats that are sensitive to the dislocation of people from their homes, livelihoods, communities, and associated place-based ties, is particularly challenging. In this context, research examining the governance of managed retreats provides a foundation for carefully considering the various types of 'managed retreats' and how they align to diverse institutional realities, as well as social and cultural mores, and political and economic imperatives.

The aim of this paper is to develop a fit-for-purpose governance framework that can inform both national and local strategies, and encompass both collective and individual responses to escalating exposure to socio-natural hazards in a changing climate. We begin our analysis by drawing on governance literature to develop a framework that allows us to distinguish between different modes of retreat governance. We therefore add to, and extend, debates aiming to link theory and practice, such as concerning a managed retreat 'conceptual model' (Hino et al., 2017), 'buyout program typology' (Greer and Brokopp Binder, 2017) and 'reconceptualization of retreat' (Siders et al., 2019). By applying a governance lens, we more specifically examine the question of 'managed retreats by *whom and how?*' by characterising multiple retreats and their corresponding actors, power distribution, and instruments, to strategically utilise the framework in practice. We apply this framework in the Aotearoa-New Zealand context, examining three forms of 'retreats' placed across a spectrum of governance, from state intervention to societal autonomy, in order to highlight how they reveal different problems and require fit-for-purpose tools and approaches.

Although governance arrangements vary within and between countries, there are common issues faced, such as ascertaining the most appropriate and effective role of the state, the remit and function of agencies, objectives and methods for dealing with public engagement and uncertainty, and the vital role of political leadership (Abel et al., 2011; Buser, 2020; Doberstein et al., 2020; Frohlich et al., 2019; Gibbs, 2016; Harman et al., 2015; Hayward, 2008; Hino et al., 2017; Siders et al., 2019; Siders, 2019). In practice, there is a managed retreat governance lacuna that is compounded by concern about government interference in private property rights, and calls for self-determination and individual autonomy. Whilst highlighting these governance gaps, we also recognise that advancements have already been made following decades of international mobility practice and research that has unfolded in parallel with national planning and coastal management regimes. To integrate these relevant fields, we converge our framework with the mobility literature, to demonstrate a way forward for nations to govern retreats in ways that protect basic human rights whilst strategically avoiding, reducing, and responding to risks.

2. Methodology

To develop a governance framework for managed retreats, we, firstly, reviewed scholarly literature to present an overview of the challenges, mechanisms, and practices of managed retreats. Searches for peer-reviewed literature were undertaken in January 2018 (updated in January 2020) on the Web of Science Core Collection database using key words, "managed retreat" and "managed realignment". The results were ordered by relevance and the top 200 results were reviewed. Snowball searches (pursuing citations in the tabulated literature) were also undertaken and included to supplement the review.

Secondly, we conducted a review of governance theory and frameworks. Key terms, "governance theory" and "governance conceptual frameworks" were searched in July 2018 on the Web of Science Core Collection, confined to the 2000–2018 period. The results were ordered by relevance and the top 100 results were reviewed (due to the significant number of results; >300,000). This step identified a range of governance modes, predominant actors, powers, and instruments. To overcome the limitation of searching only the top 100 results over an 18-year period, snowball searches were also undertaken and included to supplement the review. Driessen and others' (2012) conceptual framework and Hysing's (2009) governance continuum provided the main foundation for

distinguishing three governance modes with corresponding actors and instruments (Kooiman and Jentoft, 2009; Kooiman, 2003).

Thirdly, once the governance framework was developed, we examined potential retreat strategies using real world examples from Aotearoa-New Zealand (Hanna, 2019). We used document analysis and semi-structured interviews with nine planners experienced in scoping or undertaking managed retreats, to better understand the governance and political challenges. This final stage allowed us to distinguish the characteristics of different governance modes, actors and instruments, and how they might be used, in order to highlight fit-for-purpose, strategic managed retreats. We now turn to the development of the framework in more depth.

3. Towards a governance framework for managed retreats

As a process, Kooiman (1993, p. 2) determines governance to be “those activities of social, political and administrative actors that can be seen as purposeful efforts to guide, steer, control or manage (sectors or facets of) societies.” Therefore, remedies for many of the challenges affecting the operationalisation of managed retreats depend on how governance is framed and practiced by actors in government, civil society and the private sector. In simple terms, governance approaches encompass various modes that can be situated on a notional spectrum from state intervention to societal autonomy (Driessen et al., 2012; Hysing, 2009; Kooiman and Jentoft, 2009; Kooiman, 2003; Treib, 2005).

Governance scholarship recognises that the state is not the only authoritative actor for dealing with public concerns like ‘socio-natural hazard’ risk (being the combination of aspects such as natural hazards, human vulnerability and choices). For example, we also see instances of self-governance by private actors who adjust behaviour after consulting risk maps, or co-governance involving networks of actors from civil society, the private sector, and government. We acknowledge that each modality is an ‘ideal type’ which, while conceptually informative, seldom prevails in the real world, with more hybridised modes of governance commonplace. In reality, there is a wide range of evolving interactions that have different configurations of the state, the private sector, and civil society, which draw on distinct, and sometimes overlapping, sources of authority and deploy different instruments to effect outcomes (Driessen et al., 2012; Lemos and Agrawal, 2006). Depicting this ‘spectrum’ of governance modes, and their distinctive combination of actors, powers and instruments, does, however, facilitate critical reflection and the articulation of strategically planned, managed retreats.

The framework in Fig. 1 maps three different types of retreats onto the governance continuum, from more state control to more social autonomy. It is a useful device to highlight how the types of retreat are associated with different actors, instruments and power in order to shed light on who might enable different options, with what tools and approaches, and who wields the power to implement retreat decisions. Note that some instruments can be useful for multiple modes. For example, regulations can be used for building controls administered by the state and they can also be used to contain market irregularities.

Hierarchical governance (often delivered in a de-centralised system of government) is on the far-left of the spectrum, comprising the authority of central and local governments, mandated by society to promulgate and enforce legislation, standards, policies and regulations, etc., to drive state-led managed retreats. In principle, this modality of governance enables managed retreats by the state exercising legitimate power and authority in the public interest.

Network governance (sometimes referred to as co-governance) (Kooiman et al., 2008) involves power sharing between the state, the private sector and civil society, with parties collaboratively managing retreats through negotiated agreements or strategies, and

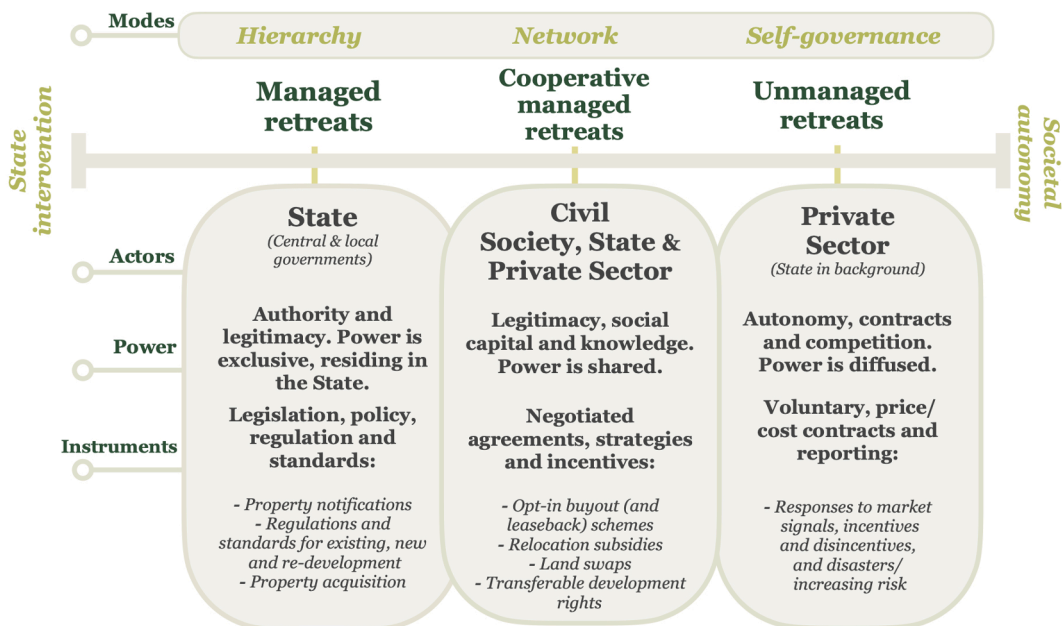


Fig. 1. Retreat governance framework.

sharing knowledge and resources.

At the far right of the spectrum is *self-governance*, where retreats take place through autonomous actions, often enabled through the logic of markets via price/cost incentives or risk transfer contracts. Individual autonomy is high, power is diffused, and opportunities for self-organisation are maximised.

In addition to the more formal, procedural power we have identified, we recognise that there may be difference in conceptualisations of the state, and in different places there may be subtleties of power which are less obvious. For example, state-led spatial imaginaries, such as climate adaptation plans, exert legitimate control over space (Wolford, 2004), yet may have significant private sector involvement. As such, state-corporate power may drive development-induced displacement, masked as adaptation (Paprocki, 2019). Alternatively, political groups such as The Property Council, may lobby for state protective structures and the continued performance of housing as an asset class. These less obvious power dynamics highlight the need for clear processes and they raise valid concerns regarding the distributive justice of less transparent retreat practices, such as who is discriminated against and who is facilitated by spatial imaginaries of adaptation (Ajibade, 2019; Paprocki, 2019). All forms of retreat must involve critical examination of the impacts on a range of interests, to avoid reinforcing existing inequalities and power structures in society (Ajibade, 2019). In the following sections, we examine the risks of each governance modality, including potential injustices resulting from retreats.

