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From vulnerable to resilient: ‘Fixing’ mechanisms and ‘unfixing’ practices in Onehunga, Auckland

Climate change threatens modern urban communities. For vulnerable, high-density, high-demand coastal communities to thrive proactive modifications addressing the ecological and economic impact of a changing climate are required. We will need to address anthropogenic pressures: global energy descent, economic crisis, debt problems, increasing inequalities, geopolitical instabilities, and technological disruptions. New Zealand’s predominantly coastal population will be at the forefront of this global shift.

Onehunga, a suburb of Tāmaki Makaurau Auckland on the northern edge of the inner Manukau Harbour is a prototypically vulnerable area exposed to climate-related threats and lacking adaptive capacity. Auckland Council’s recent climate change risk assessment identified Onehunga as a “vulnerability hot spot” (Fernandez & Golubiewski, 2019: 17-18). The primary concerns are sea level rise and terrestrial flooding, with aging infrastructure in flood zones. These physical threats are exacerbated by intensifying socio-economic and cultural pressures from population increases and more high-density housing. Onehunga shares characteristics with many vulnerable urban areas worldwide. This paper discusses possibilities for building desirable resilience and sustainable development in Onehunga with a view to this broader relevance. It suggests design could reinforce and foster courage, resourcefulness, and compassion, and explores alternative approaches to community and landscape development.

It would be incorrect to assume that resilience means returning to a desirable equilibrium state, an original form that promises sustainability. In complex adaptive socio-ecological systems returning to the past is impossible. The focus should be future opportunities. We consider three crucial aspects: First, in the anthropogenic world scalar interactions and dynamics within and between systems are changing the biosphere at unprecedented speeds, scale and patterns. An ‘original form’ or ‘earlier state’ does not guarantee resilience to overcome the unknown, unpredictable, and unknowable. Second, embedded in socio-ecological systems, landscapes are hybrid landscapes formally shaped by human cultural patterns and practices (Hood, 2019; Walker & Salt, 2006). Efforts to restore, reinstate, sustain, conserve, preserve and reserve, are not sufficient for these dynamic and regenerative landscapes. Third, memories are fallible, and perceptions of the past do not necessarily reflect past realities. We need to look forward while accepting

