

## Indigenous knowledge driven nature-based solutions: findings from an international design competition

Maibritt Pedersen Zari<sup>a,b,\*</sup> , Mercia Abbott<sup>a,c</sup>, India Chenery<sup>a,d</sup>, Huhana Smith<sup>e</sup>,  
Rebecca Kiddle<sup>a,f</sup>, Lama Tone<sup>g</sup>, Selina Ershadi<sup>a,d</sup>

<sup>a</sup> NUWAO (Nature-based Urban Design for Wellbeing and Adaptation in Oceania) Research Project, Te Moananui-a-Kiwa Oceania, Aotearoa New Zealand

<sup>b</sup> Te Wānanga Aronui o Tamaki Makau Rau Auckland University of Technology, Auckland, Aotearoa New Zealand

<sup>c</sup> Wellington City Council, Wellington, Aotearoa New Zealand

<sup>d</sup> Te Herenga Waka Victoria University of Wellington, Aotearoa New Zealand

<sup>e</sup> Massey University, Wellington, Aotearoa New Zealand

<sup>f</sup> Te Wānanga o Aotearoa, Wellington, Aotearoa New Zealand

<sup>g</sup> University of Auckland, Auckland, Aotearoa New Zealand

### ARTICLE INFO

#### Keywords:

Design competition  
Nature-based solutions  
Indigenous knowledge  
Traditional ecological knowledge  
Climate change adaptation  
Pacific islands

### ABSTRACT

Nature-based solutions (NbS) strengthen biodiversity and ecosystems but should also centre human wellbeing. Understandings of wellbeing differ however and relate closely to cultural values, relationships with nature, and worldviews. This means that NbS can hold very different meanings across contexts, reflecting varying cultural values and understandings of wellbeing. This is true in the culturally diverse region of *Te Moananui* Oceania (the island nations of the Pacific), where relationships to nature and cultural worldviews are unique. The region is where many nations most impacted by climate change are located. NbS offer significant potential for effective climate change adaptation and are increasingly being explored and utilized in *Te Moananui* Oceania.

To explore nature-based adaptation agendas grounded in Indigenous ecological knowledge and cultural understandings of wellbeing, and to strengthen connections between NbS and place-based worldviews in urban climate adaptation, an international design competition focused on urban NbS in *Te Moananui* Oceania was held in 2023. This design-led research methodology was used to both understand how people were already thinking about and implementing NbS in relation to the range of Indigenous knowledge in the region as a means to adapt to climate change. The competition was also a means to capture and exhibit the collective imagination regarding climate futures in an inclusive, enabling, and impactful way. Strategies offered by competition entrants in turn informed ongoing research into how to design effective NbS in the region. We examine the usefulness of the design competition as a research methodology, and its suitability to bridge cultural differences, political agendas, and varying worldviews in the climate change adaptation arena.

Findings from over 70 entries revealed that working with water-based ecologies, storytelling, and relational place-based design were recurring themes. Many projects combined Indigenous and contemporary knowledge systems, suggesting that hybrid approaches have value. We argue that design competitions can be effective research tools; supporting dialogue across worldviews and illustrating contextually grounded strategies for just climate adaptation. For climate adaptation to be realistic, effective, culturally relevant, and just, a deep and considered understanding of connection to place and a place's people is vital.

## 1. Introduction

### 1.1. The *Te Moananui* Oceania context

*Te Moananui* Oceania, the Pacific islands region, is highly diverse in

its languages, cultures, colonial histories and realities, world views, ecologies, geologies, and climate change contexts, so what is effective in one place may not be appropriate in another. The notion of a 'Pacific region' is itself a debated construct [1]. Despite this, the peoples of *Te Moananui* Oceania are often linked through varied but shared concepts

\* Corresponding author at: 55 Wellesley Street, CBD, Auckland, Aotearoa New Zealand.

E-mail address: [maibritt.pedersen.zari@aut.ac.nz](mailto:maibritt.pedersen.zari@aut.ac.nz) (M. Pedersen Zari).

<https://doi.org/10.1016/j.nbsj.2025.100252>

Received 13 March 2024; Received in revised form 19 May 2025; Accepted 23 June 2025

Available online 1 July 2025

2772-4115/© 2025 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/by-nc/4.0/>).

of relationality and circular time. These are described in some places as *tā*, *vā/wā*, and *lā* [1–3]. The region is also united by the *Moana* (Pacific Ocean) as a physical space, expertly and intimately known and navigated by Oceanic peoples for thousands of years [4]. This echoes Hau'ofa's conception of Oceania as a 'sea of islands' [5]. Here we define *Te Moananui* Oceania as the Island nations of the Pacific, including Aotearoa New Zealand (Fig. 1).

### 1.2. Climate change and *Te Moananui* Oceania

The complex impacts of climate change, both direct and indirect, are perhaps the most significant issues humanity faces now and into the future [14]. Human activity, primarily from wealthier countries that industrialized earlier, as noted in the 1992 United Nations Framework Convention on Climate Change (UNFCCC), has driven climate change at an unprecedented rate [6]. Although the Pacific Island Nations (excluding Aotearoa) contribute only around 0.03 % of global emissions, they are disproportionately affected by climate change. Even if the world succeeds in limiting warming to 1.5 degrees Celsius, as outlined in the Paris Agreement, some islands, and entire nations, are likely to become uninhabitable in the traditional sense within this century [7].

Many Pacific Island nations are already among the most vulnerable in the world to weather-related disasters as well as earthquakes, volcanic eruptions and tsunami [8]. The low-lying atoll islands of Kiribati, the Marshall Islands, Tuvalu, Tokelau, and others are at particular risk from sea level rise [7].

In *Te Moananui* Oceania major issues related to the direct impacts of climate change include sea level rise, coastal erosion, storm surges, groundwater inundation, extreme weather and flooding events, and ocean acidification [7,16]. These factors are of particular importance in a region where Indigenous peoples are more likely to be directly reliant on self-harvested ecological resources for subsistence, or to experience food sovereignty issues [16], or are more likely to be directly impacted and in greater magnitude by climate change impacts [12].

Climate change impacts and societal pressures vary widely across the region and tend to interact in complex ways. The pressures of urbanization, lower socio-economic realities, ecological changes related to biodiversity loss both in terrestrial and marine contexts, and systemic inequalities related to the impacts of historic or ongoing colonization are all factors [15] and emphasize that climate change adaptation has significant social justice implications in the Pacific [11,13]. Some Pacific researchers suggest that the commonly used term 'vulnerability', often framed through a Western lens [9], can instead be understood as an enhanced adaptive capacity to navigate highly dynamic environments. From this perspective, many Pacific nations illustrate increased ability to practise and demonstrate resilience, making them not just 'vulnerable' but in fact leaders in adaptability [10].

### 1.3. Nature-based solutions in *Te Moananui* Oceania

Understanding and working symbiotically with nature, to generate or sustain human wellbeing, and to adapt to changes is not a new concept in *Te Moananui* Oceania [15,17,18]. The term 'Nature-based solutions (NbS)' is defined by the IUCN [19] as '*actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature*'. NbS is an umbrella term that covers a wide range of strategies for working with nature to improve human wellbeing through strengthening ecological health for the benefit of all life. Working with nature can lead to more effective and culturally appropriate responses to societal challenges such as climate change while conserving or restoring biodiversity [20].

Cultural concepts of human-nature relationships influence the design of NbS. In diverse *Te Moananui*-Oceania, Indigenous peoples have varying relationships with nature that tend to emphasize interconnected socio-ecological systems, and spiritual dimensions of nature, which may differ from dominant industrialised or technocratic ideas about how people should engage with and relate to nature [11].

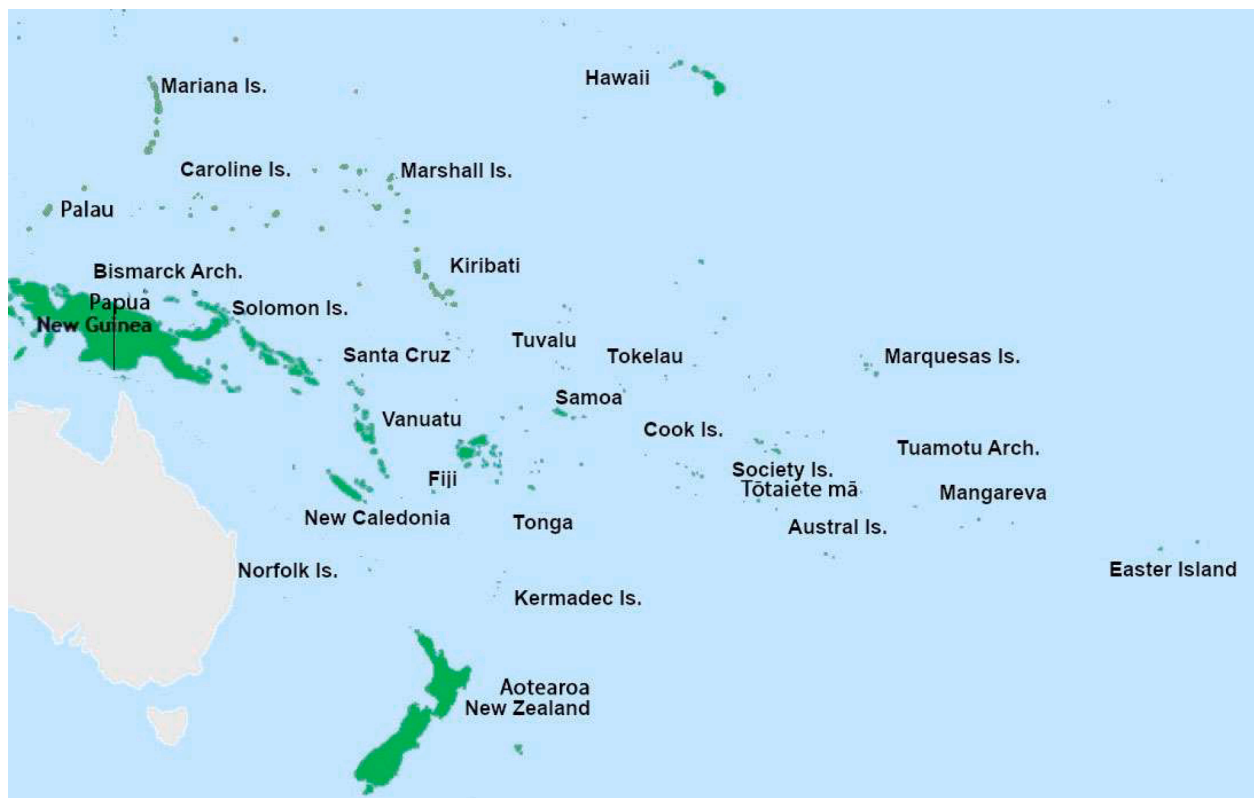


Fig. 1. *Te Moananui* Oceania. Image by Sam Wood, 2024.

Almost all ‘standardizations’ of NbS terms and processes come from outside of *Te Moananui* Oceania, and most NbS literature does not consider Indigenous knowledge or participation [21]. This occurs despite clear evidence that adaptation actions and policies that include Indigenous and/or local people in conception, design, and implementation are more effective [22], and that ‘*climate policies need to tap into intrinsic, deeply-held values and motives if cultural innovation and change are to be lasting and effective*’ [23]. Cottrell [21] points out that ‘*future assessment and revisions to the IUCN standards should build upon the inclusion of Indigenous peoples and local communities and strive to better validate, integrate, and protect Indigenous local knowledge in NbS projects*’. There is a clear need to reassess how NbS can better align with Indigenous conceptions of wellbeing and human-nature relationships in *Te Moananui* Oceania, where most nations or states (except for New Zealand, New Caledonia, and Hawai’i) have majority Indigenous populations. Without this framework of reference, NbS may in fact undermine the wellbeing of Indigenous people [11].

Mihaere et al. [11] argue that working with nature in the context of *Te Moananui* Oceania is not just a technical exercise, but a deeply meaningful, potentially spiritual, and inherently political act in the context of decolonization and re-Indigenization. They discuss regional concepts of time, space and interconnected living forces that link all forms of life, including entities not typically considered alive in Western science such as land, ocean, forests, mountains, and rivers.

Given this context, this research aimed to explore how NbS for urban climate adaptation in *Te Moananui* Oceania can be effectively informed by Indigenous ecological knowledge and culturally grounded conceptions of wellbeing. Specifically, the study asks: How can people conceive of and design NbS in *Te Moananui* that are just, appropriate, participatory, and effective?

While traditional research methods, such as literature reviews, surveys, interviews, and case study analysis, typically produce journal articles, conference papers, and reports, design-led research methodologies offer different insights and outputs including visual design work, mapping explorations, exhibitions, and podcasts. This paper reports on one such design-led research methodology; the design competition. This ties into the secondary research question investigated here: Can the design competition serve as a valid and impactful research methodology for driving climate adaptation in culturally diverse regions?