This framework captures and distinguishes between the plural managed retreats of practice, and links these to distinct governance modes, actors, instruments, power, and means of delivery. While we have discussed these modes in isolation of one another, we recognise that they constitute ideal types and should be considered as presenting a portfolio of possibilities and combinations to craft fit-for-purpose strategies. The next section explores the application of this framework in the Aotearoa-New Zealand context.

4. Applying the framework in the Aotearoa-New Zealand context

Aotearoa-New Zealand settlements and their associated natural, cultural, economic and physical resources are often exposed to severe impacts due to socio-natural hazards and escalating risk in the face of climate change (Bell et al., 2015; Ministry for the Environment, 2020b; Wright, 2015). Evidence is emerging that climate change effects will intensify where they compound and cascade across physical and human systems (Lawrence et al., 2020a). For example, the combination of rising sea level and groundwater levels with increased pluvial flooding will challenge gravity-based stormwater systems in Aotearoa-New Zealand (Lawrence et al., 2020a; White et al., 2017). Despite the risks, as in many other countries, there is little strategic direction concerning managed retreats and there are divergent views about how they should be implemented. For example, there is little clarity about who is responsible, or who should bear the associated costs and liabilities. Retreat projects have unfolded in an ad hoc, experimental manner, essentially comprising what are fragmented government interventions, locally-specific policy and planning provisions, divergent community responses, and reactive market (including insurance) influences. Pre-emptive managed retreats are rare to date, but there is a clear need for strategic and adaptive planning to prepare for both proactive and reactive management of sudden, compound, and slow-onset effects (Bronen et al., 2020; Lawrence et al., 2020b; Siders et al., 2019).

To explore the application of our framework in the Aotearoa-New Zealand setting, we begin at one end of the governance spectrum with state-led managed retreats, followed by discussion of cooperative managed retreats, and finally, self-governed or unmanaged retreats. Each section reveals and examines the mode-specific interactions between actors, powers and instruments, and associated challenges and opportunities.

4.1. State-led managed retreats:

Managed retreats under hierarchical government authority typically involve clear planning provisions to determine the extent and nature of retreats and new development, and to establish rules or controls over existing and planned activities, either before or after impacts occur. Central government typically enacts enabling legislation, and prepares policies and technical guidance, which are applied by local government, following public consultation. Towards this end of the governance spectrum, central and local (including regional) government lead, with civil society and the private sector adhering to formal risk management rules, regulations, policies and procedures (Driessen et al., 2012). State-led managed retreats are most likely to be implemented under conditions of especially high risk, where there are compelling 'public good' considerations, and to enable proactive regulation of future developments in localities prone to severe socio-natural hazard risk.

Aotearoa-New Zealand example:

Following significant earthquake events in 2010–11, a state-led managed retreat led to the establishment of the Canterbury Red Zones and subsequent relocation of approximately 20,000 people within Aotearoa-New Zealand (Hoang and Noy, 2020). The Government spent \$1.9 billion on 'voluntary' property purchases of insured properties, recovering some costs from the insurance payments on the purchased land and buildings (Noy, 2020).

Whilst powers of compulsory acquisition were not applied directly, it is "unrealistic to describe the transactions that occurred as voluntary" as the Red Zone inhabitants had "no realistic alternative but to leave, given the damage to infrastructure and the clear message from the government that new infrastructure would not be installed and that existing infrastructure may not be maintained and that compulsory powers of acquisition could be used" (*Quake Outcasts v Minister for Canterbury Earthquake Recovery* [2015] NZSC 27 [140]). The coercive nature of the Red Zones was effective at physically removing people from an area deemed to be at very high risk, but there were polarised perceptions about the approach, procedures, and outcomes (Canterbury Earthquake

Recovery Authority, 2016; New Zealand Human Rights Commission, 2016). The majority of respondents in the Canterbury Earthquake Recovery Authority (CERA) survey (2,038 former residential red zone property owners who accepted the Crown offer) generally agreed with the Crown's approach in response to such a significant event. However, key programme improvements were emphasised, including fairer settlement prices, quicker timeframes for red zoning decisions and more clarity about the *choice* to stay in situ, with less pressure on people to accept the Crown 'offer' (CERA, 2016). The need for greater transparency, honesty, community consultation, fairness and consistency were also noted, *inter alia*. The New Zealand Human Rights Commission (2016, p. 97) emphasised that many who remained (or were financially trapped) in situ were "deeply affected by the red zoning" with widespread "disillusionment and dissatisfaction with the process." 'Red Zone Stayers' who did not retreat due to financial constraints, place attachment, risk tolerance and other factors faced difficulty due to lack of certainty in how this would unfold (Ibid). Important lessons from the Canterbury Red Zones highlight the value of meaningful, equitable engagement and legitimate decision-making, the wellbeing implications of reactive retreat, and greater acknowledgement that "life risk is something individually assessed rather than imposed" (Ibid, p. 156). The Red Zones constitute a hierarchical response to a significant disaster in which rebuilding carried seemingly unjustifiable risk.

With regard to pre-emptive retreats, local government actors in Aotearoa-New Zealand are largely responsible for implementation. However, much like international experience, due to the absence of a strategic national framework, local authorities are individually grappling with each managed retreat situation, and who to involve and how best to do so. Research by Hanna (2019, pp. 161, 249) and Hanna et al. (2020) revealed that retreat projects and policy experiments thus far have revealed a series of problems, including limited regulatory powers, inadequate national policy direction and resourcing, and misaligned government functions resulting in significant political, administrative and professional risks to key state actors. The 'muddling through' (Marchman et al., 2020, p. 138) that is occurring via policy learning and experimentation extends uncertainty and 'routine waiting' for affected people and communities (Hanna et al., 2020). To compound matters, a top-down approach can invoke community resistance, disempowerment, and litigation (Jones, 2020). Without a clear central government mandate and policy direction, supported by regulatory instruments and powers, local government actors, subject to short-term election cycles, are understandably reluctant to make such difficult decisions.

4.1.1. Governance framework

To effectively manage retreats at the local level, the need for strong national direction to manage the tensions between existing land use rights and sustainable resource management is clear (Grace et al., 2019; Hanna, 2019). Governance uncertainties regarding statutory powers and their interpretation results in the courts having to fill the vacuum, underscoring the need for roles and responsibilities for managed retreats to be clarified in legislation (Harvey et al., 2012). This extends to the use of science, tools, and processes. Having each unit of local government "using different assessment and implementation approaches is inefficient and creates duplication of effort" (CCATWG, 2017, p. 55), as well as scope for challenge. National direction, and new legislation (Resource Management Review Panel, 2020) is required to institutionalise national policy and standards, avoid conflicting guidelines and plans, and ensure effectiveness in implementation and administration, including clarity about 'who pays'. Ideally, a national framework for state-led managed retreats would improve controls to: review and retreat existing assets and activities; avoid inappropriate subdivision and development (including limiting certain resource consent periods and regulating intensification, hard protection works and rebuilding); provide direction for assessing and managing vulnerable assets and activities to improve community equity and environmental outcomes; to guide service provision and withdrawal; apportion costs and roles and responsibilities; safeguard retreated sites from inappropriate use and development; and provide direction for resolving local planning disputes and litigation.

To achieve managed retreats of existing assets and activities, there are two key hierarchical instruments governments can apply: property acquisition; or regulation that extinguishes rights to use/occupy land and requires retreat at a certain point in time. Compulsory acquisition and regulations can be applied immediately (with potential for leaseback schemes) or can be designated to activate prior to ownership/land use change.

A governance approach also highlights how implementation powers and resources are essential to give effect to regulatory frameworks. For managed retreats to be effective, national policy and guidance needs to be enabled by clear delineation of roles, responsibilities (power) and resources too. "Without some form of national cost sharing, the principles of need and ability to pay will almost certainly be violated. Equally, it will be hard for poorer communities to find the resources necessary to fund proactive measures to mitigate future risks" (Boston and Lawrence, 2018, p. 46). Boston and Lawrence (2018) recommend that central government establish a national Climate Change Adaptation Fund with a statutory mandate to fully, partially, or co-fund adaptation-related costs such as managed retreats to enhance capacity for anticipatory governance. This would help link the instruments to the power to implement them. The funding model would require careful consideration of the cost allocation principles to be employed (see Rulleau et al., 2017; Boston and Lawrence, 2018). Answering 'which specific costs should be funded and to what extent?' requires further analysis and public debate before the state-led system can be legitimately established.

In summary, state-led managed retreats are guided by directive national government frameworks that provide policy and regulations for when, where and how they will occur, and deliver the instruments, powers and resourcing to achieve them. In many contexts, the responsibility to manage retreats will be devolved to local governments who will need to develop integrated risk management strategies in consultation with local stakeholders. A risk management hierarchy may be applied to prioritise local action, or local consultation may even create opportunities for communities to request managed retreat. In response to disasters that cripple local government's capacity, national governments may be required to intervene instead. Government actors thus hold authorising power to manage retreats, funded by a combination of local differential and targeted taxes/rates and national taxes, possibly

supplemented by community/private contributions.