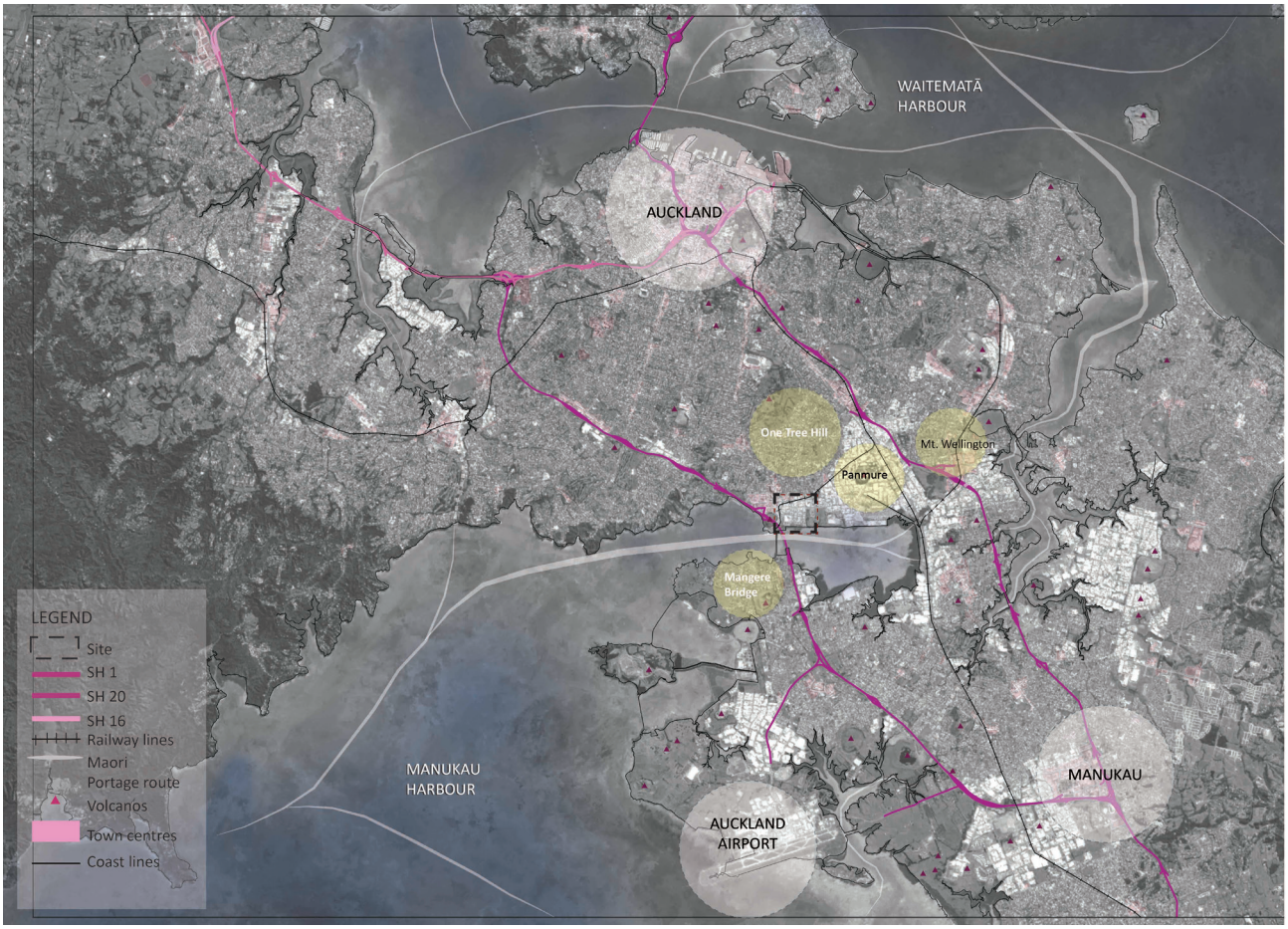


Fig. 1 Bloomfield and Yu (2020). Contextualising Onehunga. [Map, Yu & Bloomfield, 2020]

and respecting the accruing palimpsest of culture (Hood, 2019: 114).

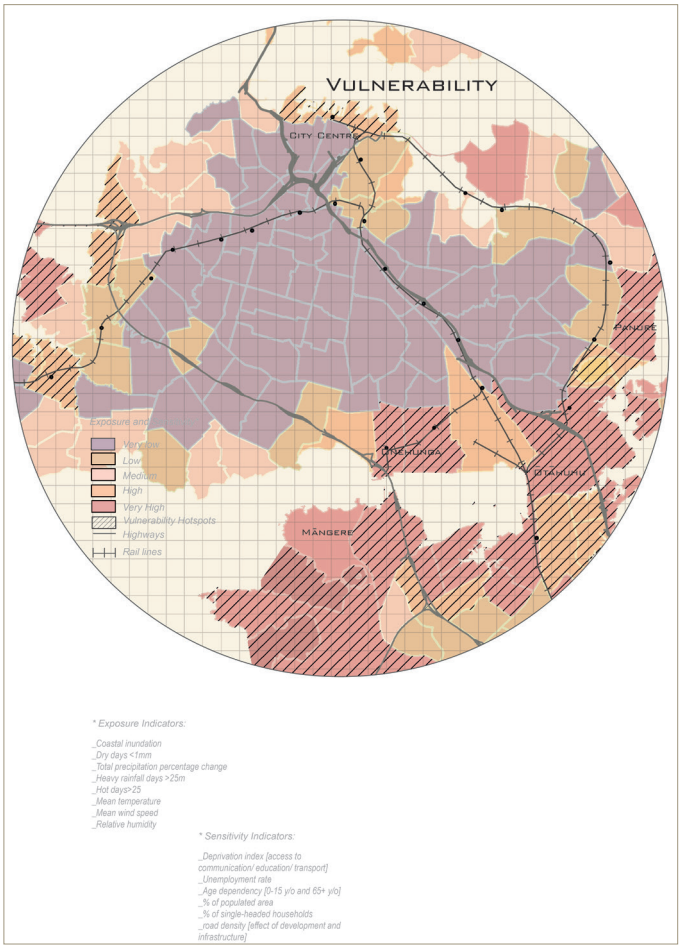
Māngere Inlet provides the shortest route between the Manukau and Waitematā harbours, via the narrow isthmus of Otāhuhu, site of two Māori portages (Kāretu and Te Tō Waka). It remains a regionally important transport nexus connecting Auckland Central with the International Airport and Manukau via State Highway 20. Onehunga takes its name from a historic papakāinga, known for kumara cultivation. Onehunga Beach served as an important canoe landing place for generations and was a marketplace for trading with other hapu and later European settlers (Murdoch, 2013). This important strategic position encouraged the development of industry, generating large daily volumes of transport and labour. As land prices have risen in Onehunga and adjacent suburbs, the industrial fabric is being transformed. Manufacturing is moving further south, replaced by logistics and wholesale businesses. Fewer local residents work in local industries and manufacturing, instead travelling out of the area each day. The most vulnerable land is the coastal reclamation along the Onehunga foreshore of Māngere inlet. Locked in by seawalls and SH20 the reclaimed area is characterised by impermeable surfaces over landfill loaded with industrial contaminants. It is also the site of Waikaraka Cemetery and Waikaraka Park, cultural heritage sites and important cultural amenities for Onehunga.