#### 1.4. The NUWAO nature-based urban climate adaptation for wellbeing driven by indigenous knowledge design competition

The design competition and resulting exhibition series discussed in this article were conceived of and organized by NUWAO (Nature-based Urban design for Wellbeing and Adaptation in Oceania); a three-year project funded by the New Zealand Government through a Royal Society of New Zealand Marsden grant. External research funding was obtained for prizes, a prize-giving ceremony, and to partly cover exhibition costs (see acknowledgments section). NUWAO aims to develop nature-based urban design solutions, driven by Indigenous knowledges that support climate change adaptation and individual and community wellbeing in diverse *Te Moananui* Oceania urban settings. Further details about NUWAO and an online exhibition of competition work are available at [www.nuwao.org.nz](http://www.nuwao.org.nz). The competition was run from Aotearoa New Zealand through Te Wānanga Aronui O Tāmaki Makau Rau Auckland University of Technology’s (AUT) School of Future Environments, and Te Herenga Waka Victoria University of Wellington’s (VUW) School of Architecture, Wellington. Entries were received and judged in November 2022.

Whilst design competitions, and even NbS design competitions have been held around the world (see for example the Nature-based Solutions Challenge [24]), the use of design competition outputs as research data is relatively unique. Competitions such as *Imagining Decolonised Cities* [25] demonstrate how entries can be used not just as proposals, but a

form of participatory research. Treating competition entries as data supports a democratisation of solution building and opens up access to designers worldwide to contribute to the development of these solutions.

A key objective of this project was to build capability in relation to NbS that work in and are appropriate for *Te Moananui* Oceania specifically, and to centre Indigenous knowledges in these solutions. As a result, some submissions may not align with standard international definitions of NbS, such as those set by the IUCN [26]. However, there is growing recognition within the region that global standards may not fully capture local values, relationships to nature, or culturally grounded approaches [11,16]. Work is currently underway to adapt and contextualise these standards to better reflect and serve the priorities of *Te Moananui* Oceania.

Recognising that all knowledge systems are evolving, and that Indigenous knowledge in *Te Moananui* Oceania is both traditional and contemporary and future-focused, we use the term Indigenous Ecological Knowledge (IEK) rather than Traditional Ecological Knowledge (TEK). The term IEK reflects a commitment to design approaches that are grounded in Indigenous ways of knowing while not confining them to the past. Design in this context can be viewed as a sovereign act; an expression of the rights of Indigenous peoples to determine how climate adaptation and socio-ecological regeneration should occur in place. This aligns with Article 31 of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) [27], which affirms the right of Indigenous peoples to maintain, control, protect and develop their cultural heritage and traditional knowledge, as well as their sciences and technologies. Indigenous-led NbS can be perceived therefore not only as ecological strategies but also as acts of sovereignty and self-determination.

This framing was central to the intent of the NUWAO design competition. By inviting designers, students, and community members to engage with the socio-ecological context of *Te Moananui* Oceania, the competition aimed to capture expressions of climate adaptation grounded in specific cultural and ecological contexts. The aim was to ask how nature-based design can serve as an enactment of relational responsibilities to land, water, and people specifically in *Te Moananui* Oceania. In doing so, the competition provided a platform to explore not only the technical or aesthetic dimensions of NbS, but their deeper ethical, cultural, and geopolitical implications. The competition aimed to highlight the potentials of NbS to foster more-than-human considerations in design, support co-design processes, and articulate Indigenous-led pathways of resilience that are rooted in both tradition and innovation.

#### 1.5. Positionality

In line with a commitment to decolonising research practices [28, 29], we acknowledge the diverse positionalities of the authors, which shape the perspectives and approaches taken in this article. Our team includes researchers and practitioners who are Māori (Indigenous New Zealanders), Samoan, Pākehā (New Zealanders of European descent), and Tauīwi (New Zealanders of non-Māori descent). Positionality is understood here not solely in terms of ethnicity or ancestry, but as shaped by worldviews, lived experiences, and ethical commitments. Further details about each author’s positionality are available in the supplementary material.

## 2. Methodology

### 2.1. Design-led research

Design-led research is a set of methods where the processes and outcomes of iterative design can be analysed to contribute to research findings [30]. It is common in architectural and urban design academic research and is often associated with more participatory outcomes [31].

It is thought to be useful when seeking to address complex problems (in this case climate change adaptation) to transform conceptual thinking into actionable design agendas and solutions [32]. While traditional research methods typically involve systematic data collection, analysis, and interpretation, and are based in the context of what exists and can be measured now, design-led research can be used to generate ideas and foster creativity in addressing specific challenges. It tends to be in the future realm of what is possible.

## 2.2. Design competition as research methodology

Design competitions have a long tradition in architecture, going back at least 2500 years [33]. They provide a dynamic approach to exploring, addressing, and solving design challenges and offer a platform to test the practical application of creative thinking. This makes them a unique form of research methodology within the domain of design that pushes the boundaries of excellence [34]. Design competitions can serve to understand emerging trends and innovative solutions within a specific field or related to a given design challenge. Analyzing the outcomes of competitions can enable researchers to identify common thinking as well as new ideas and approaches that may influence broader research findings. The NUWAO Design Competition sought design solutions to climate change adaptation in *Te Moananui* from a wide range of professionals, students, and the general public to generate research findings by analyzing emerging themes and new potential solutions from the body of submitted work.

Design competitions are a kind of design-led research methodology and typically present participants with a specific challenge that serves as the research question or focus. In the case of this research, we posed a series of research questions to stimulate design responses including: How can we respond to climate change and societal challenges using NbS together with Indigenous knowledges in *Te Moananui* Oceania? Can design help to integrate nature into urban spaces and transform them so they can evolve or regenerate socio-ecological living systems? How might we improve our ecologies and wellbeing in just ways through climate change adaptation?

Many design competitions emphasize a ‘user-centered approach’, where people are encouraged to consider the needs and preferences of the end-users. This aligns with the principles of design-led research, where user insights often play a crucial role in shaping solutions, and is compatible with concepts of climate justice where it is acknowledged that local people often know best what is needed for their community [11]. In this research, we encouraged people to centre the wellbeing of local people rather than take a purely technical approach to climate change adaptation. Because most of the nations and states of *Te Moananui* Oceania are made up of majority Indigenous populations, the climate adaptations NUWAO were particularly interested in were ones that are rooted in Indigenous ecological knowledge (IEK). This relates to knowledge that is intrinsically connected to place, by working with the *whenua* (land) and *wai* (waters), and by reading and naming *tohu* (signs in nature) where understanding how everything is interconnected, and letting nature be navigator and teacher is key [35]. In the context of Aotearoa New Zealand, Tuhiwai Smith points out that ‘*Māori knowledge represents the body of knowledge which, in today’s society, can be extended, alongside that of existing Western knowledge*’ [24]. The premise and perhaps provocation of the competition was that both traditional and western science knowledge systems could work together to combat climate change and actively contribute to environmental regeneration. The competition was conceived of to elevate and better understand Indigenous knowledge of the region in the context of climate change adaptation.

A final reason for employing the design competition as a research methodology ties into the concept of enabling and building capabilities across *Te Moananui* Oceania in relation to climate change adaptation. The competition provided a platform for participants to engage deeply with IEK, not only as inspiration but as a foundation for exploring,

expressing, and disseminating contextually grounded responses to climate challenges. This approach recognises design competitions as a potential method for co-designing solutions, strategies, and plans in partnership *with* communities, rather than *for* them. An aim was to empower communities to articulate their visions for climate adaptation, to initiate dialogue, and to bring to light the complex realities of lived experience in the face of climate change in the unique context of *Te Moananui* Oceania. In doing so, it sought to shift the focus from deficit-based narratives to those centred on resilience, capability, and inter-generational care, which is important in many *Te Moananui* Oceania cultures. As climate impacts continue to affect all dimensions of well-being, including the rise of ‘eco-anxiety’ and ‘climate grief’ [36], participating in future-oriented design processes offers a hopeful, action-based response rooted in cultural identity and collective stewardship.

## 2.3. The NUWAO competition process

The competition was conceived of as a platform to generate innovative concepts, methodologies, processes, and design strategies for climate adaptation in *Te Moananui* Oceania and to understand and rethink urban environments, particularly in ways that centre, celebrate, integrate, and draw upon local Indigenous knowledges. The aim of the competition was to deepen understanding of the specific challenges facing urban areas in Oceania and to assess existing knowledge and approaches to these issues. At the same time, it sought to capture the collective imagination; inviting creative, culturally appropriate, and technically effective visions for adapting to climate change.

People were invited to share their visions of a happier and healthier way of living brought about through climate adaptation work, that supports the resilience of communities, responding to societal challenges by working with nature together with Indigenous knowledges (often one in the same), while acknowledging, celebrating, and working with local cultural identities. Entrants were organized into three categories (professionals, tertiary students, and youth / general public). The professional category was open to design and built environment professionals, urban ecologists, development professionals, and related practitioners. The student category was open to all tertiary students who were currently studying or who had graduated since 2020. Design ideas could be expressed through a variety of mediums. Design professionals and tertiary students were asked to submit work in traditional urban, landscape, and architectural design formats (plans, sections, and perspective images) with scope for creativity. The general public category invited submissions of any visual, written, or oral recorded cultural expression work. Both individual and group entries were welcomed across all categories.

The call for the design competition was disseminated through video and written word through various architectural design websites and magazines, email networks, blogs, and social media platforms over a period of 6 months in 2022. Promotional materials announcing the design competition were distributed to selected primary and intermediate schools, as well as universities across *Te Moananui* Oceania. This approach aimed to encourage integration of the competition into teaching syllabi, creating opportunities for deeper engagement and learning through classroom-based exploration of climate adaptation and Indigenous knowledge systems. The iterative process of design encourages people to explore the challenge from various angles and usually designers conduct initial site, climate, and cultural research to understand the context and constraints associated with the challenge. To aid in this contextual design research phase, resources including, maps, academic journal articles, and reports related to key *Te Moananui* sites of interest to NUWAO (South Tarawa in Kiribati, Port Vila in Vanuatu, Apia in Samoa, and The Taieri catchment and Awakairangi (Lower Hutt) in Aotearoa New Zealand) were available online for entrants, though any urban site in *Te Moananui* could be chosen.

Submissions were identified only by an assigned registration number

rather than name, ensuring that the judging process remained blind. This meant that projects were considered without judges knowing names, ages, Indigenous affiliations, or where the entrants were from. Indigenous affiliations were not required from entrants, but many choose to supply this information. Judging took place on the 28th of November 2022 in Wellington, New Zealand where seventy-seven eligible entries were considered. Each category had a first prize of \$NZ1500, two runner-up prizes of \$NZ500, and a total prize pool of \$NZ1000 for special mentions across the three categories.

Dr Rebecca Kiddle of Te Wānanga o Aotearoa, Wellington, Dr Huhana Smith of Massey University, Wellington, and Lama Tone of the University of Auckland, Auckland were invited to judge the entries. NUWAO invited these three judges because they are well-known academics, artists, and designers, are respected in their fields, known for their high-calibre work, and have skills in and lived experience of Indigenous knowledge from their own ancestry and *mahi* (work).

Design competitions typically involve a judging process where entries are evaluated based on predefined criteria. The criteria for the NUWAO Nature-based Urban Climate Adaptation for Wellbeing Driven by Indigenous Knowledge Design Competition were ranked as high, medium, or low for: effectively working with nature and ecosystems; ability to adapt to climate change impacts; working with local and/or Indigenous knowledge; and ingenuity and creativity.

#### 2.4. Public engagement

Public engagement and communication are typical parts of design competition methodology, often involving prize givings, exhibitions, presentations, panel discussions, and online platforms. These activities support research impact by engaging broader communities beyond academic publishing. Selected competition work was exhibited in 2023 and 2024 in Wellington (VUW, Thistle Hall, and The New Zealand Climate Change Commission), Auckland (AUT) in Aotearoa New Zealand, and in Rarotonga, Cook Islands. Some prize winners participated in an awards ceremony, open forum at the exhibition opening, and a panel discussion at the 2023 NUWAO International Symposium on Nature-based Urban Climate Adaptation for Wellbeing, held at VUW creating opportunities for public dialogue.

### 3. Results

To analyse the seventy-seven eligible entries submitted to the NUWAO Design Competition, we applied a thematic coding framework based on:

1. Typology and programme (e.g., water structures, master plans, architectural spaces, conceptual artworks);
2. Knowledge and technology approach (e.g., traditional/Indigenous, hybrid, contemporary high-tech); and
3. Ecosystems and climate impacts (e.g., sea level rise, flooding, biodiversity loss);
4. Cultural grounding and Indigenous concepts (e.g., mātauranga Māori, place-based narratives, more-than-human design logics).

This analytical structure allowed us to assess the diversity of responses, the prominence of Indigenous knowledge in shaping NbS proposals, and patterns that could potentially inform future design and policy work in the region.