4.1.2. Modality risks

Directive frameworks, regulation and state-led property acquisition have a number of benefits, but careful consideration of political, social and cultural impacts is needed, as well as injustice and inequity, particularly in poorer areas where managed retreats may be less challenging due to lower property values and political marginalisation of affected communities (Anguelovski et al., 2016; Lopez and Clark, 2013). There are also ethical and legal concerns about the compulsory acquisition of settlement land (land re-claimed as cultural redress for historic breaches of Te Tiriti O Waitangi and The Treaty of Waitangi). For instance, the principle of ‘active protection’ may mean that there is a greater duty to *protect* remaining Māori land, assets and other ‘taonga’ (highly prized objects or resources—see Moorfield (2011)) (Iorns Magallanes, 2019). Fundamentally, to uphold Treaty principles, tangata whenua (local Māori) must be an equal partner in decision-making for managed retreats of ancestral Māori land (Ibid). The nature of state-led managed retreats consequently raises serious concerns about the ability of government alone to deliver just, equitable and socially acceptable outcomes for affected people and communities. We recognise however, that the role of information provision and regulation to avoid increasing or creating new risks is necessary for any retreat strategy.

4.2. Network-based cooperative managed retreats

The governance challenge goes beyond removing institutional ‘barriers’ to deliver action. State-led managed retreats raise vexing social contract questions and encounter strong community and individual resistance due to low levels of trust in authorities and opposition to compulsory land acquisition and stringent regulation. Importantly, resistance to ‘being forced’ to retreat is at times simply because of understandable reluctance to sever deep connections to place and community. Government alone is limited in its capacity to address such matters in a manner that is perceived to be fair and acceptable. Affected parties typically want to have a say in whether or not and how managed retreats should take place. Thus, *cooperative managed retreats* are positioned between state intervention and self-governance on the spectrum in Fig. 1, representing more collective decision-making, where power is shared amongst government, civil society and private sector actors, and outcomes are negotiated. A cooperative approach may deliver individual and/or collective retreats via instruments such as incentives, buyouts or relocation subsidies, land swaps, or community relocation schemes. Distinct from top-down hierarchical decision-making, cooperative retreats involve individual and collective decisions about whether or not, how, when and to where, retreat should occur, with risk tolerability and the retreat strategy determined by affected people and communities with supportive governing authorities.

Aotearoa-New Zealand example

A pioneering example in Aotearoa-New Zealand is the Clifton to Tangoio Coastal Hazards Strategy 2120 to manage coastal hazard and climate change risks that was developed by the local authorities, local stakeholders and representatives of mana whenua (iwi (tribes) with territorial rights) and tangata whenua in Hawke’s Bay (Hawke’s Bay Regional Council et al., 2016; Kench et al., 2018). The strategy employed a range of instruments for technical analysis and community engagement to secure stakeholder agreement in formulating the 100-year strategy. The strategy adopted elements of the ‘Dynamic Adaptive Policy Pathways’ (DAPP) framework (Haasnoot et al., 2013). Moving away from traditional static planning, DAPP can help partners prepare for an uncertain future by providing a decision strategy and sequence, triggered by ‘adaptation tipping points’ with different types of actions defined over the short, medium, and long-term (Haasnoot et al., 2013). The DAPP logic, and a modified Real Options Analysis (ROA), were integrated with Multi-criteria Decision Analysis to construct a tailor-made analytical platform (Lawrence et al., 2019). The strategy formulation process was overseen by a Joint Committee involving governing authorities and local Māori, the establishment of two community panels with members representing key stakeholders who participated actively in the strategy process, as well as providing opportunities for citizen engagement (Corbett and Bendall, 2019). Unlike standard consultation processes, community members and stakeholders designed the options for councillors to consider, producing a “more robust outcome that has been developed by, rather than for, communities” (Ibid, p. 147). The strategy is a good example of networked governance to integrate managed retreats within a wider risk management approach that acknowledges when significant risk thresholds are reached in exposed localities. Managed retreats are long-term (50–100 year) actions for a number of pathways (Bendall, 2018) demonstrating anticipatory governance over the long-term. However, given the currently limited funding and governance capacity in Aotearoa New Zealand, it has not yet been determined how they will be delivered. This is not necessarily a failure of the governance approach, but of the immature institutional framework and funding deficit for managed retreats. The collaborative, long-term perspective gives parties ‘room’ to adapt over time as circumstances change, thus taking into account inevitable uncertainty and the complexities associated with sea-level rise. This approach mobilises a wider array of institutional capabilities, resources, powers, and implementation measures than state-led retreats.

4.2.1. Governance framework

The network-based approach enables the co-production of managed retreat governance, whereby a diverse range of actors collaboratively set why, when, and where specific actions will occur. Being non-statutory, strategies provide flexibility and collaborative opportunities that are less easily achieved under hierarchical government. However, their flexible nature may be in tension with a planning and legal context that is accustomed to linear decision making frameworks and established ‘rights’ that promise certainty (Frohlich et al., 2018; Lawrence et al., 2019). Network governance depends on ongoing support and political leadership to

institutionalise and action agreements over time. As such, to give effect to strategy recommendations, including retreat pathways, ‘commitment devices’ need to be institutionalised (Boston, 2016). Commitment to implement a cooperative strategy could be achieved via a more hybrid governance framework, but drawing upon wider instruments than outlined under hierarchical government. This would result in co-produced governance but with a tendency for state-led delivery. However, there is potential to foster cooperation throughout the framework, from decision-making to delivery. Buyout programmes, relocation subsidies, land swaps and transferable development rights are examples of network instruments to enable cooperative managed retreats. These instruments require cooperative negotiations whereby risk tolerability is determined by property owners, based on their perceptions of their own vulnerability and insurance options. We use the term ‘cooperative’ instead of ‘voluntary’ as the presence of risk and incentives to leave or disincentives to stay inevitably influence individuals’ decisions, and therefore do not allow for absolute freedom of choice. However, people and communities are embedded in the strategy design, decision-making and delivery, ultimately consenting to stay or to retreat, (Bronen, 2017; Farbotko et al., 2020) unless displaced by disaster.

A networked governance approach, such as the Hawke’s Bay model, could enable affected people, stakeholders and local authorities to strategically plan for cooperative managed retreats within long-term adaptation and risk management plans, and use multiple methods to enable land use transitions over time. A further area of focus could involve designing instruments that enable both individual and collective relocations. Yarina et al. (2019) note that particularly for indigenous and close-knit communities, individualistic strategies fail to meet their needs and, in some cases, may imperil the survival of tribes and sever cultural ties.

For countries like Aotearoa-New Zealand, such an approach would require central government leadership and funding tailored to the level of financial assistance, and the apportionment of costs as deemed appropriate. A significant challenge with this governance modality is funding responsibility and provision. The Hawke’s Bay strategy alone had significant additional funding, technical, cultural, and academic support to identify pathways, and worked towards solving complex issues in a collaborative manner, but ongoing support remains a concern (2020a). Enabling cooperative managed retreats through buyouts may not be economically viable in all circumstances (Siders, 2019; Young, 2018). Another instrument is a relocation subsidy incentive to reduce the financial burden and allow costs to be spread between private and public actors. Alternatively, a land swap, such as in Grantham, Australia, (Sipe and Vella, 2014) or transferable development rights (TDR), may be appropriate, depending on the local context and institutional arrangements. Ideally, any cooperative programme will have a nationally consistent framework of cost allocation principles, clarity of cost-sharing responsibilities, and funding support available at the local level.

4.2.2. Modality risks

Cooperative managed retreats protect the right to self-determination, requiring mutual agreement between governing bodies and those at risk. Inevitably, there are trade-offs, such as accepting and managing residual risk with respect to people who remain and the associated activities and service providers of their sites. A core driver of network-based managed retreats is recognition that no one governance actor can single-handedly implement retreats in ways that are universally judged to be fair and just: a cooperative approach is likely to be more feasible and equitable (Hino et al., 2017). However, under this mode, sensitivity to the inequalities of social power is vital to avoid domination by people or groups with greater resources, networks, persuasion powers and experience than others (Few et al., 2007).

For coastal adaptation, it might be expected that retreats will occur chiefly in rural, low-income areas, particularly as they may struggle for resources to invest in hard defences (Hinkel et al., 2018; Lincke and Hinkel, 2018; Oppenheimer et al., 2019). Mach et al. (2019) found that at the county level in the US, buyouts are more likely to occur in localities with high local government capacity (using wealth and density as proxies). However, at the sub-county level, they are more likely to occur in neighbourhoods with greater socio-economic vulnerability. If poor and rural coastal areas are most susceptible to retreating as indicated, Mach and others’ (2019) findings suggest that to be socially just, these communities need dedicated support under cooperative programmes. Fundamental governance questions include: who are cooperative managed retreats developed for; who will benefit; and where do the political, social, cultural, economic and environmental costs (and responsibilities) lie (Yarina et al., 2019)?

In situations where risk is not yet high but is increasing, or if it is unclear due to the uncertainty of environmental change, it is more difficult to determine when or if relocation is appropriate, which presents challenges for decision making. In the Hawke’s Bay, modified ROA was applied to inform the development of adaptation pathways (and by implication, retreat pathways). ROA is an expanded version of cost-benefit analysis that assesses whether there is value in waiting for more certainty before an expensive and potentially irreversible pathway is implemented, and whether or not an alternative might suffice (Infometrics, 2017). A key area of sensitivity in this type of modelling is the base discount rate. As revealed in the Hawke’s Bay ROA: “the more weight one attaches to the economic welfare of future generations, the more the optimal path tends towards managed retreat sooner rather than later” (Infometrics, 2017, p. 11).