Vulnerability and maladaptive practices

Vulnerability to climate change is the degree to which geophysical, biological, and socio-economic systems are susceptible to adverse impacts of climate change. Vulnerability assessments diagnose drivers of vulnerability, their social and economic implications, and their spatial variation at local scales. In Auckland Council's 2019 assessment, Onehunga was designated a vulnerability hot spot by looking at three main factors: exposure, sensitivity, and adaptive capacity.

> Exposure to climate change effects are represented by the number of dry and hot days, the number of days with heavy rainfall and total precipitation change, mean wind speeds, mean temperature, relative humidity, and exposure to coastal inundation risk … Sensitivity is represented by indicators of local socio-economic structure and land use patterns … Adaptive capacity is closely linked to the concept of social vulnerability, the characteristics of an individual or group that influences their capacity to anticipate, cope with, resist and recover from a physical hazard (Fernandez & Golubiewski, 2019: 11–12).

The primary climate change-related concerns for Onehunga are sea level rise, increased recurrence and intensity of terrestrial flooding, and aging infrastructure under pressure from high-density housing and a growing population. By 2043, Onehunga is predicted to have 10,000 more residents, 4,773 more houses, and a



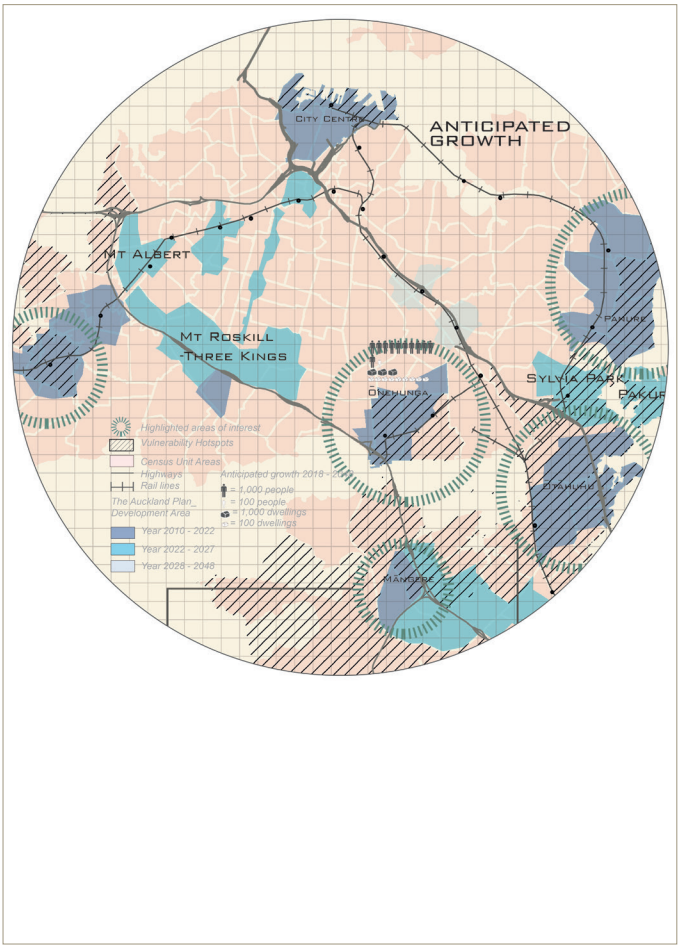


Fig. 2 Bloomfield & Yu (2021). Vulnerability mapping Onehunga. [Map]