The design competition attracted a highly diverse range of entries, both in terms of who submitted them and where the projects were located, with sites across Oceania and beyond. While around half of the entrants came from within the region, the blind judging process resulted in winners from a surprisingly wide array of countries and territories, including Aotearoa New Zealand, the Canary Islands, Russia, Indonesia, and China. All submissions were imaginative rather than realised proposals, and each entrant or team responded to the brief in distinct ways.

The projects explored various dimensions of working with nature and addressed multiple aspects of climate change, with many focusing on adaptation rather than mitigation as a means to respond creatively and practically to the combined impacts of climate change and rapid urbanisation in Oceania.

Fourteen prize winners were selected by the three competition judges. In both the professional and student categories, two equal first place winners and one-third-place winner were awarded (no second prize), while in the general public category, first, second, and third prizes were given. In addition, five special mentions were awarded to entries that stood out and scored highly. A brief selection of winning projects are described below. More detailed descriptions are given in supplementary material.

#### 3.1. Prize winners

##### 3.1.1. Professional category

Entries in the professional category demonstrated diverse strategies for climate adaptation, often combining traditional ecological knowledge with contemporary materials or forms. Projects focused on coastal resilience, regenerative land-making, and culturally grounded material practices. A key emerging theme was working with water and embracing dynamic ecological processes rather than resisting them. The most successful proposals integrated Indigenous knowledge into both conceptual frameworks and material systems.

One of the winning entries, *'Fishing Sand'* by Lourdes Galindo Delgado and Héctor García Sánchez (S.O.S RETHINK, Canary Islands), used woven coconut fibre netting to form coastal barriers different to but reminiscent of existing traditional ways to manage coastal erosion in Kiribati, through the buibui method [37–39]. Judges recognised its low-tech innovation and adaptability, allowing local communities to construct modular structures for erosion control and lagoon protection. Its combination of ancestral practice and adaptive design embodied an effective hybrid NbS approach (Fig. 2).

*'I hanga tātou i te whenua'* (we create the earth together), a project by Jacky Bowring (Aotearoa New Zealand), proposed using household waste to build human-made islands in Christchurch's red zone; land severely affected by the 2010 and 2011 earthquakes and highly vulnerable to sea level rise. Drawing on examples of Indigenous island-building across the Pacific, the project combined contemporary municipal systems with ancestral land-making knowledge to generate new habitats and resist coastal inundation (Fig. 3).

A final unnamed project by Anna Konoplitis, Alexandra Barmushkina, Rudolf Kizelbash, Julia Lavrentieva, Polina Belets, Arden Gabrielyan, and Julia Zurarik (Russia) presented a master plan for Tarawa Atoll in Kiribati, incorporating floating farms, mangrove restoration, and biorock reefs. While rich in speculative urban design and biodiversity strategies, it relied on futuristic technologies and was less rooted in local cultural frameworks (Fig. 4).

Across this category, winning entries showed a shared commitment to working with water and employing site-responsive adaptation strategies. Projects that referenced or built on Indigenous methods were more likely to be considered appropriate and resilient within the context of *Te Moananui* Oceania.

##### 3.1.2. Student category

Entries in the student category explored hybrid approaches, blending Indigenous ecological knowledge with new materials and urban infrastructure. Many designs focused on riparian and wetland ecologies, showing strong awareness of site-specific conditions, cultural narratives, and opportunities for educational and community engagement. The use of storytelling and sensory experiences was a notable trend across student submissions.

One of the winning projects, *'Mutuality'* by Nina Cole (Massey University, Aotearoa New Zealand), proposed a floating walkway along Te Awakairangi River that integrated EConcrete and wetland planting to



Fig. 2. ‘Fishing Sand’. Image by Galindo Delgado and García Sánchez, 2022.

**E hanga ana tātou i ngā motu**  
BUILDING THE ISLANDS

## ŌTAUTAHI

**14**

The prototype of Future Islands is proposed for Ōtautahi’s Residential Red Zone (14). The Red Zone was cleared of housing following the earthquakes, owing to soil and water conditions.

The area mimics the effects of sea level rise, as the ground level dropped up to 1 metre. There are resonances with the Waihou River area, as shown earlier in images 1 and 2. Both areas are flat river plains that have experienced substantial subsidence following an earthquake.

The Red Zone ground is already very wet, and prone to flooding (15). The land is flat and rising sea levels mean the area will quickly become inundated and inaccessible, and the relationship with the coastal edge will be difficult. We need to be pre-emptive and begin piling the midden before the water levels rise further.

**15**

## MIDDEN

Ōtautahi has an excellent record of waste management. The city recently achieved a recycling milestone, with every truckload of recyclable material picked up from the roadside being accepted for processing. This means that none of the truckloads were rejected because incorrect material had been placed in residents’ ‘wheelie bins’. Ōtautahi also has an established green waste roadside collection, so residents are used to sorting out organic waste.

The new ‘midden’ bin will become a familiar part of daily life for residents as well as marine and commercial facilities. The bin gathers shells, bones, terracotta, charcoal, and other natural materials for island building. Electric rubbish trucks transport the material to the Red Zone. Although it seems a daunting task to build islands from waste, the Indigenous precedents demonstrate the potential to create landforms of substantial scale.

**3421247**

## QUINCUNX

*Quil Quincunx freestitas, qui, in quam cunqz partem spectaueris,*

**16**

The midden piles are laid out in a quincunx pattern. This is a specific type of grid, best described as how the ‘5’ appears on a dice, with one point in each corner and one in the middle – as opposed to a square grid which is like a chess board. It is an efficient grid layout as more elements can be included in a quincunx. Image 16 is the iconic quincunx diagram from Thomas Browne (1658). The quincunx was used by Maori, and was noted by the crew of the Endeavour. In his diary, Joseph Banks observed what were likely to have been kūmara plantations, writing, “When we first came to Toigaitū their crops were just covered and had not yet begun to sprout: the mould was as smooth as in a garden, and every root had its small hillock rang’d in a regular Quincunx by lines which with the pegs still remain’d in the field.” (1770). For ngā motu it means setting up an efficient geometric layout which over time will become shaped by the actions of the waves, tides and currents.

Image sources  
14. GeoImage map from Canterbury Maps CC BY 4.0  
15. Ōtautahi Residential Red Zone, photo by Michael Klusen CC BY SA 4.0  
16. Thomas Browne, Prolusion to *The Garden of Cyrus* (1658), Public Domain

Fig. 3. ‘I hanga tātou i te whenua’, image by Bowring, 2022.

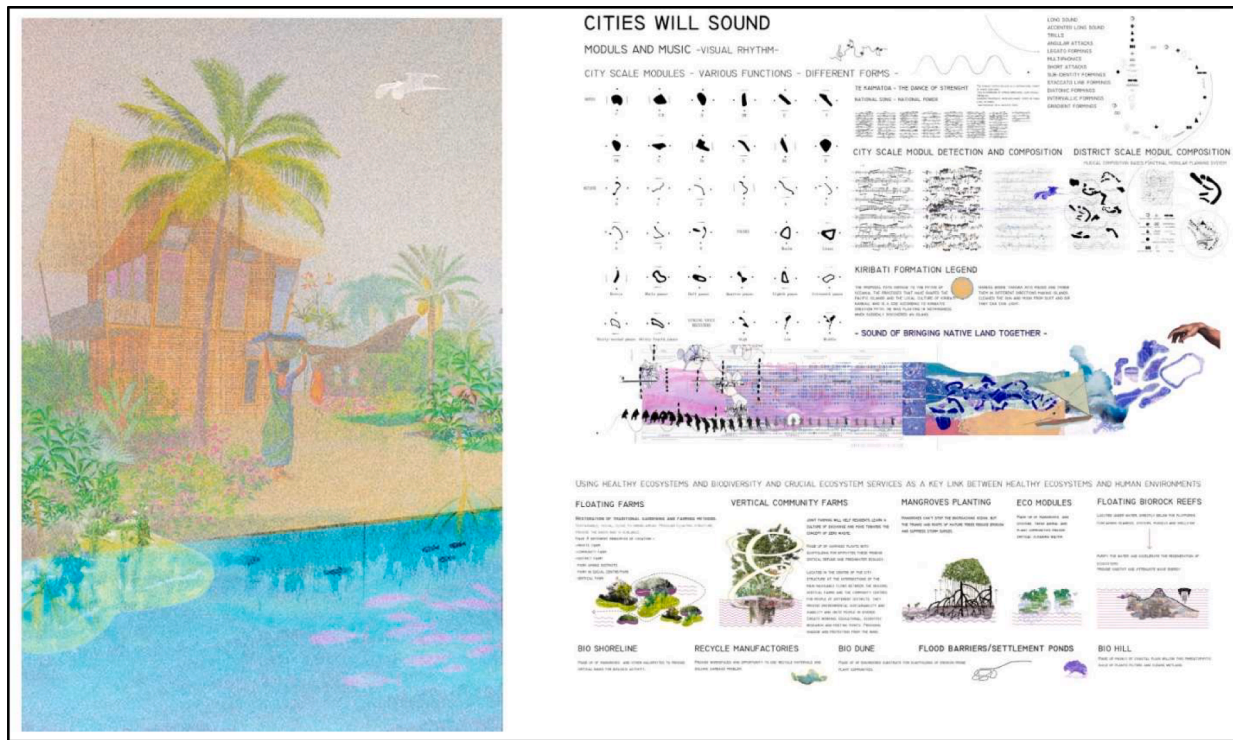


Fig. 4. Image by Konoplitis, Barmushkina, Kizelbash, Lavrentieva, Belets, Gabrielyan, and Zurarik, 2022.

improve biodiversity and community access. The design celebrated playful human-water interaction, thereby strengthening human relationships to nature, and responded to flooding risk. It illustrated a conceptual idea from local *mana whenua* (people Indigenous to a given area in Aotearoa New Zealand) to improve transport connections and provide an additional crossing of the river (Fig. 5).

‘Wetland for the Future’ by Bridget Allan (Lincoln University, Aotearoa New Zealand), another prize winner, illustrated the design of the restoration of a degraded wetland along the Pūharakekenui River in Christchurch, Aotearoa. It was driven by some Te Ao Māori concepts, the *maramataka* (Māori lunar calendar), and celestial navigation as guiding design principles. Built structures included observation points and education spaces, reinforced the value of Indigenous knowledge in ecological restoration and place-based learning (Fig 6).

Across student entries, the most successful designs foregrounded human-nature relationships and ecological regeneration, using design as a tool for re-learning and re-connecting with place. Cultural grounding, rather than purely technical ambition, distinguished the strongest submissions.

### 3.1.3. Youth and general public category

Submissions in the youth and general public category displayed a wide range of creative approaches, including school redesigns, speculative coastal interventions, and visual storytelling. While diverse in media and intent, many entries shared a focus on community wellbeing, intergenerational learning, and respect for local ecosystems. The emphasis was often on communicating values rather than technical resolution.

‘Alona: Alongside Nature’ by Nurul Izza and Tri Anggita (Indonesia), proposed a green belt and elevated housing to address flooding in Lower Hutt, Aotearoa New Zealand. The design integrated mangrove planting and renewable energy, and acknowledged the role of local *iwi* and *hapū* (Indigenous people of the place, tribe, family unit) in guiding urban adaptation strategies (Fig. 7).

‘Redesign of St. Patrick’s School’ by Beau Gray (age 11, Aotearoa New Zealand) embodied a rich value system of *kotahitanga* (unity), *whanau-gatanga* (connection of family), *manaakitanga* (hospitality), and *kaitiakitanga* (guardianship). The proposal included green infrastructure, food gardens, and a layout aligned with Te Ao Māori. Judges highlighted the clarity and depth of cultural understanding conveyed by such a young

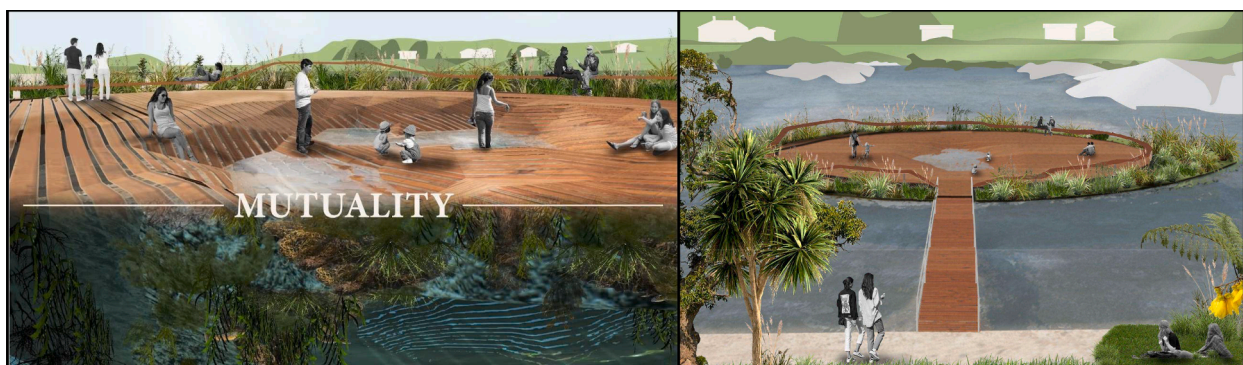


Fig. 5. ‘Mutuality’, image by Cole, 2022.