While each analysis and location will be different, debate about the social and ethical implications of discount rates is required to avoid a ‘presentist bias’ (White and Haughton, 2017) and to clarify how future generations are valued in decisions. Fundamental to such questions is the influence of cultural values on the judgements made to determine discount rates. Kilvington and Saunders (2015, p. 22) recognised that there will also be cultural differentiation, finding that in a risk tolerability workshop, some iwi were less inclined to discount future risk than in the predominantly Pākehā (New Zealand European) workshops, as iwi regarded risk to children or grandchildren as equally or more significant than risk encountered in their own lifetime.

For determining ‘when’ to retreat, the nature of cooperative strategies could be supported by what Bronen et al (2015; 2020) calls ‘community-based integrated social-ecological assessments’. These depend on a community’s capacity to assess and document environmental changes and sociological vulnerabilities in collaboration with technical experts. Particularly for climate change risks, co-production can be integrated into conventional risk management, whereby those directly affected actively engage in risk

assessment, capturing the unique nature of a community's vulnerability (May and Plummer, 2011). Therefore, affected people and communities can share power by considering and collaboratively setting the social and ecological indicators to assess vulnerability by, and collaboratively determine the triggers for change, with future generations in mind (Bronen, 2015).

4.3. Self-governance and unmanaged retreats

Self-governance affords the greatest level of societal autonomy on the governance spectrum, where individual actions, and self-determination, facilitate unmanaged retreats from risk (or at the broader scale, migration). Self-governance is shaped primarily by individual risk perceptions and market signals, and is driven mainly by citizens and the private sector such as the insurance or real estate sectors. Pure self-governance does not exist in practice, as people are invariably subject to a range of formal and informal institutional constraints. In reality, state law, regulation, provision of risk maps by governing authorities, or even new data on sea-level rise projections, shape market signals and decisions by both public and private actors (Callon, 2007; White, 2019).

This archetypal governance mode affords far-reaching autonomy based chiefly on market exchange, risk transfer, individual risk perceptions and appetites, and self-organising actions. A constraint in the use of this mode alone can be its inability to deal with complexity due to the individualistic focus and the tendency to ignore intended and unintended consequences for others (Kooiman, 2003). Left to individual choice and market incentives, unmanaged retreats would unfold as risk and damages increase, as property values (and local tax revenues) decrease, and people relocate in an ad hoc self-organising manner—assuming they are willing and able to disinvest or even abandon their assets. This modality devolves power to individuals to manage their own risk, but can undermine social capital, and increase exposure to harm, social injustice and inequity (Bosomworth and Blanchi, 2020; Tubridy et al., 2020)

Aotearoa-New Zealand example

Unmanaged retreats are difficult to trace, as they operate in the 'shadows' of formal interventions. There are few documented examples in Aotearoa-New Zealand where people have retreated in this manner, and data is therefore scarce. In some instances, unmanaged retreats have resulted in illegal seawalls and eventual abandonment of property and structures (for example, Ohiwa Spit, Pourewa Point, Te Kopi and Mokau (Turbott and Stewart, 2006)). These actions (and inaction) have occurred at the latest possible point in time for people to evacuate, but too late to avoid social and environmental harm. Where risks are projected to increase over the long-term (up to 100 years), unmanaged retreats are likely to manifest in the same way. For example, in September 2012, notifications of 50 and 100 year erosion risks were placed on 1,800 affected Kapiti Coast properties. Due to significant public backlash and litigation these were removed in October 2014. In the two year notification period, according to Filippova et al. (2020, p. 220), decisions to sell were unrelated to the property notifications and "overall, given the known hazard risks, buyers are still willing to pay the same premium for these coastal properties."

4.3.1. Self-governance instruments and modality risks

Unmanaged retreats are the sum of individual decisions to relocate based on individually relevant triggers. As such, experiences of hazards and provision of accurate risk information are important enablers. Planning notifications or risk maps are a good example of how the state can provide information to influence private decisions and market signals, but there is no guarantee that these will affect behaviour, whether by insurers or individuals. Incentives are another opportunity for government to influence unmanaged retreats, such as a proposal in Bangladesh, which is designed to draw future growth away from low-lying coasts with provision of infrastructure, educational and employment opportunities in less risky inland cities (Siders et al., 2019). However, this scenario raises concern about resilience gentrification whereby vulnerable people and communities who are less mobile or unable to obtain security are trapped as a result of outstanding mortgage liabilities, and are potentially at greater risk of compounding financial vulnerability when investment or insurance retreat occurs (Keenan et al., 2018; Storey et al., 2017; Tubridy et al., 2020). Tubridy et al. (2020) demonstrate that there is already evidence of climate gentrification via unmanaged retreats in the US due to sea level rise in Miami, intense heat in Arizona, and wildfires in California. Where retreat is unplanned and unmanaged, the impacts on receiving (and left behind) communities, infrastructure and services are potentially severe and may leave deep injustices and inequities.

Self-governance does have a role to play in risk reduction, but if it is not part of a deliberate, strategic approach it can conflict with 'good' governance principles as it is unlikely to enable equitable or proactive community retreat (Bennett and Satterfield, 2018; Graham et al., 2003; Lockwood et al., 2010). For example, attempts to persevere with unsustainable settlements can result in over-abstraction of groundwater in drought prone areas (Aerts et al., 2018) and coastal squeeze (Tubridy et al., 2020, p. 131). Equally, loss of access to beach and coastal areas due to autonomous private protection measures is unlikely to be environmentally, economically or socially desirable, legal, or equitable (Kousky, 2014). With unmanaged retreats, property owners seldom bear all of the costs of their decisions to live in risky locations (Kousky, 2014). If retreats are only delivered by the sum of local or individual actions, they will likely be inequitable and perpetuate land use legacies that deepen or create vulnerability (Waters and Barnett, 2018, p. 710). More fundamentally, the same risk signals will be acted on differently. For example, research suggests that individuals who do not believe in climate change will not price that risk into their real estate decisions (Baldauf et al., 2019).

In summary, unmanaged retreats enable individuals to make autonomous decisions based on their level of risk tolerance to protect their own interests. While they have a place as a mode of retreat governance, without sufficient strategic oversight, they may produce inequitable outcomes within and between communities, and current and future generations. This also transfers costs to future governments, and potential future homeowners. In this regard, evidence is emerging that climate change litigation due to failures to implement adaptation measures may put pressure on administrations to act, making 'do nothing' choices politically risky (Hodder,

2019; United Nations Environment Programme, 2017). In reality, without the requisite capacity building necessary for managed retreats, unmanaged retreats may be one of the few options available, especially when resources are limited, political will to action retreat is low, or an underdeveloped governance framework is in place. Unmanaged retreats may also not reflect so much an ‘absence’ of policy, rather they point to the difficulty facing the state in seeking to intervene fairly in existing development and property rights given the unevenness of private economic and political power.

5. Convergence between retreat governance and mobility experience

Managed retreats ‘by whom, when, to where, why, how, and at whose cost?’ are key questions to inform the development of strategic planning. Answers to these questions lie within the socio-cultural values informing who is empowered to influence where and how people live and adapt. Historic trends of population redistribution, disaster-forced migration, displacement and resettlement and development-forced displacement and resettlement offer rich lessons for contemporary managed retreats. However, practices endure in intellectual silos, with limited integration (McAdam, 2015; Siders, 2019; Wilmsen and Webber, 2015). For instance, there is a great deal of literature on human mobility, and with this, multiple definitions pertinent to managed retreats (Adger et al., 2018; Ferris, 2015; Weerasinghe et al., 2014). To bring together the disciplines of planning for managed retreats and the diverse applications of resettlement, displacement and migration, Fig. 2 converges our framework with this parallel literature and practice to demonstrate the modality correlations and lessons learned that can inform retreat governance arrangements.

An underlying principle is that under hierarchy, governments essentially “render people and space more governable” (Rogers and Wilmsen, 2019, p. 258), whether directly or by providing clear governance frameworks. While people and communities may be consulted, governments can enforce managed retreats to de-risk legacy land use patterns (and in some cases, achieve ulterior motives (Ibid)). As illustrated in Fig. 2, state-led managed retreats are similar to involuntary development and resettlement practices which determine why, where, when, and how people move. While they may not always determine where people move to (and therefore, depending on the support mechanisms in place, could be considered involuntary internal displacement), there remains a level of influence on mobility due to planning controls affecting land availability and services.

Moving across the spectrum, we see how experience and knowledge transfer can advance retreat theory and practice by learning from the devastations of forced resettlement and displacement. Ideally, ‘planned relocations’ deliver networked, strategic partnerships which enable relocation and resettlement of affected people and communities on their terms (Barnett and McMichael, 2018; Weerasinghe et al., 2014). Thus, ‘planned relocation’ aligns with our notion of ‘cooperative managed retreats’ but there remain gaps in converging and developing these literatures, somewhat due to the limited evidence on planned relocation made necessary by the slow-onset impacts of climate change (Ibid). Finally, at the far right of the spectrum, are ad hoc, self-governed movements most commonly referred to as displacement and migration. Like planned relocation, these movements can occur from local to international scales.