Fig. 3 Bloomfield & Yu (2021). Population and development projection for Onehunga. [Map]

significant increase in elderly and youth population (Statistics NZ, 2013). As the population grows, health of the coastal ecology declines. Water is contaminated, benthic condition degraded, habitats threatened, and biodiversity diminished. Substantial investment in built infrastructure does not necessarily mark a shift away from vulnerabilty. On the contrary, if proposed developments are still based on existing paradigms, they will exacerbate the situation to crisis point.

We could term such developments maladaptive practices, symptomatic of short-term thinking and politically driven reactions to immediate concerns, especially the protection of assets. Such practices highlight tensions between natural processes and human inhabitation. In the urban environment these maladaptive strategies can take the form of seawalls to protect low-lying land, reclamation for coastal development, and the investment in nationally and regionally critical infrastructure that remains vulnerable to climate-related impacts. Existing seawalls are no longer sufficient in withstanding inundation. Residential development increases impermeable land cover in areas already prone to terrestrial flooding. In Onehunga, reclamation of land on the seaward side of SH20 for the coastal Taumanu Reserve exacerbates the threat of coastal inundation along other parts of the Māngere Inlet foreshore.

The Intergovernmental Panel on Climate Change (IPCC) has proposed three basic adaptation strategies: protect (to reduce the probability of an event's occurrence), accommodate (to increase society's ability to cope with effects of the event), and retreat (to reduce the risk of the event by limiting its potential effects (IPCC, 1990: 135). The New Zealand Coastal Policy Statement encourages local authorities to favour 'managed retreat' in the coastal environment, with the only exception being the protection of regionally or nationally significant infrastructure (Department of Conservation, 2010). Crisis can create space for transformation towards resilience, and encourage functions, feedbacks, and identities in tune with the biosphere's own resilience. Systems can be reset onto more sustainable trajectories, and human agents empowered for shared learning (Folke, 2016: 4, 9; Lerch, 2017: 14-31, 22-23). There is exciting potential for the Auckland Council Vulnerability Assessment to trigger the unshackling of Onehunga from status quo land management practices, leading towards a progressive, adaptive, and resilient community.

However, this will require selecting and inventing adaptive rather than maladaptive strategies. We suggest that such strategies could be understood as 'fixing' mechanisms initiated by 'unfixing' practices such as de-paving, stepping back, decommissioning, repurposing industrial facilities, blurring property lines and eliminating existing maladaptations. But these 'un-fixing' practices cannot achieve community resilience alone. It is important to provide physical fixing points that connect people to place, socio-cultural narratives, shared memories and heritage landmarks. In this way social capital can be cached as the environment shifts and adapts.