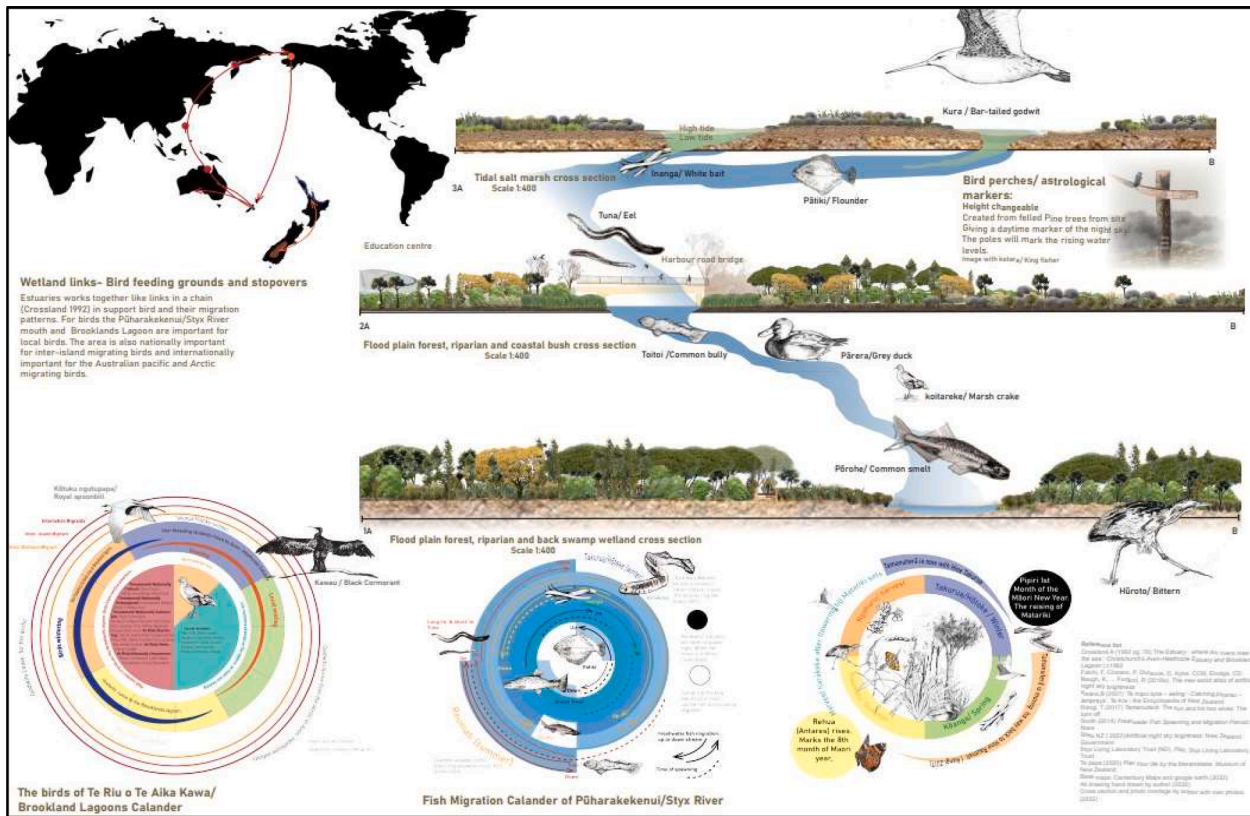


Fig. 6. 'Wetland for the Future'. Image by Allan, 2022.

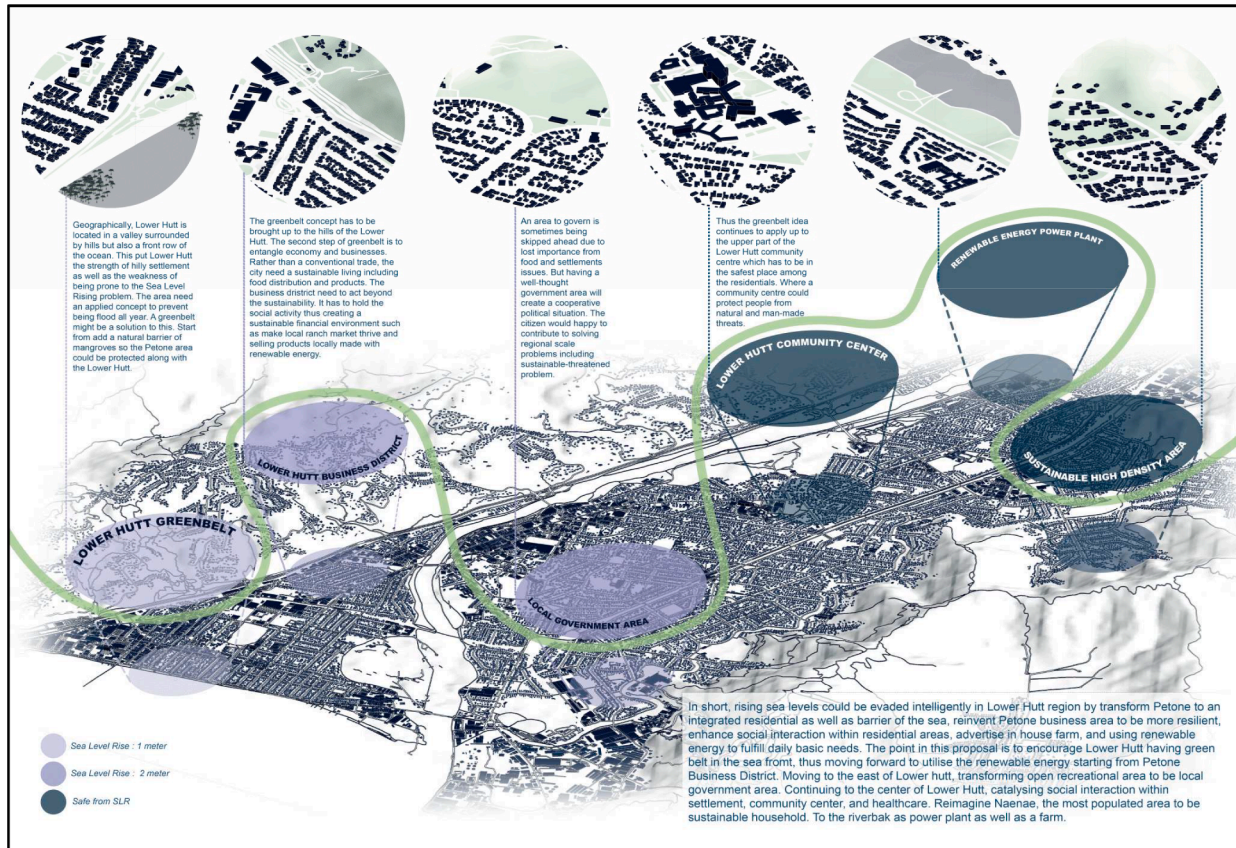


Fig. 7. 'Alona: Alongside Nature'. Image by Izza and Anggita, 2022.

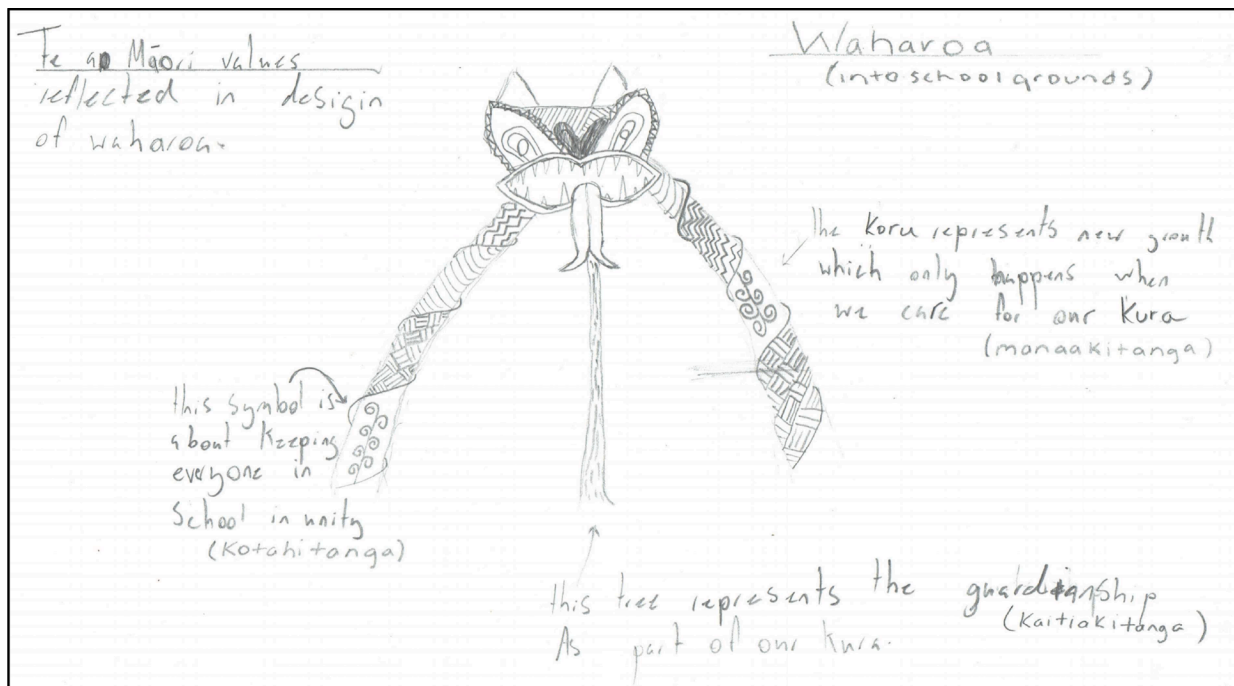


Fig. 8. 'Redesign of St. Patrick's Catholic School'. Image by Beau Gray, 2022.

designer (Fig. 8).

Overall, this category reinforced the value of inclusive design competitions in enabling the expression of grounded, relational perspectives, especially from groups often excluded from formal climate adaptation discourse. Entrants demonstrated that cultural values, even when expressed simply, can powerfully shape how communities envision resilient, nature-connected futures.

### 3.2. Typology and programme

#### 3.2.1. Urban contexts

One of the aims of the competition was to focus on towns and cities within the region. While we used the term 'urban' in promotional materials, the concept is not clearly defined across *Te Moananui* Oceania, where many 'cities' are relatively small and 'towns' may lack formal boundaries, often blending into dispersed peri-urban or village areas.

We deliberately chose not to rigidly define what constituted 'urban', in order to give participants the freedom to interpret the term in ways that made sense within their own contexts. As a result, some submissions, including winners, did not strictly focus on dense urban areas, but still generated valuable and thought-provoking ideas.

#### 3.2.2. Projects by typology or programme

Out of seventy-seven, almost half of all entrants (46 %) focused on the design of water structures, meaning projects where the main element of their design related to water (Figs. 2–7). These included high structures (to get above high tides, storm surges, or rising sea levels) (e.g. Fig. 9), floating structures (on the water, and able to rise and fall with it) (e.g. Fig. 5), the incorporation of deliberately floodable areas of structure or whole landscapes, wetland restoration and mangrove planting, and the incorporation of sea walls (e.g. Figs. 6, 7). Another 37 % of entries focused on architectural urban spaces including the master



Fig. 9. Rescue Station. Image by Kirill Mukaseev, 2022.

planning of towns or cities or plans for a community or neighbourhood. Many projects envisaged multiple buildings and catchment level landscape analysis and interventions in their proposals. ‘Urban Design with Nature - What Does the Future of Tāmaki Makaurau Look Like?’ by James Paxton (Fig. 10) for example focused on the urban development of Alexandra Park in Tāmaki Makaurau Auckland, Aotearoa New Zealand with multiple buildings, courtyards and landscaping. The project explored possibilities for the redesign of the urban fabric to include walkable areas, biodiversity positive interventions, and rain gardens within the city landscape.

Approximately 10 % of entries focused on interventions that encouraged tourists to come to the Pacific Islands. Entrants discussed engaging with visitors in these projects with an aim to grow economies and increase employment opportunities. ‘Beyond Little Kiriwina’, by Fatiha Nugrahati shows resort style raised buildings over the water located in Kiriwina, Papua New Guinea for example (Fig. 11).

Finally, a small but significant proportion of entrants (7 %) focused on a more experiential and experimental response to the design brief where the wellbeing of the inhabitant was centred. These projects could be considered conceptual or even art installation in typology and were designed in many cases to create awareness around a topic or issue or encourage behavioural change. An example is ‘A living tapestry of water bodies’, by Kate Ashworth of Massey University in Wellington, Aotearoa New Zealand. This project received a special mention and shows a walkway which erodes with weathering and water level increases, depositing seeds as it does to then form the landscape around it (Fig. 12). This project was sited on the banks of Te Awakairangi Lower Hutt, New Zealand. It also spoke to the importance of connection to the past and how people ‘hold our own tapestries - interwoven webs of *tīpuna* (ancestors) and *uri* (descendants), with threads deeply tied to ecologies and environment’. Fig. 13 summaries the analysis by typology or programme.