While insufficient attention has been paid to who governs managed retreats and how, the mobility literature is well-developed and offers valuable governance insights and lessons. Decades of research has identified the perils of relocating people and communities, such as impoverishment (Cernea, 1997; The World Bank, 2004) tenure, livelihood, financial and food insecurities, loss of cultural

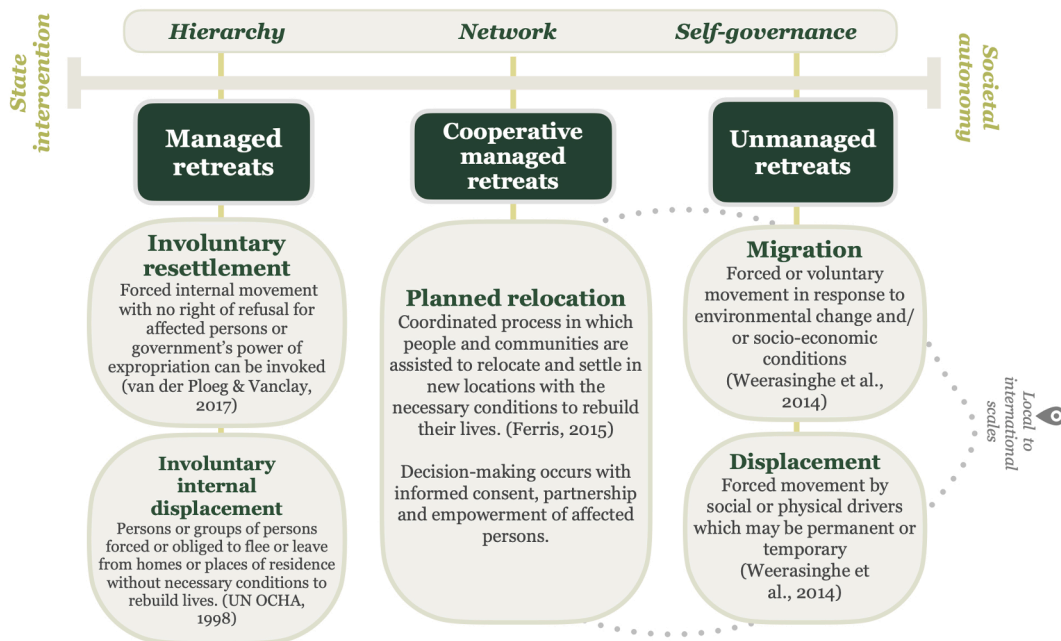


Fig. 2. Retreat and mobility governance.

identity, adverse health impacts, community disarticulation (Cernea, 1997; Farbotko et al., 2020), political marginalisation (Wilmsen and Webber, 2015), and social fragmentation (Bronen, 2017). Forced displacements have been disastrous for many communities due to insufficient compensation, ill-preparation of host communities, significant health, cultural and social costs, and the lack of consideration of the influences of politics and power which undermine equitable decision making (Wilmsen and Webber, 2015, p. 83). The ad hoc, non-strategic, and sometimes coercive approaches to managed retreats in Aotearoa-New Zealand and abroad risk generating the same harms.

The trials and tribulations of involuntary resettlement and displacement are critical to informing the design of frameworks for retreats. Both retreat and broader human mobility literatures emphasise that effective governance frameworks are vital to ensuring that human mobility is not maladaptive (Adger et al., 2018; Bronen, 2017; Lawrence et al., 2020b; McAdam and Ferris, 2015). In determining how frameworks should be designed, there is now widespread recognition that planned relocations should be undertaken on the basis of non-discrimination, free and informed consent, empowerment, participation and partnership with those directly affected (Bronen, 2017; McAdam, 2014; Norwegian Refugee Council, 2011; Weerasinghe et al., 2014). As recognised by McAdam (2014), ‘consultation’ does not equate to consent and ‘participation’ requires engagement which may include control over decision-making. The ‘Nansen Initiative’ (Norwegian Refugee Council, 2011), Bronen (2017) and Weerasinghe et al. (2014) all assert that human rights’ protections must form the basis of mobility governance. Bronen (2017, p. 140) further argues that the right to self-determination is “the cornerstone of the human rights principles that need to guide community relocations.” Under the *International Covenant on Economic, Social and Cultural Rights* and the *International Covenant on Civil and Political Rights*, ‘all peoples’, have the right to self-determination and the United Nation’s (UN) *Declaration on the Rights of Indigenous Peoples* affords Indigenous Peoples collective rights to self-determine (Ibid). Rights to self-determine require that people and communities have the authority to decide whether to move or not, when, where and how (Ibid). There may be circumstances where due to overriding public interest, state-led managed retreats are justified (van der Ploeg and Vanclay, 2017). However, as declared in the *Guiding Principles on Internal Displacement*, states should avoid the “displacement of indigenous peoples, minorities, peasants, pastoralists, and other groups with a special dependency on and attachment to their lands” (UN. Office for the Coordination of Humanitarian Affairs, 1998). In determining retreat modalities to deliver national frameworks, human rights principles direct us towards enabling cooperative managed retreats/planned relocations.

As recognised by Bronen (2017) and Hino et al. (2017), successful outcomes are expected to be more likely if and when affected people are able to make the critical mobility decisions themselves. To protect human rights, managed retreats should not reduce human security, be that physical, economic, health, environmental or cultural, and therefore people and communities need to be embedded in their design, decision-making and delivery (Farbotko et al., 2020). The potential social, cultural and economic impacts of moving people and communities suggest the need for more cooperative governance to enable self-determination with regard to when, where, how and why retreats occur and whether ‘voluntary immobility’ is in fact preferred (Ibid). If people choose to remain in place, recognition of, and support for voluntarily immobile populations may be necessary (Ibid). Remaining in place is quite different to ‘do nothing’ approaches often presented in planning literature and practice. Farbotko et al. (2020, p. 703) argue that the “onus is on governments and donors to co-develop programmes that support a reasonable quality of life in climate-impacted territories through alternative, in situ adaptation measures.” There should also be measures in place to avoid displacement caused by sudden-onset events (Adger et al., 2018) and irreversible harm to ecosystems and public goods.

Moving further across the framework is migration, the deliberate movement of people associated with the changing attractiveness and livelihood viability of places (Adger et al., 2018). Migration can be an important form of climate change adaptation, giving people choices about whether, when and how to adapt in situ or move elsewhere for a short or long timeframe (Barnett and McMichael, 2018). Migration/unmanaged retreats operate in the ‘shadows’ of actively facilitated mobility (and voluntary immobility) to gradually influence movement over time, especially for slow-onset climate risks (Adger et al., 2018). Regulatory, information and investment mechanisms can aid migration by removing mobility restrictions and sending signals about the attractiveness of both places at risk and alternative places to settle. By strategically facilitating migration with supporting policies to protect human rights, the risks of

Conceptual policy framework

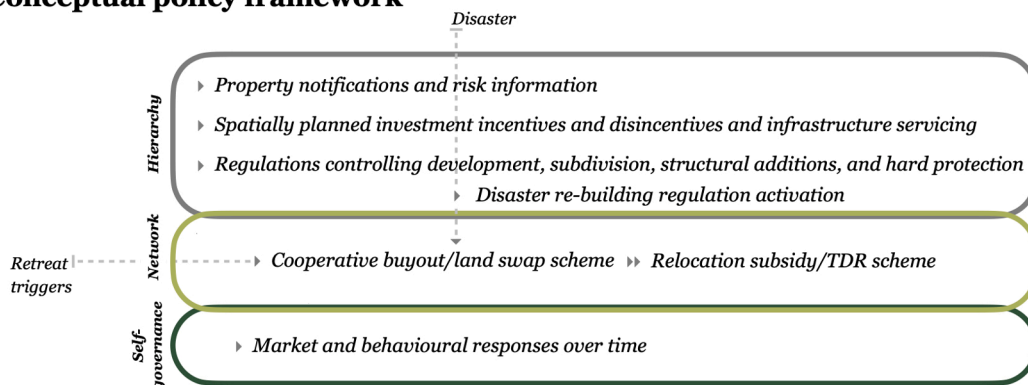


Fig. 3. Conceptual policy framework for strategic managed retreats.

environmentally forced displacement and the emergence of ‘trapped populations’ may be reduced (Adger et al., 2018).

6. Discussion and conclusion

The governance challenge is to integrate insights from scholarship and experience in the field of human mobility to facilitate proactive and reactive, cooperative managed retreats that are supportive of immobility; at the same time as strategically encouraging and supporting self-governed movements and more resilient land use patterns. The international literature and practice are clear that conditions for cooperative action are necessary. However, hybrid governance modalities remain important, such as regulation to inform markets or time-limited land use consents for new activities, such as to change unrealistic expectations regarding the permanence of transient lands. We recognise that the presence of regulation, market signals, and risk influence retreat decisions, hence we have avoided the term ‘voluntary retreat’, but recommend cooperative managed retreats where people and communities are embedded in the retreat strategy design, decision-making and delivery.

While we have depicted governance modes and instruments as distinctive in theory, in practice, managed retreats will involve a hybrid of actors and instruments across the governance spectrum and there will be a blurring of boundaries. Our final diagram, Fig. 3, provides an illustration of how the various hierarchical, network or self-governance approaches can work strategically. Multiple governance modes and instruments will need to be operationalised within an integrated strategy which can be sequenced over time.

To elucidate, network strategies and instruments manage existing activities and assets (with potential for dynamic application of instruments using a sliding-scale over time: see Robb et al. (2020)) and hierarchical instruments avoid development and investment in risky localities, supported by self-governed responses. Importantly, retreats of existing activities and assets are predominantly cooperative. In practice, greater detail of the diverse components will be required, such as discrete actions and timeframes for alternative land provision, infrastructure withdrawal, land rehabilitation, and legal protections to effectively achieve the overarching strategy in an integrated manner (Lawrence et al., 2020b).