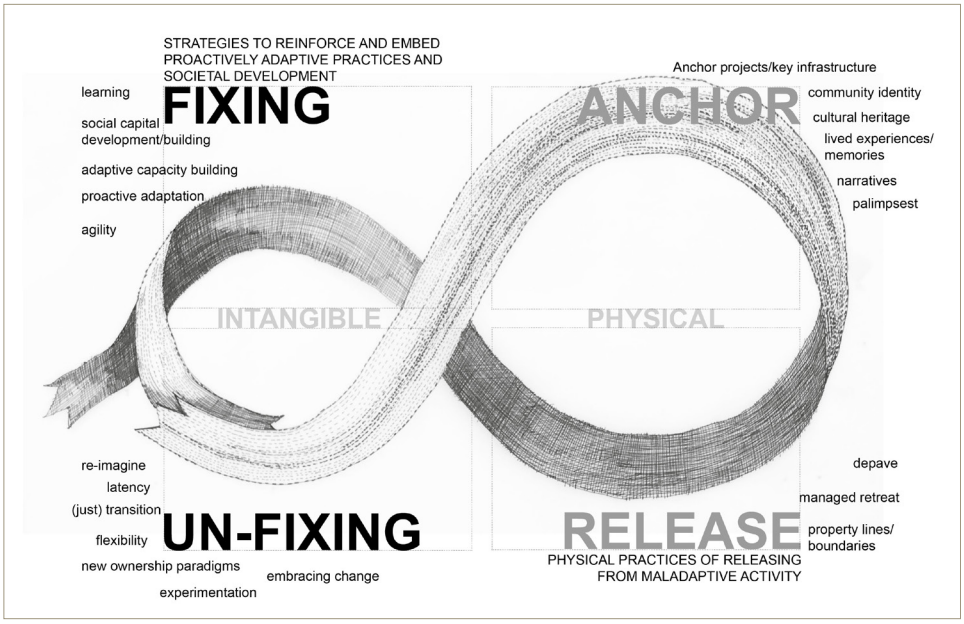


Fig. 4 Bloomfield & Yu (2021). 'Fixing' mechanisms and 'un-fixing' practices. [Diagram]

A masterplan for a novel resilient community in Onehunga

To explore ways that unfixing practices might enable the transition from a vulnerable to resilient Onehunga, we undertook a speculative design research project. It proposed a socio-ecological biosphere based on a flexible community structure focused on collective problem-solving rather than traditional property. Our lens of inquiry was provided by resilience thinking in general, and the balance between unfixing practices and fixing mechanisms in particular. We focused on exploring land-use programmes that could regenerate and build biosphere capacity, support healthy ecosystem structure, and reinforce socio-ecological connections with the biosphere within and across scales. The proposal, developed as a final year Bachelor of Landscape Architecture student project, consisted of a conceptual master-plan for Onehunga. While we also visualised how it could appear if implemented, our focus was on planning and landscape strategies rather than architectural resolution.

Our key strategy was to unfix housing by means of off-grid, nomadic living models. By framing housing as temporary and situating it amongst ecological regeneration, we promote the interests, responsibilities, relative rights, and duties of individual social actors as part of a new social contract that responds to the challenge of managing human interactions with natural ecosystems in a changing climate. We posited three stages of unfixing towards resilience. These are not necessarily to be applied as linear stages, but as iterative and continuous processes:

In Stage One, we asked how landscape architecture design interventions could assist in community resilience to climate change, and how resilience could be built into the daily lives of neighbourhoods. Communal spaces oriented the masterplan by providing a connected spatial structure and defining a module for living spaces (Fig. 6). This light landscape infrastructure would include renewable energy technologies, biological water purification, passive heating systems, greywater treatment, and recycling, as well as waste processing and nutrient recovery for food production.

In Stage Two we asked how vulnerable land could be made safe for communities, and conversely, how the community might restructure its daily life around this version of land use. Through GIS mapping and analysis, we identified the land most vulnerable to flooding, and made this the centre of the scheme. This land would be encouraged to flood, creating new wetlands and tidal zones. Off-grid, light-footprint, nomadic community housing and pop-up inhabitation would gather around this new fluid landscape. We demarcated quick-release and slow-release zones suitable for shorter or mid-term use. Historically reclaimed industrial land became high ground: a strategic nexus for shelter, cached resources, and community hubs fostering social capital. Three housing typologies are proposed for the slow-release zone: 'stilts', 'wheels' and 'rails'.[1] Households were grouped around communal buildings and outdoor spaces to tighten the bond between residents and enhance a shared place-based identity. In these communities, people would be encouraged to learn how to build their own passive houses using recycled resources.

In Stage Three we looked at how to engage this emergent landscape regionally. Auckland Council's long-discussed light rail line through Onehunga was activated to create connection across the project site and into the rest of the city. By