### 3.3. Knowledge and technology approach

The competition called for Indigenous knowledge driven ways to adapt to climate change. Most entries had a mixture of ideas (both traditional and contemporary) from within *Te Moananui* Oceania and from outside the region of Indigenous knowledge and that from contemporary architectural and urban thinking. All of the winners had processes, elements, or conceptual frameworks in their designs related to Indigenous knowledges of *Te Moananui* Oceania in some form. This was because a key aspect of judging criteria was the ability to work with local or Indigenous knowledge. However, most of the design outcomes produced by both winners and the rest of the entrants drew heavily on new technologies rather than traditional knowledges or technologies.

In terms of the technologies used in the designs a large majority (91 %) focused on employing current or potential future technology. ‘New Zealand Rescue Station’ by Kirill Mukaseev (a student from Stieglitz Academy in Russia) (Fig. 9) received a special mention and designed a tall structure with a helicopter pad for people to be rescued in the event of a flooding or other emergency for example. It was sited in Te Awakairangi Lower Hutt, Aotearoa New Zealand. The tower can hold up to 100 people for a week and has a constant rotation of water which turns a turbine to produce electricity along with a filtration and storage system for fresh drinking water. These ideas are not related to an Indigenous worldview or working with nature but are innovative in thinking about new ways to adapt and challenge a business-as-usual response.

‘Volcanic Ash’, by Zhuang Qianyu, Gu Xiaotong, Zhao Ruyun, and Cheng Yanan (students from Beijing Institute of Fashion and Technology, China), also received a special mention (Fig. 14). This project was located in Tonga and demonstrates an innovative response to local conditions. The Hunga Tonga-Hunga Ha’apai Volcano 65 km north of Tongatapu, Tonga’s main island, erupted in December 2021 and January 2022 causing ash clouds and tsunamis which greatly impacted Tongatapu [40]. These events inspired the students to propose incorporating microalgae hydrogel combined with local volcanic ash cement as a material support set on rooftops along with a framing layer for structural integrity. They asserted that microalgae have carbon sequestration properties and can absorb nitrogen oxides, sulphur oxides, and hydrogen sulphide from volcanic gases, allowing the algae to multiply when covered in volcanic ash. They used hydrogel because as a material with stable water content, it can control the reaction of microalgae organisms and their biological activity. In the design, the volcanic ash is filtered by a designed ‘holder’ and falls into a collection pond, where it is harvested by a suction unit and can then be recycled as crop fertilizer.

A small number (8 %) of projects were categorised as ‘traditional’ meaning those that focused fundamentally on the application of Indigenous processes, practices, and knowledge systems specific to place. These projects recognized and/or referenced fundamental values that connect *whenua* (land), *wai* (water), and *tangata* (people) as interconnected living ecosystems. This concept of ecosystems and natural elements such as mountains, rivers, oceans as being alive has common threads among the diverse world views of Pacific peoples [11]. People are often seen as *kaitiaki* (guardians) of *Te Taiao* (the living world and natural system) within this context. In these projects, there was a focus on regenerative measures, strengthening human-nature relationships, and connecting to the past as a way of moving forward. ‘Wetland of the Future’ (Fig. 6) was a project that used core values of *kaitiakitanga* (guardianship) of the land for example. Restoring the land back to its



Fig. 10. ‘Urban Design with Nature - What does the Future of Tāmaki Makaurau Look Like?’ Image by James Paxton 2022.

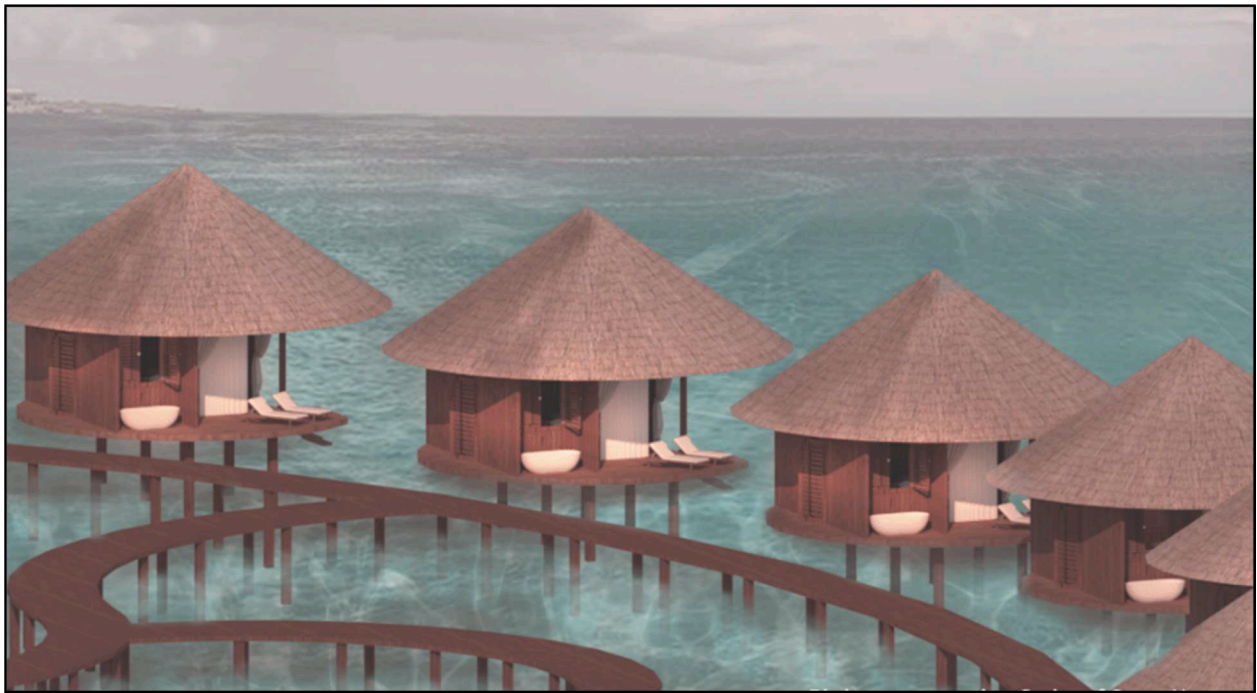


Fig. 11. 'Beyond Little Kiriwina'. Image by Fatiha Nugrahati, 2022.



Fig. 12. 'A living Tapestry of water bodies' Image by Kate Ashworth, 2022.

former wetland state, daylighting streams, creating a biodiverse ecosystem, reconnecting people to their natural environment, and highlighting the past important trading route for Kai Tahu (also known as Ngāi Tahu). The technologies and ideas used were rooted in Indigenous knowledge and importantly *whakapapa* (genealogical ties) to the area. Another entry of note in this regard was from Te Wānanga Aronui O Tāmaki Makau Rau Auckland University of Technology's whole architecture programme across years two to four, including work from more than one hundred students (Fig. 15). This work showcased a diverse range of nature-based responses to the re-design of Rotorua in Aotearoa New Zealand. All the work was guided by an Indigenous knowledge derived framework named the 'Mauri Ora Compass', designed by Yates et al. [41]. They state that '*mauri ora is a radically*

*inclusive notion of wellbeing that pertains to all more-than-human entities... an indissoluble network of interacting relationships'* [41].

### 3.4. Ecosystems and climate impacts

#### 3.4.1. Ecosystems worked with

Although 13 % of entrants submitted projects that did not specifically work with nature despite the competition being related to NbS, the majority did and presented ideas across a wide variety of ecosystem types (Fig. 16). 20 % focused on increasing biodiversity in general, while working with ocean and marine ecologies (15 %), and urban agriculture (14 %) were also key ecosystems targeted. Projects employing NbS related to water (ocean, rivers, wetlands, coastal, mangroves etc.) were

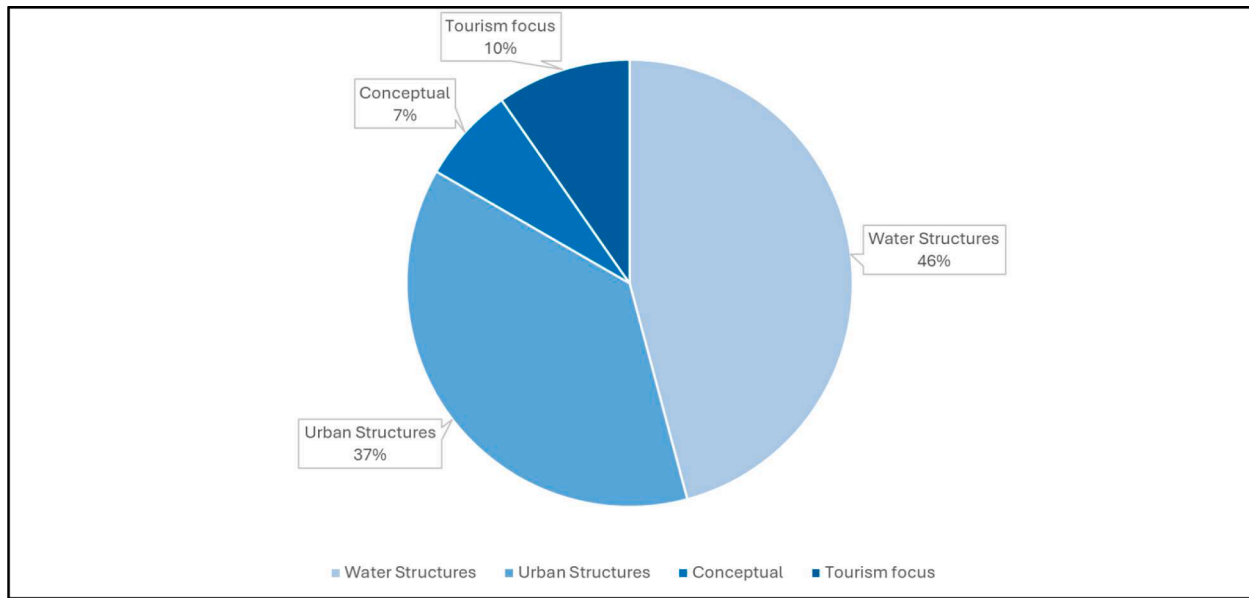


Fig. 13. Analysis by topology or programme.

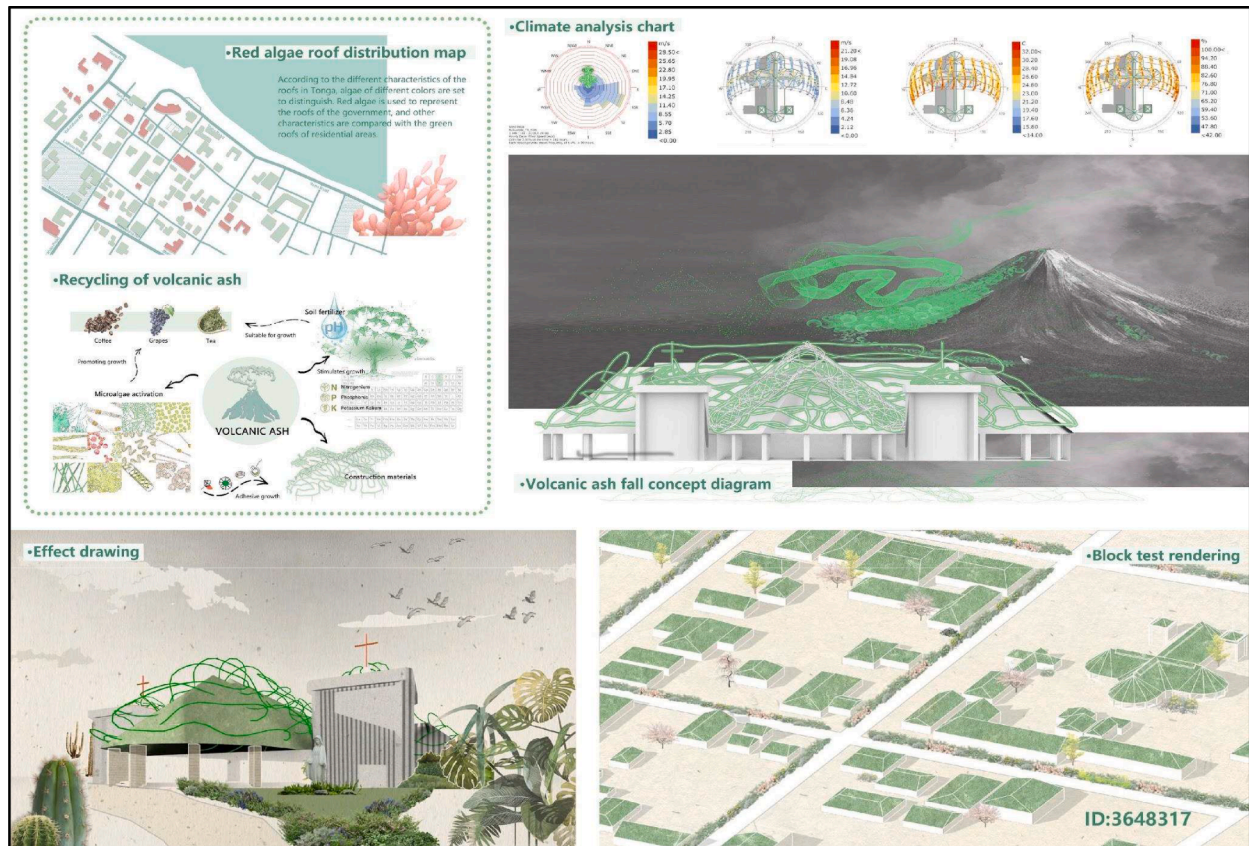


Fig. 14. 'Volcanic Ash'. Image by Qianyu, Xiaotong, Ruyu, and Yanan, 2022.

the most common, found in 50 % of entries.