Fundamentally, a governance approach is needed that can achieve integrated risk reduction, avoidance, and disaster response, with various actors and agencies working to prevent the escalation of risk and cost transfers to future governments and communities. Recognising both the plurality of retreats and the plurality of powers and instruments is a critical step in achieving this. It is also apparent that the state plays a key role, even when they are not directly managing retreats. They can provide the clarity that fosters effective governance where each modality can play its distinctive role, according to the affected community’s needs and situation, changing level of risk, scientific uncertainty, and socio-economic and political imperatives.

Managed retreats are a compelling contemporary problem. The mobility literature and practice offers valuable insights into how to develop a governance approach that is both effective and socially just. Much evidence is critical of forced and unmanaged action and places emphasis on the value of networked modalities to enable adaptation. We recognise that managed, cooperative and unmanaged retreats each have a role to play, but that they must be strategically planned, with cooperation a central focus. Nations currently grappling with managed retreats can usefully recognise this distinction. Our research addresses the vexing challenge of enabling managed retreats. The proposed governance framework facilitates fit-for-purpose responses to avoid and reduce risks in ways that seek to share power, promote justice and equity, and emphasises the importance of a strategic approach.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or professional relationships that have unduly influenced the work reported in this paper.

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Author contributions

CH, IW and BG conceived and wrote the paper, CH conducted the interviews and data analysis with input from IW and BG throughout the data collection, analysis and writing of the paper.

References

- Abel, N., Gordard, R., Harman, B., Leitch, A., Langridge, J., Ryan, A., Heyenga, S., 2011. Sea level rise, coastal development and planned retreat: Analytical framework, governance principles and an Australian case study. *Environ. Sci. Policy* 14 (3), 279–288. <https://doi.org/10.1016/j.envsci.2010.12.002>.
- Adger, W., Safra de Campos, R., Mortreux, C., 2018. Mobility, displacement and migration, and their interactions with vulnerability and adaptation to environmental risks. In R. McLeman & F. Gemenne (Eds.), *Routledge Handbook of Environmental Displacement and Migration* (pp. 29–41).
- Aerts, J.C.J.H., Barnard, P.L., Botzen, W., Grifman, P., Hart, J.F., De Moel, H., Mann, A.N., de Ruig, L.T., Sadrpour, N., 2018. Pathways to resilience: Adapting to sea level rise in Los Angeles: Sea level rise and flood risk in LA. *Ann. N.Y. Acad. Sci.* 1427 (1), 1–90. <https://doi.org/10.1111/nyas.13917>.

- Agyeman, J., Devine-Wright, P., Prange, J., 2009. Close to the edge, down by the river? Joining up managed retreat and place attachment in a climate changed world. *Environ Plan A* 41 (3), 509–513. <https://doi.org/10.1068/a41301>.
- Ajibade, I., 2019. Planned retreat in Global South megacities: Disentangling policy, practice, and environmental justice. *Clim. Change* 157 (2), 299–317. <https://doi.org/10.1007/s10584-019-02535-1>.
- Angelovski, I., Shi, L., Chu, E., Gallagher, D., Goh, K., Lamb, Z., Reeve, K., Teicher, H., 2016. Equity impacts of urban land use planning for climate adaptation: Critical perspectives from the Global North and South. *J. Planning Educ. Res.* 36 (3), 333–348. <https://doi.org/10.1177/0739456X16645166>.
- Baldauf, M., Garlappi, L., Yannelis, C., 2019. Does climate change affect real estate prices? Only if you believe in it. SSRN <https://doi.org/10.2139/ssrn.3240200>.
- Barnett, J., McMichael, C., 2018. The effects of climate change on the geography and timing of human mobility. *Popul. Environ.* 39 (4), 339–356. <https://doi.org/10.1007/s11111-018-0295-5>.
- Bell, R., Paulik, R., Wadhwa, S., 2015. National and regional risk exposure in low-lying coastal areas: areal extent, population, buildings and infrastructure. Report prepared for the Parliamentary Commissioner for the Environment by NIWA. Wellington, New Zealand: Parliamentary Commissioner for the Environment. Retrieved from www.pce.parliament.nz/media/1384/national-and-regional-risk-exposure-in-low-lying-coastal-areas-niwa-2015.pdf.
- Bendall, S., 2018. Clifton To Tangoio Coastal Hazards Strategy 2120: Report of The Northern and Southern Cell Assessment Panels Hawke's Bay, Aotearoa New Zealand: Hawke's Bay Regional Council, Hastings District Council and Napier City Council. Retrieved from <https://www.hbcoast.co.nz/assets/Document-Library/Assessment-Panel-Report-FINAL-28.2.18-reduced-size.pdf>.
- Bennett, N.J., Satterfield, T., 2018. Environmental governance: A practical framework to guide design, evaluation, and analysis. *Conserv. Lett.* 11 (6), e12600. <https://doi.org/10.1111/conl.12600>.
- Bosomworth, K., Bianchi, R., 2020. As safe as houses: Do people consider climate change impacts in 'choosing' where to live? In M. Scott & M. Lennon (Eds.), *Climate disruption and planning: Resistance or retreat?*
- Boston, J., 2016. Anticipatory governance: How well is New Zealand safeguarding the future? *Policy Quarterly*, 12(3).
- Boston, J., Lawrence, J., 2018. Funding climate change adaptation: The case for a new policy framework. *Policy Quarterly* 14 (2), 40–49.
- Bronen, R., 2015. Climate-induced community relocations: Using integrated social-ecological assessments to foster adaptation and resilience. *Ecology and Society*, 20 (3) doi: 10.5751/ES-07801-200336.
- Bronen, R., 2017. The human rights of climate-induced community relocation. In D. Manou, A. Baldwin, D. Cubie, A. Mihr & T. Thorp (Eds.), *Climate Change, Migration and Human Rights: Law and Policy Perspectives*. doi: 10.4324/9781315622217.
- Bronen, R., Pollock, D., Overbeck, J., Stevens, D., Natali, S., Maio, C., 2020. Usteq: Integrating indigenous knowledge and social and physical sciences to coproduce knowledge and support community-based adaptation. *Polar Geogr.* 43 (2-3), 188–205. <https://doi.org/10.1080/1088937X.2019.1679271>.
- Buser, M., 2020. Coastal adaptation planning in fairbourne, wales: Lessons for climate change adaptation. *Planning Practice Res.* 35 (2), 127–147. <https://doi.org/10.1080/02697459.2019.1696145>.
- Callon, M., 2007. What does it mean to say economics is performative? In: MacKenzie, D., Muniesa, F., Siu, L. (Eds.), *Do Economists Make Markets? On the Performativity of Economics*. Princeton, Princeton University Press, pp. 311–357.
- Canterbury Earthquake Recovery Authority, 2016. Residential red zone survey (of those who accepted the crown offer) CERA: CERA. Retrieved from <https://www.dpnc.govt.nz/sites/default/files/2017-03/cera-rrz-surveyreport-feb2016.pdf>.
- CCATWG, 2017. Adapting to climate change in New Zealand stocktake report. Wellington, New Zealand: Ministry for the Environment. Retrieved from <http://www.mfe.govt.nz/sites/default/files/media/adapting-to-climate-change-stocktake-tag-report-final.pdf>.
- Cernea, M., 1997. The risks and reconstruction model for resettling displaced populations. *World Dev.* 25 (10), 1569–1587. [https://doi.org/10.1016/S0305-750X\(97\)00054-5](https://doi.org/10.1016/S0305-750X(97)00054-5).
- Corbett, E., Bendall, S., 2019. Clifton to Tangoio Coastal Hazards Strategy 2120 Hawke's Bay, New Zealand. In OECD (Ed.), *Responding to rising seas: OECD country approaches to tackling coastal risks*. 10.1787/9789264312487-en.
- De Vries, D., Fraser, J., 2012. Citizenship rights and voluntary decision making in post-disaster US. *Int. J. Mass Emergencies Disasters* 30, 1–33.
- Doberstein, B., Tadjell, A., Rutledge, A., 2020. Managed retreat for climate change adaptation in coastal megacities: A comparison of policy and practice in Manila and Vancouver. *J. Environ. Manage.* 253, 109753. <https://doi.org/10.1016/j.jenvman.2019.109753>.
- Driessen, P.P.J., Dieperink, C., Laerhoven, F., Runhaar, H.A.C., Vermeulen, W.J.V., 2012. Towards a conceptual framework for the study of shifts in modes of environmental governance – experiences from the Netherlands: Shifts in environmental governance. *Env. Pol. Gov.* 22 (3), 143–160. <https://doi.org/10.1002/eet.1580>.
- Farbotko, C., Dun, O., Thornton, F., McNamara, K.E., McMichael, C., 2020. Relocation planning must address voluntary immobility. *Nat. Clim. Change.* 10 (8), 702–704. <https://doi.org/10.1038/s41558-020-0829-6>.
- Ferris, E., 2015. Climate-induced resettlement: Environmental change and the planned relocation of communities. *SAIS Review of International Affairs* 35 (1), 109–117. <https://doi.org/10.1353/sais.2015.0001>.
- Few, R., Brown, K., Tompkins, E., 2007. Public participation and climate change adaptation: Avoiding the illusion of inclusion. *Climate Policy*, 7(1), 46–59. doi: 10.1080/14693062.2007.9685637.
- Filippova, O., Nguyen, C., Noy, I., Rehm, M., 2020. Who cares? Future sea level rise and house prices. *Land Economics* 96 (2), 207–224. <https://doi.org/10.3368/le.96.2.207>.
- Frohlich, M.F., Jacobson, C., Fidelman, P., Smith, T.F., 2018. The relationship between adaptive management of social-ecological systems and law: A systematic review. *Ecol. Soc.* 23 (2) <https://doi.org/10.5751/ES-10060-230223>.
- Frohlich, M.F., Smith, T.F., Jacobson, C., Fidelman, P., Carter, R.W., Baldwin, C., 2019. Towards adaptive coastal management: Lessons from a “legal storm” in Byron Shire, Australia. *Ocean Coast. Manag.* 179, 104909. <https://doi.org/10.1016/j.ocecoaman.2019.104909>.
- Gibbs, M.T., 2016. Why is coastal retreat so hard to implement? Understanding the political risk of coastal adaptation pathways. *Ocean Coast. Manag.* 130, 107–114. <https://doi.org/10.1016/j.ocecoaman.2016.06.002>.
- Grace, E., France-Hudson, B., Kilvington, M., 2019. Reducing Risk through the Management of Existing Uses: Tensions under the RMA. GNS Science, Lower Hutt, New Zealand.
- Graham, J., Amos, B., Plumtree, T., 2003. *Governance Principles for Protected Areas in the 21st Century*. Institute on Governance, Parks Canada, and CIDA, Ottawa, ON.
- Greer, A., Brokopp Binder, S., 2017. A historical assessment of home buyout policy: Are we learning or just failing? *Housing Policy Debate* 27 (3), 372–392. <https://doi.org/10.1080/10511482.2016.1245209>.
- Haasnoot, M., Kwakkel, J.H., Walker, W.E., ter Maat, J., 2013. Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world. *Global Environ. Change* 23 (2), 485–498. <https://doi.org/10.1016/j.gloenvcha.2012.12.006>.
- Hanna, C., 2019. *Restraints of Change: Limits to 'Managed Retreats' in Aotearoa New Zealand*. The University of Waikato, Hamilton, New Zealand.
- Hanna, C., White, I., & Glavovic, B. (2019). Managed retreat in practice: Mechanisms and challenges for implementation. In, *Oxford Research Encyclopedia of Natural Hazard Science*. (New York, USA: Oxford University Press).
- Hanna, C., White, I., Glavovic, B., 2020. The uncertainty contagion: Revealing the interrelated, cascading uncertainties of managed retreat. *Sustainability*, 12, 736. doi: 10.3390/su12020736.
- Harman, B.P., Heyenga, S., Taylor, B.M., Fletcher, C.S., 2015. Global lessons for adapting coastal communities to protect against storm surge inundation. *J. Coastal Res.* 314, 790–801. <https://doi.org/10.2112/JCOASTRES-D-13-00095.1>.
- Harvey, N., Clarke, B., Nursey-Bray, M., 2012. Australian coastal management and climate change. *Geographical Res.*, 50(4), 356–367.
- Hawke's Bay Regional Council, Napier City Council, Hastings District Council, Mana Ahuriri Incorporated, Maungaharuru Tangitū Trust, & He Toa Takitini. (2016). Clifton to Tangoio Coastal Hazards Strategy 2120. Hawke's Bay, New Zealand. Retrieved from <https://www.hbcoast.co.nz/assets/Document-Library/Project-Documents/Clifton-to-Tangoio-Coastal-Hazard-Strategy-2120-DRAFT-Aug-2016.pdf>.