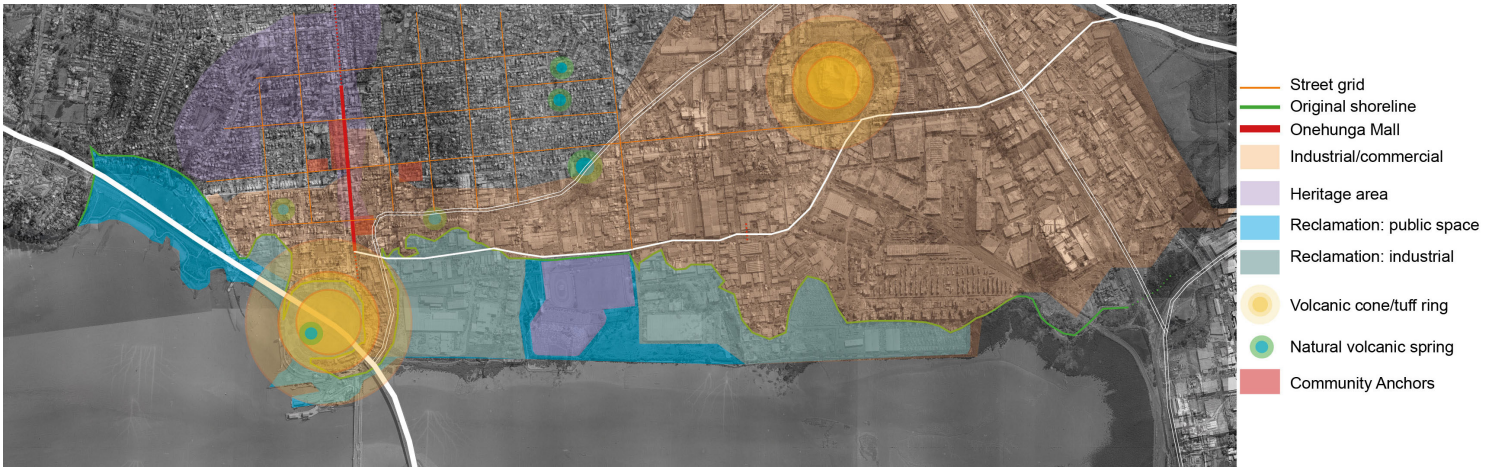


Fig. 5 Bloomfield & Yu (2021). Understanding Onehunga's fabric. [Diagrammatic map]

introducing light rail on an elevated bridge and replacing existing train tracks between Penrose and Onehunga stations, a major disruption to hydrological flow and filtration was lifted. Pedestrian and cycle paths wove between this new line and the changing zones of the new landscape. Movement through the landscape would tighten socio-ecological feedback loops. People would regain observational skills to recognise important ecological signals and allow timely responses and adjustments to behaviour.

Exploring a new ownership paradigm

Existing property-ownership paradigms would present a significant obstacle to a community like this. Attachment to private property rights, monetised land value and other societal measures of security set limits on the adaptive capacity of communities. Silos of ownership and responsibility need to be unfixed by blurring abstract rigid planning boundaries, property lines, edges and defined eco-domains. Sea level rise will impact vulnerable land regardless of private property boundaries. Transcending fixations on land ownership would ease

fundamental land-use conflicts. Spatially, it would create room to restore environmental functions that have been appropriated by the city: clearing flood paths, creating wetlands, allowing rainwater infiltration, and recharging aquifers (Folke et al., 2021b: 1). Temporally, it would address the tension between long term strategies and short-term private interests.

This tension has prompted community resistance and legal challenges (such as *Coastal Ratepayers United Incorporated* v *The Kāpiti Coast District Council)* that have limited local government's ability to identify environmental risks and plan for adaptation to climate change. There is also tension between the need for consistent long-term commitment from decision-makers, and comparatively short political terms. This is exacerbated by fluctuating political will under the influence of changing community understanding and acceptance of climate change challenges. To build resilience, we need to prioritise multi-generational thinking and sustainable livelihoods over short term property rights and values. Long-term thinking provides opportunity and space for multi-faceted experimentation and learning, which is identified by many resilience thinkers and professionals as a key resilience-building priority (Folke et al., 2021a: 4; Lawrence et al., 2013: 8-9). Functional and responsive diversity can be trialled and developed at community level, alternative and adaptive pathways that complement and empower top-down planning and policy framework can be initiated.

Small-scale experiments have the possibility of evolving into lived experiences and narratives, and eventually transforming into a new collective paradigm (Folke, 2021c: 17). De-paving (the removal of impermeable surfaces) for example, can be instigated in public space, public-concerned space, commercial and industrial land, or private property. Where terrestrial flooding and inundation are significant threats, this is a very simple and effective response. The physical and highly visible nature of this 'un-fixing' practice engages the community by demonstrating a realisable 'fix' to the threats of overland flow, flood damage, biodiversity loss, and the urban heat island effect, while also enabling placemaking and community building activities to take place from the bottom up.