### 3.4.2. Climate change impacts addressed

Many projects sought to address multiple climate change impacts targeted in each entry, most sought to address either sea level rise (38 %) or flooding (15 %). Biodiversity loss was also a key impact focused on (12

%).

### 3.5. Cultural grounding and indigenous concepts

A small, but significant number of submissions demonstrated deep engagement with Indigenous ecological knowledge and relational design principles. These projects moved beyond technical or aesthetic



Fig. 15. ‘Regenerating Rotorua’ Image by Govendar, 2022.

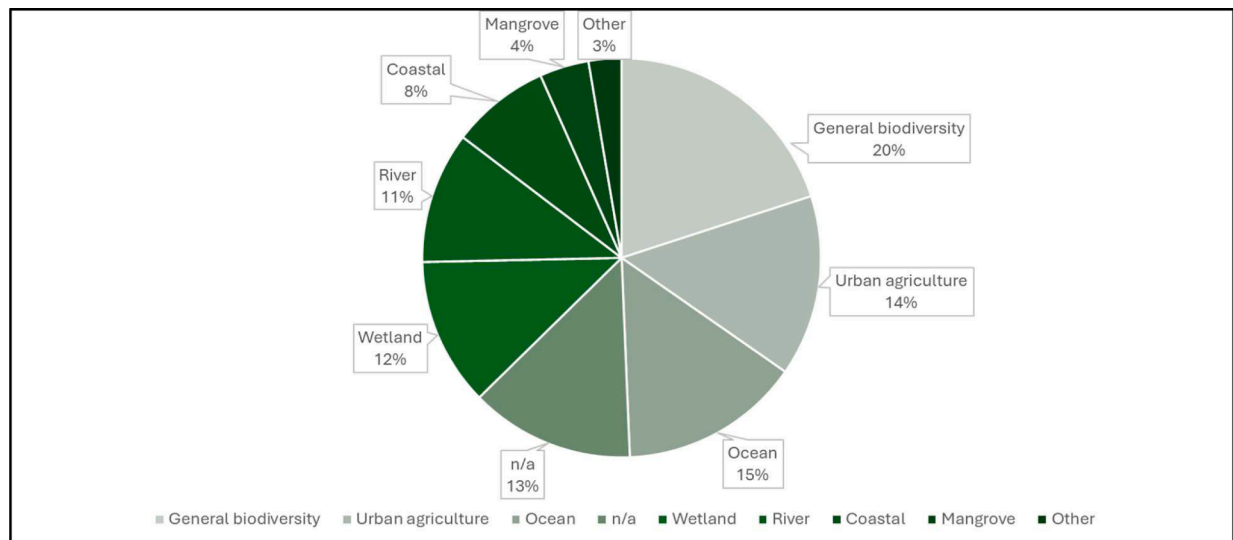


Fig. 16. Ecosystems worked with in competition entries.

design responses, embedding cultural narratives, values, and worldviews grounded in place and *whakapapa* (genealogy). They highlighted the importance of designing not just for but *with* local ecologies and communities, and of recognising the spiritual and ancestral dimensions of human-nature relationships in *Te Moananui Oceania*.

Several entries employed storytelling as a method to communicate these relationships. ‘*A Living Tapestry of Water Bodies*’ by Kate Ashworth (Fig. 12), for instance, used the metaphor of a woven tapestry to express the interconnected threads of *tīpuna* (ancestors), *uri* (descendants), and ecologies, illustrating both ecological and cultural renewal through design.

Other projects reflected a strong emphasis on *whakapapa* and connection to *whenua* (land). ‘*Katao o te maunga, Hōkio ki te tai*’ by Samuel Dunstall (Massey University) was a notable example of this (Fig. 18). Rather than resisting water, the design embraced flooding as a generative process. In ‘*Wetland for the Future*’ by Bridget Allan, the design approach centred around *mahinga kai* (food growing sites), the *maramataka* (Māori lunar calendar), and the visibility of *Matariki* (the Pleiades star cluster), illustrating how celestial knowledge and seasonal

rhythms can guide ecological restoration (Fig. 6). *Kaitiakitanga* (guardianship) was another recurrent theme. For example, in ‘*Redesign of St. Patrick’s School*’ by Beau Gray the landscape and architecture were informed by core Māori values demonstrating that even the youngest participants can articulate relational design thinking (Fig. 8).

#### 4. Discussion

Analysis of results reveals several key themes for discussion. These are organised related to findings from the entries themselves and to the nature and worth of the design competition as a research methodology.

##### 4.1. The entries - understanding how to approach adaptation and NbS in *Te Moananui Oceania*

In *Te Moananui Oceania* the ocean is a fundamental part of everyday lives, traditional worldviews, and cultural practices, and is seen by many as an entity that connects rather than separates related peoples of the Pacific [5]. It was to be expected then that the dominant design response

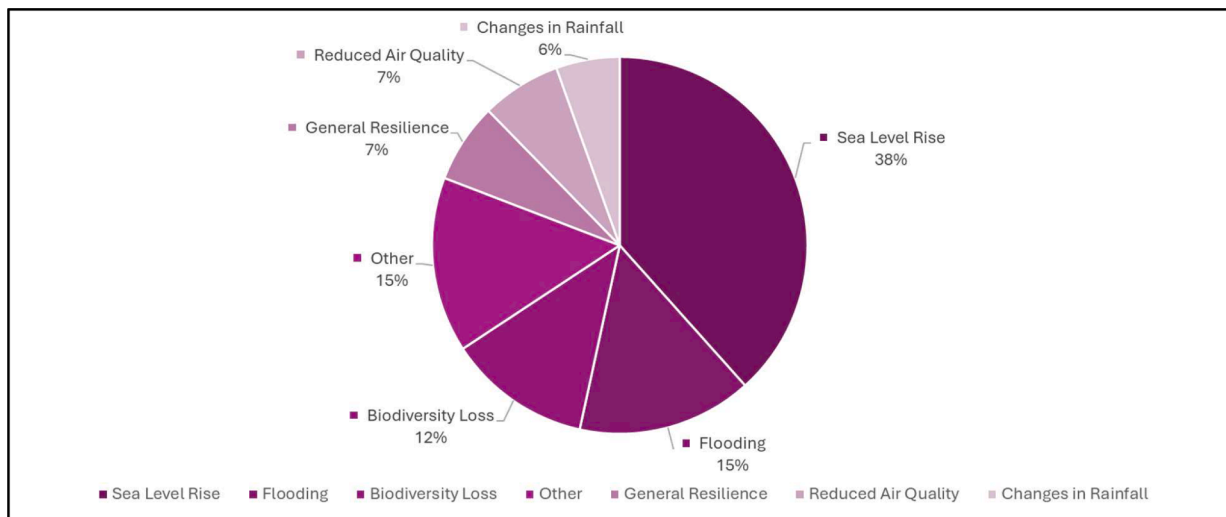


Fig. 17. Climate impacts addressed by competition entries.



Fig. 18. Kātao o te maunga, Hōkio ki te tai. Image by Samuel Dunstall, 2023.

themes in terms of how to work with nature, and how to adapt to climate change were in connection to *wai* (water). Many water/floating structures were proposed; some logistically possible and others more conceptual. This theme also reflects the vulnerability of islands across *Te Moananui* Oceania in the face of sea-level rise, and the urgent need for coastal protection, the protection of freshwater sources, and protection against land erosion [7].

Some of the more successful entries were ones that delved into what local materials, construction methods, and knowledge that already existed that could form the basis for reimagined or new approaches to

climate change adaptation. Rebecca Kiddle (judge) noted that *'Fishing Sand'* was an example of this where the low-tech approach was innovative and was clearly referencing local knowledge rooted in Indigenous ways of thinking even though what was proposed is not exactly what Indigenous people did or would do. One of the tensions seen in the entries was exploration of old ideas and materials compared to contemporary ones. In the context of the built environment, new materials and methods tend to more likely be studied and standardised, whereas old knowledge is often not as valued. Looking at current building codes, where they do exist in *Te Moananui* Oceania, it is rare to find reference to

traditional materials or building methods for example.

There were many entries that proposed futuristic and advanced technology ideas, rather than Indigenous techniques. This is perhaps to be expected given the nature of design competitions with their emphasis on creative future-focused responses. Utopian and idealised architecture have been proposed throughout the history of architecture. This is known as ‘visionary’ or ‘paper’ architecture; the imagined or conceptual world of designs that are not intended to be built but exist to provoke response [42]. A common vehicle for this is the design competition. In today’s context, artificial intelligence and other advancing technologies support designers to explore ideas of what could be possible in the future. Although climate adaptation requires many innovative and visionary responses, the brief was to explore working with nature, therefore projects that were heavily dependent on technical approaches to solving climate change issues only, were considered by the judges to be both unrealistic and culturally inappropriate for the *Te Moananui* Oceania context. Cole’s ‘Mutuality’ (Fig. 5) fitted in the category of new technologies in our analysis because it was a new response to addressing flooding using new materials. This project was a good example however of one that successfully worked with Indigenous knowledge while making use of new materials that are beneficial to biodiversity and increasing resilience. Such a project illustrates that a hybrid response of past (and current) Indigenous knowledge with new technologies and materials is a suitable way to benefit from global advances in materials, technologies, and adaptation strategies while changing the narrative of design responses more effectively towards what is important to local communities. This emphasis was a key finding of the research; in Oceania, climate change adaptation must be more than just a technical exercise. Projects that were most effective in addressing both ecological and cultural adaptation framed nature as an ancestor, a teacher, or a kin being, not as just a resource to be managed. These entries proposed that relationality, reciprocity, and respect are essential to designing NbS that are not only ecologically sound but culturally grounded. Findings reinforce the notion that designing NbS in *Te Moananui* Oceania requires more than technical innovation: it requires deep cultural literacy, humility, and a commitment to restoring the relationships that sustain life.

Analysis of some of the more poetic and speculative projects revealed that the open brief allowed people to push their design thinking in explorative ways, where practical limitations such as budget did not restrict the imagination. Judges described some of these projects as ‘hyper fanatical’ and tended to be more interested in projects that might be practically implementable. The generation of imagined responses that are not intended to be built, but enable illustration of more transformative and radical responses, are perhaps central to the value of the design competition as a research methodology in the context of design for uncertain futures. The act of using imagined symbolic designed responses that are motivated by provoking a response from the wider community is in itself another kind of solution; one which uses design ideas to try to get people to reflect and change behaviour. An example of such a project was Ashworth’s ‘A living Tapestry of water bodies’ (Fig. 12).

Another subset of projects was both practical and grounded in a deep understanding of restoring ecologies. They identified a need to re-indigenize the land, and to recognize the past and its importance in finding ways to adapt to climate changes. An example of this was Dunstall’s ‘*Kātao o te maunga, Hōkio ki te tāi*’ (loosely translated as ridge to coast) (Fig. 18). This project spoke to the importance of identity being intrinsically connected to place, from the *whenua* (land) beneath our feet and *awa* (river) that flows, and how this, in turn, connects people to their *tīpuna* (ancestors). By understanding that our relationship to nature is heightened and experienced more deeply through these connections and that we should uphold *mauri* (connecting life essence) to guide design is a key lesson is learnt about effectively working with nature in *Te Moananui* Oceania: designing relationships is as important as designing buildings and infrastructure. Understanding the way such projects were conceived, reinforced that a deeper and more considered connection to place is vital to just and appropriate climate adaptation in *Te Moananui*

Oceania.