- Hayward, B., 2008. 'Nowhere far from the sea': Political challenges of coastal adaptation to climate change in New Zealand. *Political Science* 60 (1), 47–59. <https://doi.org/10.1177/003231870806000105>.
- Hinkel, J., Brown, S., Jiménez, J., Lincke, D., Nicholls, R., Scussolini, P., et al., 2018. The ability of societies to adapt to twenty-first-century sea-level rise. *Nature Climate Change*, 8(7), 570–578. doi: 10.1038/s41558-018-0176-z.
- Hino, M., Field, C.B., Mach, K.J., 2017. Managed retreat as a response to natural hazard risk. *Nature Clim Change* 7 (5), 364–370. <https://doi.org/10.1038/nclimate3252>.
- Hoang, T., Noy, I., 2020. Wellbeing after a managed retreat: Observations from a large New Zealand program. *Int. J. Disaster Risk Reduct.* 48, 101589. <https://doi.org/10.1016/j.ijdrr.2020.101589>.
- Hodder, J., 2019. Climate change litigation: Who's afraid of creative judges? "Climate Change Adaptation" session of the Local Government New Zealand Rural and Provincial Sector Meeting (Wellington, New Zealand): Jack Hodder QC.
- Hysing, E., 2009. From government to governance? A comparison of environmental governing in Swedish forestry and transport. *Governance* 22, 547–672. <https://doi.org/10.1016/j.forpol>.
- Infometrics, 2017. Real options analysis of strategies to manage coastal hazard risks: Southern units J-L. Retrieved from <https://www.hbcoast.co.nz/resources/>.
- Iorns Magallanes, C., 2019. Treaty of waitangi duties relevant to adaptation to coastal hazards from sea-level rise. *Deep South National Science Challenge*, Wellington, New Zealand.
- Jones, C., 2020. Commissioners agree: Bay of Plenty township unsafe and residents must go. Retrieved from <https://www.stuff.co.nz/national/politics/local-democracy-reporting/120753289/commissioners-agree-bay-of-plenty-township-unsafe-and-residents-must-go>.
- Keenan, J.M., Hill, T., Gumber, A., 2018. Climate gentrification: From theory to empiricism in Miami-Dade County, Florida. *Environ. Res. Lett.* 13 (5), 054001. <https://doi.org/10.1088/1748-9326/aabb32>.
- Kench, P., Ryan, E., Owen, S., Bell, R., Lawrence, J., Glavovic, B., et al., 2018. Co-creating resilience solutions to coastal hazards through an interdisciplinary research project in New Zealand. *J. Coastal Res.* 85, 1496–1500. <https://doi.org/10.2112/S185-300.1>.
- Kilvington, M., Saunders, W., 2015. "I can live with this". The Bay of Plenty Regional Council public engagement on acceptable risk. *GNS Science Miscellaneous Series* 86.
- Kooiman, J., 1993. *Modern Governance: New Government-Society Interactions*. Sage Publications Ltd., London.
- Kooiman, J., 2003. *Governing as Governance*. Sage Publications, London.
- Kooiman, J., Bavinck, M., Cheuenpagdee, R., Mahon, R., Pullin, R., 2008. Interactive governance and governability: An introduction. *J. Transdisciplinary Environ. Stud.* 7 (1).
- Kooiman, J., Jentoft, S., 2009. Meta-Governance: Values, norms and principles, and the making of hard choices. *Public Administration*, 87(4), 818–836. doi: 10.1111/j.1467-9299.2009.01780.x.
- Koslov, Liz, 2016. The case for retreat. *Public Culture* 28 (2 79), 359–387. <https://doi.org/10.1215/08992363-3427487>.
- Kousky, C., 2014. Managing shoreline retreat: A US perspective. *Clim. Change* 124 (1), 9–20. <https://doi.org/10.1007/s10584-014-1106-3>.
- Lawrence, J., Bell, R., Stroombergen, A., 2019. A hybrid process to address uncertainty and changing climate risk in coastal areas using dynamic adaptive pathways planning, multi-criteria decision analysis & real options analysis: A New Zealand application. *Sustainability* 11 (406). <https://doi.org/10.3390/su11020406>.
- Lawrence, J., Blackett, P., Craddock-Henry, N.A., 2020. Cascading climate change impacts and implications. *Clim. Risk Manage.* 29, 100234 <https://doi.org/10.1016/j.crm.2020.100234>.
- Lawrence, J., Boston, J., Bell, R., Olufson, S., Kool, R., Hardcastle, M., Stroombergen, A., 2020. Implementing pre-emptive managed retreat: Constraints and novel insights. *Curr. Climate Change Reports*. <https://doi.org/10.1007/s40641-020-00161-z>.
- Lemos, M.C., Agrawal, A., 2006. Environmental governance. *Annu. Rev. Environ. Resour.* 31 (1), 297–325. <https://doi.org/10.1146/annurev.energy.31.042605.135621>.
- Lincke, D., Hinkel, J., 2018. Economically robust protection against 21st century sea-level rise. *Global Environ. Change* 51 (67–73).
- Lockwood, M., Davidson, J., Curtis, A., Stratford, E., Griffith, R., 2010. Governance principles for natural resource management. *Society Natural Resour.* 23 (10), 986–1001. <https://doi.org/10.1080/08941920802178214>.
- Lopez, E., Clark, J., 2013. The problem with the holdout problem. *Review of Law and Economics* 9 (2). <https://doi.org/10.2139/ssrn.2239176>.
- Mach, K., Kraan, C., Hino, M., Siders, A., Johnston, E., Field, C., 2019. Managed retreat through voluntary buyouts of flood-prone properties. *Sci. Adv.* 5 (10) <https://doi.org/10.1126/sciadv.aax8995>.
- Marchman, P., Siders, A., Leilani Main, K., Herrmann, V., Butler, D., 2020. Climate disruption and planning: Resistance or retreat? *Planning Theory & Practice* 21 (1), 125–154. <https://doi.org/10.1080/14649357.2020.1704130>.
- May, B., Plummer, R., 2011. Accommodating the challenges of climate change adaptation and governance in conventional risk management: Adaptive collaborative risk management (ACRM). *Ecol. Soc.* 16 (1).
- McAdam, J., 2014. Historical cross-border relocations in the Pacific: Lessons for planned relocations in the context of climate change. *J. Pacific History* 49 (3), 301–327.
- McAdam, J., 2015. Lessons from planned relocation and resettlement in the past. *Forced Migration Review* 49, 30–32.
- McAdam, J., Ferris, E., 2015. Planned relocations in the context of climate change: Unpacking the legal and conceptual issues. *Cambridge J. Int. Comparative Law* 4 (1). <https://doi.org/10.7574/cjicl.04.01.137>.
- Ministry for the Environment, 2020a. Case study: Challenges with implementing the Clifton to Tangoio Coastal Hazards Strategy 2120. Wellington, New Zealand: Ministry for the Environment.
- Ministry for the Environment, 2020b. National Climate Change Risk Assessment for Aotearoa New Zealand: Main report – Arotakenga Tūraru mō te Huringa Ahuarangi o Aotearoa: Pūrongo whakatōpū. Wellington, New Zealand: Ministry for the Environment. Retrieved from <https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/national-climate-change-risk-assessment-main-report.pdf>.
- Moorfield, C., 2011. *Te Aka Māori-English, English-Māori Dictionary*. Longman/Pearson Education New Zealand, New Zealand.
- Mortreux, C., Safra de Campos, R., Adger, W.N., Ghosh, T., Das, S., Adams, H., Hazra, S., 2018. Political economy of planned relocation: A model of action and inaction in government responses. *Global Environ. Change* 50, 123–132. <https://doi.org/10.1016/j.gloenvcha.2018.03.008>.
- Neal, W., Bush, D., Pilkey, O., 2005. *Managed retreat*. In: Schwartz, M.L. (Ed.), *Encyclopedia of Coastal Science*. Springer, Netherlands, Dordrecht, pp. 602–606.
- New Zealand Human Rights Commission, 2016. Staying in the red zones – Monitoring human rights in the Canterbury earthquake recovery – Te manawaroa ki te pae whero – Whakaora rū whenua Waitaha he aroturuki tika tangata. Retrieved from https://www.hrc.co.nz/files/8614/7864/4133/HRC_Red_Zone_Report_2016.pdf.
- Norwegian Refugee Council, 2011. The Nansen Conference: Climate change and displacement in the 21st century. Retrieved from <http://www.unhcr.org/4ea969729.pdf>.
- Noy, I., 2020. Paying a price of climate change: Who pays for managed retreats? *Current Climate Change Reports* 6 (1), 17–23. <https://doi.org/10.1007/s40641-020-00155-x>.
- Oppenheimer, M., Glavovic, B., Hinkel, J., van de Wal, R., Maignan, A. K., Abd-Elgawad, A., et al., 2019. Sea level rise and implications for low-lying islands, coasts and communities. IPCC Special Report on the Ocean and Cryosphere in a Changing Climate.
- Paprocki, K., 2019. All that is solid melts into the bay: Anticipatory ruination and climate change adaptation. *Antipode* 51 (1), 295–315.
- Pinter, N., Ishiwatari, M., Nonoguchi, A., Tanaka, Y., Casagrande, D., Durden, S., Rees, J., 2019. Large-scale managed retreat and structural protection following the 2011 Japan tsunami. *J. Int. Soc. Prevention and Mitigation Natural Hazards* 96 (3), 1429–1436. <https://doi.org/10.1007/s11069-019-03602-7>.
- Resource Management Review Panel, 2020. New directions for resource management in New Zealand. Wellington, New Zealand: Ministry for the Environment. Retrieved from <https://www.mfe.govt.nz/sites/default/files/media/RMA/rm-panel-review-report-web.pdf>.
- Robb, A., Stocker, L., Payne, M., Middle, G.J., 2020. Enabling managed retreat from coastal hazard areas through property acquisition and transferable development rights: Insights from Western Australia. *Urban Policy Res.* 1–19 <https://doi.org/10.1080/08111146.2020.1768842>.