A more fluid idea than ownership is land stewardship:

> While traditional land management is typically led by decisions primarily driven by the site owner (according to regulation requirements), [Land stewardship] entails dialogue, collaboration, and proactive stakeholder engagement, to be defined by specific planning considering site complexity, and expected community end goals... To see the current impacts (positive and negative) and the opportunities for change, it is important to consider the parcel of land being evaluated in the context of multiple spatial and time scales: the overall property, adjacent property owners, down gradient hydrology, the local landscape context (watershed and community), regional, and international/global context. But also short and long term goals, ambitions and gains (Common Forum and NICOLE, 2018: 11-12).

We do not have to look far for models of alternative land ownership and stewardship considerations. Te ao Māori does not recognise absolute ownership of land as western traditions do. Multiple hapū and whānau can have different rights to the same piece of land, and these rights are constantly renegotiated. Exclusive boundaries are rare (McAloon, 2008). Whenua is considered a living entity that supports and nourishes life, rather than a resource to harvest and own.

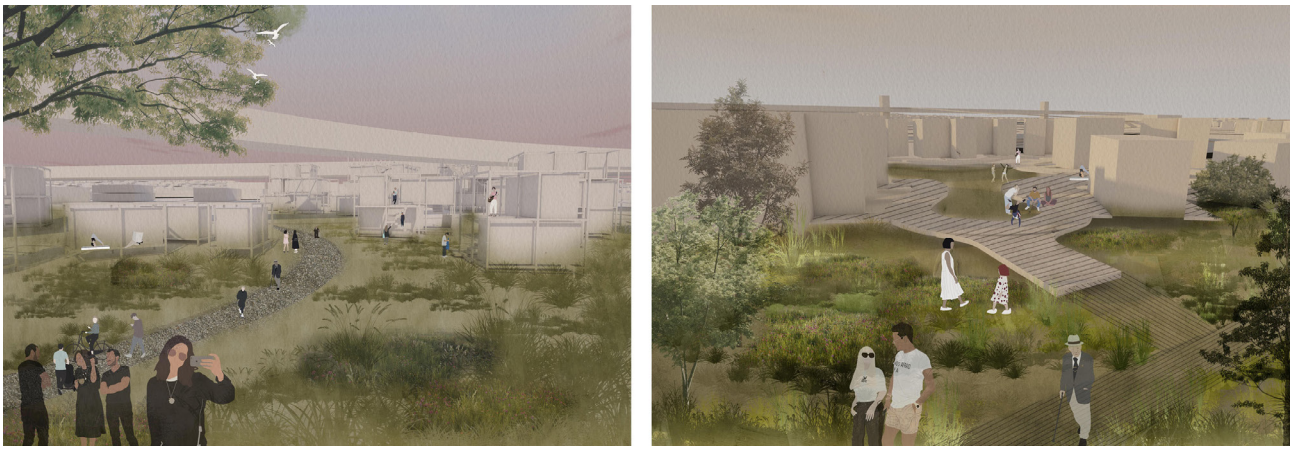
This symbiotic relationship is at the foundation of Māori customary resource management practices. Establishing a bi-cultural partnership for resilience would embrace mātauranga Māori, indigenous communities' duty of care and their spiritual connections with the land that combine to inform everyday life (Thompson-Fawcett et al., 2017: 176-177). By unfixing the absolute lines of private ownership defined by western common law and replacing them with stewardship, we can reinstate flexibility and agility and develop the ecosystem's adaptive capacity.

This new ownership paradigm would lay the foundation for (un)fixed inhabitation models. New Zealand has a proud history of off-grid living in dynamic coastal and waterside environments. 'Bach' and 'crib' communities were seasonal escapes from the trappings of the urban rat-race. These typologies have since become tangled in the consumer web and become status markers. (Un)fixed living offers the opportunity for transience and seasonal responsiveness to again become part of our inhabitation patterns. Modularity and homes with a generalised site relationship will enable transferability and return flexibility to coastal settlements, ensuring permanence through community rather than built form. We see this not as innovation but return: "ka mua, ka muri".[2]

Fig. 6 Bloomfield & Yu (2021). Resilient Onehunga Masterplan. [Diagrammatic map]

Our project imagined a resilient Onehunga facing climate change by enhancing biosphere capacity and connectivity. Socio-ecological processes and patterns would be reconnected via tangible and intangible infrastructure, forming a palimpsest of ecological and social heritage. By holding two seemingly conflicting spheres together we propose a modular structure that is self-sufficient, ecologically diligent, and flexible. A stewardship model provides opportunities for on the ground experiments, co-learning, co-production of knowledge, and shared experience. We would hope to initiate an adaptive wave that cultivates new behavioural and social patterns that propagate from the top down and bottom up concurrently.