#### 4.2. The competition - extending the value of the design competition in a research context

A ‘pure’ design competition according to Davidson and Freestone [43] is “open to all, where entries are anonymous, briefs are flexible, and judging is undertaken independently by design experts”. According to this definition, the NUWAO design competition was ‘pure’. The brief was wide in scope and flexible, enabling entrants to choose the site within *Te Moananui* Oceania, and the ecologies and climate impacts they wanted to work with. The competition was open to anyone who wanted to enter internationally. We expected that most entrants would come from within *Te Moananui* Oceania, particularly Aotearoa New Zealand and other Pacific Island nations, and perhaps from Australia. However, many entrants were not from *Te Moananui* Oceania. This shows that there is global interest in climate adaptation in the region, however a proportion of entrants had little experience of the world views, priorities, or context of *Te Moananui* Oceania and of Oceania’s Indigenous peoples. This meant that some of the projects submitted, while innovative and well-intentioned, would not be culturally appropriate, or focused on ideas that are potentially problematic or at least controversial in some places in the region such as increasing tourism [44]. As Huhana Smith (judge) stated, ‘*the world doesn’t need more luxury resorts*’. Many projects touched on Indigenous knowledge, but this was not fully applied as a guiding conceptual framework. This was evident with entrants who applied solutions to climate change that would work in their own homelands perhaps, but when used in *Te Moananui* Oceania could be detrimental to native species, interconnected ridge to reef ecologies, and in some cases to cultural practices and worldviews. Competitions offer a space to take risks and begin a process of being imaginative and speculative, which is also a process of learning [33]. A valid question raised however by people engaging with the work was how can we safely facilitate competitions like this to avoid appropriation and/or misrepresentation/use of Indigenous practices and knowledge?

Judges did consider cultural sensitivity and competence and the ability to be able to engage with culture and place effectively. This reinforced that it was of vital importance that professionals with Indigenous knowledge and backgrounds were judges in this competition. Huhana Smith noted that ‘*you may not be of a particular culture, but you must understand the criticality of engaging in that space and ensure that you understand the kaupapa [ethos]*’. A secondary intention of the competition was to encourage a deeper engagement with concepts of Indigenous knowledges and IEK in *Te Moananui* Oceania by Indigenous and non-Indigenous peoples alike. Smith noted that in this way, the competition was successful; it had a wide international reach, even if some of the projects submitted were not culturally appropriate.

A key intention of the competition was to understand how people were thinking about climate adaptation in *Te Moananui* Oceania and ascertain what they think is appropriate for the region. Some projects proposed ideas that, while well-intentioned, would likely be ineffective or inappropriate within certain cultural contexts due to a limited understanding of local human–nature relationships or contexts. These instances reinforced broader research findings from the NUWAO project, highlighting the critical importance of ensuring that climate adaptation efforts in Oceania, including work involving NbS, are led and critiqued by local communities, or developed through participatory design methods that centre Indigenous and place-based knowledge [11,16]. As discussed, the spiritual and political nature of working with nature, and of climate change in general in *Te Moananui* Oceania is unique. Engaging in participatory design methods with integrity in imagined projects is difficult. A way to counter this and to enable entries that had deeper, participatory engagement with Indigenous or local peoples would have been to include a category for projects already implemented or constructed perhaps.

To minimize the risk of cultural appropriation in future design

competitions of this kind, there are at least four key strategies that could be implemented. Firstly, clearer communication about cultural appropriateness and the potential for appropriation could be provided from the outset, perhaps at registration point. This could include explicit guidance on respectful engagement with Indigenous knowledge systems and peoples, protocols for referencing cultural practices or symbols, and the importance of seeking appropriate permissions or collaboration when drawing on cultural material. Providing examples of what constitutes appropriation versus respectful engagement could also help set expectations, particularly for student entrants. This guidance would not only have raised awareness among participants unfamiliar with the cultural contexts of *Te Moananui* Oceania but would also have reinforced the competition's values around respect, integrity, and ethical design practice.

Secondly, a different kind of design competition, based on feedback at regular intervals provided by judges as described by Kriener et al [45], may have enabled entrants to refine work when it was not culturally appropriate and understand why. Such design competitions likely suit a tertiary student context more than others because of the emphasis on mutual, formative learning. A design competition grounded in open dialogue aligns with regional traditions of discussion, storytelling, and oral exchange—such as *talanoa*, *tokstori*, and *hui* [46–48]. With the increasing feasibility of online collaboration, even in some connectivity-challenged parts of *Te Moananui* Oceania [49], such dialogic approaches could have been effectively integrated into this competition, despite participants being spread across the globe. Kriener et al. [45] point out that ‘*celebrating the situatedness of knowledge, opinions, and priorities*’ is important particularly if one understands that ‘*such phenomena are the premises and outcomes of dialogues...*’

Thirdly, and related, is challenging a blind judging model as default best practice for design competitions. The positionality of designers is important in the context of working with Indigenous peoples and knowledges [28,46]. Requiring positionality statements from entrants may have helped judges to understand the background of entrants.

Lastly, a category for Indigenous peoples of the region to enter may have encouraged and highlighted those ideas and voices more effectively. Feedback received about the competition from people engaging with exhibitions of the work was that Indigenous and community-led projects were crucial and seeing more entries from Pacific peoples outside of Aotearoa would have been desirable. Kiddle et al. [50] explain that a tension exists between trying to think beyond the current very real oppression generated through colonization, and imagining creative futures unconstrained by present-day limitations for some Indigenous peoples. A wider issue may be that in *Te Moananui* Oceania, outside of Aotearoa New Zealand and Hawai'i there are no architecture schools or related professional spatial design programmes, and representation of Pacific peoples, including Māori, in spatial design professions though increasing, is still low [51,52].

One of our aims was to highlight work that utilized traditional ways of thinking and working with nature. Doing this demonstrated that when traditional knowledge is applied with a rich understanding of place and recognition of the past, well considered design thinking can be achieved to combat climate change impacts such as sea level rise, flooding and biodiversity loss [53]. Many of these ‘cultural resilience’ student design briefs are already present in architectural studios across tertiary institutions in Aotearoa New Zealand. The resultant architecture or designs produced from students are usually a blend of modernisation and local traditional ideas. These innovative architectural expressions convey new forms, spaces, materials, and tectonics, and a heightened sense of the need for urgent sustainability or regenerative design approaches. Evidently, there is a large interest from architecture students to learn more about Indigenous concepts of design and then combine this with modern approaches. This may be because students are not only interested in the international style from both west and east, but also in understanding and defining a new architectural identity for *Te Moananui* Oceania [54].

A final finding was that storytelling in the imagining and visualisation of climate adaptation ideas was key. The projects which were able to tell a story, whether through language or through visual communication tended to capture the attention of the judges and of the public when the work was exhibited, and therefore were able to more effectively communicate the value of their idea/proposition in the situated context of place and then in the wider context of the climate emergency. This finding was raised in the 2023 NUWAO International Symposium on Nature-based Urban Climate Adaptation for Wellbeing. The symposium also showcased an exhibition of the competition work and the prize giving awards for the work. One of the symposium's sessions was a panel discussion made up of prize winners from the competition. Participants raised the importance of language and communication. Communication should enable connection to communities beyond just built environment design professions especially if projects are to be co-created with communities and draw on Indigenous knowledge and practices. *Mātauranga Māori* (the knowledge of Indigenous peoples from Aotearoa) is a good example of how storytelling, through *Pūrākau* (stories), carries important knowledge as well as being a way to imaginatively connect with people emotionally and spiritually through aural & visual modes of communication [11]. By providing a platform for the prize winners to interact with each other, the competition was able to bring people from various parts of the world into conversation, enabling them to share their knowledge, and give people, particularly students and *rangatahi* (young people), an opportunity to learn and test out their thinking. Selina Ershadi, chair of that session noted that ‘*ultimately the value of the competition was in sparking conversation and getting a sense of how people across the industry, universities, and the general public are engaging with and thinking about the impacts of climate change on vulnerable communities across Oceania*’. This notion was reinforced by the important function the NUWAO exhibition series had on the research project overall, where feedback and ideas from the general public were received.

#### 4.4. Implications of the research

This research demonstrates that design-led methodologies, specifically international design competitions, can generate meaningful insights into how NbS are imagined, localised, and enacted across culturally diverse contexts. By revealing and forefronting visions grounded in Indigenous ecological knowledge, relational thinking, and lived experience, this approach shifts NbS research beyond conventional technical or policy frameworks. It positions design not only as a tool for representation but as a method of inquiry, capable of eliciting future-focused, place-responsive adaptation strategies.

The findings suggest that for NbS to be effective, just, and contextually appropriate in regions like *Te Moananui* Oceania, they must be deeply rooted in cultural worldviews and relationships with place. This challenges dominant NbS discourses that tend to universalise or standardize definitions, metrics, and implementation strategies. Instead, findings from the competition illustrated the importance of local sovereignty, participatory co-design, and the integration of more-than-human perspectives in shaping climate adaptation responses. More broadly, this work calls for a rethinking of how NbS research is conducted, encouraging greater methodological diversity, deeper cultural engagement, and a willingness to embrace imaginative, relational, and speculative modes of inquiry. In doing so, it opens space for NbS to be reframed as acts of cultural resurgence, ecological reciprocity, and design sovereignty.

## 5. Conclusion

One benefit of using a design competition as a research method is that it gathers ideas and solutions from a broad range of people who are familiar with the issues but are outside formal policy-making spaces where decisions about future change are usually made. This widens the

engagement pool and ideas to work with, which is vital in future-oriented research such as architecture and urban design for climate change adaptation. This wide-ranging input and ability to tap into the collective imagination is vital in transformative design contexts [55]. Seeing a collective imagination at work, reimagining how built environments and communities can work in more interconnected ways with nature, particularly in relation to *wai* (water) was a useful research outcome for the NUWAO project. Some of the ideas submitted to the competition were developed into strategies featured in the NUWAO Design Guide for Nature-based Solutions (NbS) in Te Moananui Oceania [56]. In this way, the competition findings helped distil the work of many designers into a guide that may support more effective and more Indigenous knowledge driven NbS across the region.

*Te Moananui* Oceania is at the forefront of trying to learn to live with more extreme weather events, collapse of marine and land ecosystems, and the impacts of sea level rise while already being one of the most volatile and vulnerable regions in the world to earthquakes, volcanic eruptions, cyclones, and tsunamis. We must continue to find innovative responses to these issues while resisting the possibility of rapid climate adaptation work leading to neo-colonisation in *Te Moananui* Oceania. The questions remain: How will we build resilience? How will we alter our ways of relating to and seeing the natural world we are part of? How can we (re)learn from older ways of knowing, some of which never ceased in *Te Moananui* Oceania? As the late community and climate advocate Fa'anānā Efeso Collins stated ‘...our challenges whether ecological, geopolitical or cultural are diverse. But we are bonded by the inextricable ties that we have to our land and our oceans. We’ve inherited philosophies, knowledge systems and profound ecological wisdom that holds the answers and drives our collective resilience...’ [57].

There is a need for a certain kind of humility required in rethinking how humans live and where we live; to fundamentally interrogate the political, financial, and philosophical structures of society. People have designed and created the converging crises of climate change and biodiversity loss. This means there is the possibility that we can deconstruct these drivers of change through design. We will need the cleverest design minds to do this. Design competitions can make a contribution to bringing to light those transformative visionary ideas for change, particularly when the nature-culture interface is deeply considered, and the critical reality of what design proposals really mean in terms of a holistic overall ecological, climate, and cultural footprint is reflected upon. In the context of climate change, incremental, context sensitive and place-based thinking is valuable. Adaptation for climate change must make the lives of the people being designed with, better. To do that, place, and the people of a place must be deeply understood.

A summary of six key findings from the design competition follows.

1. It is vital that Indigenous peoples drive, critique and control climate adaptation projects and that participatory design methods are used for just adaptation in *Te Moananui* Oceania.
2. To be realistic, effective, and culturally relevant, climate change adaptation must be more than just a technical exercise. A deep and considered understanding of and connection to place and a place’s people is vital to just and appropriate climate adaptation. Relationships to nature and cultural worldviews are unique in *Te Moananui* Oceania.
3. Relationality is important in *Te Moananui* Oceania. Understanding, respecting, and designing relationships is as important as designing buildings and infrastructure.
4. Working with water and the ocean as part of interconnected socio-ecosystems is key.
5. The utilisation of storytelling, and creative imagining and visualisation for generating climate adaptation ideas is both useful and important.
6. The positionality of designers and other key actors is important in the context of working with Indigenous peoples and knowledges.

## CRediT authorship contribution statement

**Maibritt Pedersen Zari:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Mercia Abbott:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **India Chenery:** Writing – original draft, Visualization, Investigation, Formal analysis, Data curation. **Huhana Smith:** Writing – review & editing, Investigation. **Rebecca Kiddle:** Writing – review & editing, Investigation, Conceptualization. **Lama Tone:** Writing – review & editing, Investigation. **Selina Ershadi:** Writing – review & editing, Data curation.

## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Maibritt Pedersen Zari reports financial support was provided by Royal Society of New Zealand. Maibritt Pedersen Zari reports financial support was provided by New Zealand National Commission of UNESCO. Maibritt Pedersen Zari reports financial support was provided by Resene. Maibritt Pedersen Zari reports financial support was provided by Ministry of Business Innovation and Employment. Maibritt Pedersen Zari reports financial support was provided by Zealandia. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgments

The NUWAO project is funded by the Royal Society of New Zealand through a Marsden Grant [grant number 20-VUW-058]. The New Zealand National Commission of UNESCO, Resene, Zealandia, the People, Cities, and Nature research project (funded by the New Zealand Government through an Endeavour Fund), Te Herenga Waka Victoria University of Wellington, and Te Wānanga Aronui O Tāmaki Makau Rau Auckland University of Technology sponsored the NUWAO design competition prizes, exhibitions, and/or awards ceremony. The authors acknowledge the input and help of all people involved in the organization and judging of the design competition and exhibitions of work, and particularly wish to acknowledge all of the people who entered the design competition. The authors acknowledge the thoughts and knowledge of Indigenous peoples who contributed to the design competition in various ways.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.nbsj.2025.100252](https://doi.org/10.1016/j.nbsj.2025.100252).

## Data availability

No data was used for the research described in the article.

## References

- [1] M. Koro, H. McNeill, H. Ivarature, J. Wallis, Tā, Vā, and Lā: re-imagining the geopolitics of the Pacific Islands, *Polit. Geogr.* 105 (2023) 102931.
- [2] M. Bailey, E. Chatzakis, N. Spencer, K. Lampitt Adey, N. Sterling, N. Smith, A design-led approach to transforming wicked problems into design situations and opportunities, *J. Des. Bus. Soc.* 5 (1) (2019) 95–127.
- [3] H. Okusitino Mahina, Ta, Va, and Moana: temporality, spatiality, and indigeneity, *Pac. Stud.* 33 (2) (2010) 168.
- [4] K. Martins, Polynesian navigation & settlement of the Pacific, *World Hist. Encycl.* (2020). Retrieved from, <https://www.worldhistory.org/article/1586/polynesian-navigation-settlement-of-the-pacific/>. Date accessed 6 March 2024.
- [5] E. Hau’Ofa, *We Are the ocean: Selected works*, University of Hawaii Press, 2008.

- [6] T. Falkland, I. White, Freshwater availability under climate change, in: L. Kumar (Ed.), *Climate Change and Impacts in the Pacific*, Springer Climate. Springer, Cham, 2020, pp. 403–448, [https://doi.org/10.1007/978-3-030-32878-8\\_11](https://doi.org/10.1007/978-3-030-32878-8_11), pg.
- [7] L. Kumar, *Climate Change and Impacts in the Pacific*, Springer Climate. Springer, Cham, 2020.
- [8] D. Sanderson, L. Bruce, P. Sitko, Climate and disaster risks, challenges and opportunities for resilient Pacific towns and cities, *Urban. Risk Pac. Asia: Disasters Clim. Change Resil. Built Environ.* (2020) 22–33.
- [9] C.K. Weatherill, Sinking Paradise? Climate change vulnerability and Pacific Island extinction narratives, *Geoforum* 145 (2023) 103566.
- [10] A. Latai-Niusulu, T. Binns, E. Nel, Climate change and community resilience in Samoa, *Singap. J. Trop. Geogr.* 41 (1) (2020) 40–60.
- [11] S. Mihaere, M.T.O. Holman-Wharehoka, J. Mataroa, G.L. Kiddle, M. Pedersen Zari, P. Blaschke, S. Bloomfield, Centring localised indigenous concepts of wellbeing in urban nature-based solutions for climate change adaptation: case-studies from Aotearoa New Zealand and the Cook Islands, *Front. Environ. Sci.* 12 (2024) 1278235.
- [12] United Nations, (2016). *State of the world's indigenous peoples: indigenous peoples' access to health services*. February.
- [13] R. Jones, H. Bennett, G. Keating, A. Blaiklock, Climate change and the right to health for Maori in Aotearoa/New Zealand, *Health Hum. Rights J.* 16 (2014) 54–68.
- [14] edited by K.R. Smith, A. Woodward, D. Campbell-Lendrum, D.D. Chadee, Y. Honda, et al., Human health: impacts, adaptation, and Co-benefits, in: C B Field, V R Barros, D J Dokken, K J Mach, M D Mastrandrea (Eds.), *Climate Change 2014: Impacts, Adaptation, and Vulnerability; Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, New York, 2014. edited byeditors. others, chapter 11,709–54.
- [15] K. Beamer, T.M. Tau, P.M. Vitousek, *Islands and Cultures: How Pacific Islands Provide Paths Toward Sustainability*, Yale University Press, New Haven, 2022.
- [16] G.L. Kiddle, M. Pedersen Zari, P. Blaschke, V. Chanse, R. Kiddle, An Oceania urban design agenda linking ecosystem services, nature-based solutions, traditional ecological knowledge and wellbeing, *Sustainability* 13 (22) (2021) 12660.
- [17] J. Bryant-Tokalau, *Indigenous Pacific approaches to Climate change: Pacific Island Countries*, Springer, 2018.
- [18] L. Carter, *Indigenous Pacific Approaches to Climate Change: Aotearoa/New Zealand*, Springer, 2018.
- [19] International Union for Conservation of Nature (Iucn), *Nat.-based Solut.* (2023). Available at, <https://www.iucn.org/our-work/nature-based-solutions>. Date accessed 6 March 2024.
- [20] M. Pedersen Zari, M. MacKinnon, K. Varshney, N. Bakshi, Regenerative living cities and the urban climate–biodiversity–wellbeing nexus, *Nat. Clim. Chang.* 12 (7) (2022) 601–604.
- [21] C. Cottrell, Avoiding a new era in biopiracy: including indigenous and local knowledge in nature-based solutions to climate change, *Environ. Sci. Policy* 135 (2022) 162–168.
- [22] C. Sobrevila, The Role of Indigenous Peoples in Biodiversity Conservation: The Natural But Often Forgotten Partners, *The World Bank*, 2008, pp. 1–102. No. 44300.
- [23] M. Hulme, Climate change and the significance of religion, *Econ. Polit. Wkly.* 52 (2017) 14–17.
- [24] Wageningen University and Research. (2022). Nature based Solutions Challenge. Wageningen University and Research. Available online at: <https://www.wur.nl/en/article/Nature-Based-Solutions-Challenge.htm>. Date accessed 19/05/25.
- [25] Tollan, K., Ross, M. Mercier, O.R., Elkington, B. Kiddle, R. Thomas, A. & Smeaton, J., *Public Aspirations for a decolonised city: food security and “re-storytelling”* in MAI J., DOI: 10.20507/MAIJournal.2023.12.2.3.
- [26] IUCN, *IUCN Global Standard For Nature-based Solutions: a User-Friendly Framework for the verification, Design and Scaling Up of NbS: First Edition*, IUCN, Gland, Switzerland, 2020, <https://doi.org/10.2305/IUCN.CH.2020.08.en>, 2020.
- [27] United Nations, *United Nations Declaration on the Rights of Indigenous Peoples*, United Nations, 2007.
- [28] P.L. Tuhiwai Smith, *Decolonizing Methodologies: Research and Indigenous Peoples*, Otago University Press, Dunedin, 2012.
- [29] A. Latai-Niusulu, E. Nel, T. Binns, Positionality and protocol in field research: undertaking community-based investigations in Samoa, *Asia Pac. Viewp.* 61 (1) (2020) 71–84.
- [30] L.N. Groat, D. Wang, *Architectural Research Methods*, John Wiley & Sons, 2013.
- [31] L. Sanders, An evolving map of design practice and design research, *Interactions* 15 (6) (2008) 13–17.
- [32] M. Bailely, E. Chatzakis, N. Spencer, K. Lampitt Adey, N. Sterling, N. Smith, A design-led approach to transforming wicked problems into design situations and opportunities, *J. Des. Bus. Soc.* 5 (1) (2019) 95–127.
- [33] P.M.H.S. Guilherme, Competitions serve a larger purpose in architectural knowledge, *Archit. Educ. J. N* 11 (2014) 425–451, pg.
- [34] J.L. Nasar, *Design by Competition: Making design Competition Work*, Cambridge University Press, 1999.
- [35] L. Carter, He korowai o Matainaka/the cloak of Matainaka, *N. Z. J. Ecol.* 43 (3) (2019) 1–8.
- [36] P. Pihkala, Anxiety and the ecological crisis: an analysis of eco-anxiety and climate anxiety, *Sustainability* 12 (19) (2020) 7836.
- [37] A. Clark, R. Howie, L. Leckie, K. Watson, C. Charteris, Many hands, many voices: an interdisciplinary approach to exhibiting Kiribati coconut fibre armour, *J. Inst. Conserv.* 42 (1) (2019) 34–51.
- [38] J. Barnett, S. Jarillo, S.E. Swearer, C.E. Lovelock, A. Pomeroy, T. Konlechner, R. Lowe, Nature-based solutions for atoll habitability, *Philos. Trans. R. Soc. B* 377 (1854) (2022) 20210124.
- [39] J.P. Cauchi, S. Moncada, H. Bambrick, I. Correa-Velez, Coping with environmental hazards and shocks in Kiribati: experiences of climate change by atoll communities in the Equatorial Pacific, *Environ. Dev.* 37 (2021) 100549.
- [40] W. Zhao, C. Sun, Z. Guo, Reawaking of Tonga volcano, *Innovation* 3 (2) (2022).
- [41] A. Yates, K. Dombroski, R. Dionisio, Dialogues for wellbeing in an ecological emergency: wellbeing-led governance frameworks and transformative indigenous tools, *Dialogues Hum. Geogr.* 13 (2) (2023) 268–287.
- [42] J. Benavides, Visionary architecture: the drawn utopia, *Estoa, Rev. Fac. Arquit. Urban. Univ. Cuenca* 8 (16) (2019) 110–129.
- [43] G. Davison, R. Freestone, Architectural design competitions: the effects of competition format on design processes and outcomes, *J. Archit.* 28 (5) (2023) 825–846, <https://doi.org/10.1080/13602365.2023.2257713>.
- [44] D. Harrison, S. Pratt, Tourism in Pacific island countries: current issues and future challenges, *Tour. Pac. Isl.: Curr. issues future chall.* (2015) 3–21.
- [45] K. Kreiner, P.H. Jacobsen, D.T. Jensen, Dialogues and the problems of knowing: reinventing the architectural competition, *Scand. J. Manag.* 27 (1) (2011) 160–166.
- [46] T.I. Fasavalu, M. Reynolds, Relational positionality and a learning disposition: shifting the conversation, *Int. Educ. J.: Comp. Perspect.* 18 (2) (2019) 11–25.
- [47] D. Robinson, K. Robinson, in: *“Pacific ways” of talk: Hui and talanoa* (No. 36). NZ Trade Consortium Working Paper, 2005.
- [48] L. Tunufa’i, Pacific research: rethinking the Talanoa ‘methodology’, *N. Z. Sociol.* 31 (7) (2016) 227–239.
- [49] L.I.A. Refiti, A.C. Engels-Schwarzpaul, L. Lopesi, B. Lythberg, L. Waerea, V. Smith, Vā at the time of COVID-19: when an aspect of research unexpectedly turns into lived experience and practice, *J. N. Z. Pac. Stud.* 9 (1) (2021) 77–85.
- [50] R. Kiddle, M. Jackson, B. Elkington, O.R. Mercier, M. Ross, J. Smeaton, A. Thomas, *Imagining Decolonisation* (Vol. 81), Bridget Williams Books, 2020.
- [51] S.J. Hopgood, A call for more Pasifika architects in Aotearoa, *Spinoff Soc.* (2022). February 22Online, <https://thespinoff.co.nz/society/22-02-2022/a-call-for-more-pasifika-architects-in-aotearoa>. Accessed 6 March 2024.
- [52] J. Paul, S. Bloomfield, Decolonising landscape architecture education in Aotearoa New Zealand, in: A. GhaffarianHoseini, A. Ghaffarianhoseini, N. Naismith (Eds.), *Imaginable Futures: Design Thinking, and the Scientific Method*. 54th International Conference of the Architectural Science Association, Auckland, 2020, pp. 325–334.
- [53] A. Fitz, E. Krasny, A. Wien, *Critical care: Architecture and Urbanism for a Broken Planet*, MIT Press, 2019.
- [54] L. Tone, C. ‘Ilaīū Talei, Mana Moana: understanding the place of Moana in Aotearoa’s architecture, *Art/Res. Int.* 8 (2) (2024) 471–498.
- [55] R. Kiddle, B. Elkington, M. Ross, O.R. Mercier, A. Thomas, M. Gjerde, J. Smeaton, T. Arona, C. Mawer, *Imagining a decolonized City in and from Aotearoa New Zealand*, *Int. J. Urban Reg. Res.* 47 (1) (2023) 146–154, <https://doi.org/10.1111/1468-2427.13132>.
- [56] Pedersen Zari, et al., *NUWAO Te Moananui Oceania Nature-Based Solutions Design Guide*, NUWAO, Auckland, 2024. Available online, [www.nuwao.org.nz](http://www.nuwao.org.nz).
- [57] Collins, F.E. Efeso Collins’maiden statement to the House: ‘I’ve come to this house to help’. Newsroom. 21/02/24. Available online: <https://newsroom.co.nz/2024/02/21/efeso-collins-maiden-statement-to-the-house/>. Date accessed 13/03/24.