- Rogers, S., Wilmsen, B., 2019. Towards a critical geography of resettlement. *Prog. Hum. Geogr.* 44 (2), 256–275. <https://doi.org/10.1177/0309132518824659>.
- Rulleau, B., Rey-Valette, H., Clément, V., 2017. Impact of justice and solidarity variables on the acceptability of managed realignment. *Climate Policy* 17 (3), 361–377. <https://doi.org/10.1080/14693062.2015.1119097>.
- Scott, M., Lennon, M., 2020. Climate disruption and planning: Resistance or retreat? *Planning Theory & Practice* 21 (1), 125–154. <https://doi.org/10.1080/14649357.2020.1704130>.
- Siders, A., 2019. Managed retreat in the United States. *One Earth* 2 (216–225).
- Siders, A., Hino, M., Mach, K., 2019. The case for strategic and managed climate retreat. *Science* 365 (6455), 761–763. <https://doi.org/10.1126/science.aax8346>.
- Sipe, N., Vella, K., 2014. Relocating a flood-affected community: Good planning or good politics? *J. Am. Planning Assoc.* 80 (4), 400–412. <https://doi.org/10.1080/01944363.2014.976586>.
- Storey, B., Noy, I., Townsend, W., Kerr, S., Salmon, R., Middleton, D., et al., 2017. Insurance, housing and climate adaptation: Current knowledge and future research. *Motu Economic and Public Policy Research* 27.
- The World Bank, 2004. *Involuntary Resettlement Sourcebook Planning and Implementation in Development Projects*. The World Bank, Washington, USA.
- Treib, O., Bahr, H., Falkner, G., 2005. Modes of governance: A note towards conceptual clarification. *European Governance Papers*. Retrieved from <http://www.connex-network.org/eurogov/pdf/egp-newgov-N-05-02.pdf>.
- Tubridy, D., Lennon, M., Scott, M., 2020. Resist or retreat? Planning for place disruption, displacement and vulnerabilities in the face of climate change. In M. Scott & M. Lennon (Eds.), *Climate disruption and planning: Resistance or retreat?* (Vol. 21). doi: 10.1080/14649357.2020.1704130.
- Turbott, C., Stewart, A., 2006. *Managed retreat from coastal hazards: Options for implementation* (Environment Waikato Technical Report 2006/048). Retrieved from <https://www.waikatoregion.govt.nz/assets/PageFiles/5405/tr06-48.pdf>.
- UN. Office for the Coordination of Humanitarian Affairs, 1998. *Guiding Principles on Internal Displacement*. Geneva: UN Retrieved from <https://www.unhcr.org/protection/idps/43ce1cff2/guiding-principles-internal-displacement.html>.
- United Nations Environment Programme, 2017. *The status of climate change litigation – a global review*. Nairobi, Kenya: UN Environment Programme. Retrieved from <http://wedocs.unep.org/bitstream/handle/20.500.11822/20767/climate-change-litigation.pdf?sequence=1&isAllowed=y>.
- van der Ploeg, L., Vanclay, F., 2017. A human rights based approach to project induced displacement and resettlement. *Impact Assessment and Project Appraisal* 35 (1), 34–52. <https://doi.org/10.1080/14615517.2016.1271538>.
- Waters, E., Barnett, J., 2018. Spatial imaginaries of adaptation governance: A public perspective. *Environment and Planning C: Politics and Space* 36 (4). <https://doi.org/10.1177/2399654417719557>.
- Weerasinghe, S., Martin, S., Turk, V., Franck, M., Mc Adam, J., Ferris, E., 2014. Planned relocation, disasters and climate change: Consolidating good practices and preparing for the future. UNHCR: The UN Refugee Agency. Retrieved from <http://www.unhcr.org/54082cc69.pdf>.
- White, I., 2019. Rigour and rigour mortis? Planning, calculative rationality, and forces of stability and change, 0042098019886764 *Urban Studies*. <https://doi.org/10.1177/0042098019886764>.
- White, I., Houghton, G., 2017. Risky times: Hazard management and the tyranny of the present. *Int. J. Disaster Risk Reduct.* <https://doi.org/10.1016/j.ijdrr.2017.01.018>.
- White, I., Storey, B., Owen, S., Bell, R., Charters, F., Dickie, B., Zammit, C., 2017. *Climate change and stormwater and wastewater systems*. Motu Econ. Public Policy Res. 28.
- Wilmsen, B., Webber, M., 2015. What can we learn from the practice of development-forced displacement and resettlement for organised resettlements in response to climate change? *Geoforum* 58, 76–85. [10.1016/j.geoforum.2014.10.016](https://doi.org/10.1016/j.geoforum.2014.10.016).
- Wolford, W., 2004. This land is ours now: Spatial imaginaries and the struggle for land in Brazil. *Ann. Assoc. Am. Geogr.* 94 (2), 409–424. <https://doi.org/10.1111/j.1467-8306.2004.09402015.x>.
- Wright, J., 2015. *Preparing New Zealand for rising seas: Certainty and uncertainty*. Retrieved from <http://www.pce.parliament.nz/media/1380/preparing-nz-for-rising-seas-web-small.pdf>.
- Yarina, L., Mazereeuw, M., Ovalles, L., 2019. A retreat critique: Deliberations on design and ethics in the flood zone. *J. Landscape Architecture* 14 (3), 8–23. <https://doi.org/10.1080/18626033.2019.1705570>.
- Young, W.A., 2018. How to retreat: The necessary transition from buyouts to leasing. *Coastal Manage.* <https://doi.org/10.1080/08920753.2018.1498716>.