Fig. 7 Bloomfield & Yu (2021). (Un) fixed Inhabitation. [Composite image]



By reinforcing and re-establishing reciprocal relationships between communities and their environment, we aim to shape the future's past today, for those who will bear the consequences of our action or inaction.

Conclusion: Living within the biosphere's capacity

As much as we need to unfix maladaptive land use paradigms and practices, we also need new fixing practices to reinforce and embed proactively adaptive practices. Demand for resources must remain in balance with ecological capacity. Individuals need to consume less resources, produce less waste, and control the horizontal sprawl of building coverage. As Greer puts it, we need LESS, "Less Energy, Stuff, and Stimulation" to face "a future of hard limits and inevitable scarcities" (2015). Our response to this context is to imagine a lifestyle we term '(un)fixed inhabitation', a responsible way of living based on a social contract for sustainable development within the carrying capacity of our ecosystems. While some might see it as retrogressing to a frugal past, we argue it recalibrates the way we balance quality of life against the quality of the earth.

On the government and organisational level, (un)fixed inhabitation would step away from engineering solutions and centrally supplied infrastructural services. It would decommission vulnerable and maladaptive infrastructure and integrate resilient, modular, and agile ones. Such systems already exist. The RISE project (Revitalising Informal Settlements and their Environments), for example, delivers water, sanitation, and hygiene infrastructure for 24 informal settlements in Makassar, Indonesia and Suva, Fiji by means of site-specific 'smart' sewage tanks, bio-filtration gardens, constructed wetlands and recycled wastewater systems (Wright, 2020; RISE, 2020). Critical infrastructure does not have to lock down a built environment but can provide essential services in an adaptable way. Another example is the De Ceuvel project in Amsterdam, where the local government awarded a 10-year lease for a contaminated shipyard to communities who were willing to transform it in innovative and sustainable ways, and return a cleaner, healthier landscape at the end of the lease (Metabolic, 2021; Delva, n.d.).

On the individual level, (un)fixed inhabitation recognises that building adaptive capacity and changing the trajectory of climate change require actions from all

(Folke, 2021c: 15-24). Behind growth-driven economies are individuals conforming to market norms and consumerist ideologies, relying on cheap energy and extraction of natural resources. (Un)fixed inhabitation builds resilience skills and knowledge at household levels, caching essential resources and skills locally, ready to respond to unexpected disruptions. Existing examples of this shared learning include 'tiny house' movements internationally and in New Zealand, as well as the Living Lightly programme in Auckland (a collaboration between community groups, Auckland Council and other partners), which provides personal footprint tools and invites Aucklanders to discover their environmental impact and track personal progress (Auckland Council, 2021).

To transcend maladaptive paradigms, shifts do not need to be initiated by top-down actions, rather the process can be more fluid and responsive, happening both at individual and collective levels concurrently. Building resilience will require courage to challenge categorical definitions and formal boundaries set by the maladaptive paradigms; courage to open to multiple knowledge systems and interdisciplinary dialogue; courage to live with the unknown and unknowable; and courage to test utopian prototypes in the hope of arriving at a sustainable coexistence (Lerch, 2017: 25-27). In particular, we need to find the courage to re-imagine property 'rights' as property 'responsibilities'.

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ENDNOTES

1 We drew from architectural precedents including the De Ceuvel Cleantech playground (Metabolic, 2021), Cedric Price's Potteries Thinkbelt (Martin, 2014), tiny house movement (Radio New Zealand, 2018), and Crosson Architects' hut on sleds (Crosson Architects, 2012).

2 This Māori whakatauki is commonly translated 'walking backwards into the future' and implies learning from the past.