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TRADITIONAL NATURE-BASED ARCHITECTURE AND LANDSCAPE DESIGN

Lessons from Samoa and Wider Oceania

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Introduction

Positionality: Sina faamatalaga i e na tusia lenei mataupu

An important part of decolonizing research practices is to make the positionality of researchers apparent (Latai-Niusulu et al., 2020; Tuhiwai Smith, 2012). In light of this, we would like to make it clear that the authors of this chapter include Indigenous Samoan academics, as well as researchers who are pākehā (New Zealanders of European descent), and tauiwi (peoples of non-Māori heritage in Aotearoa New Zealand), all of whom are involved in research related to Pacific peoples' well-being and climate change adaptation as part of the Nature-based Urban design for Wellbeing and Adaptation in Oceania (NUWAO) project. NUWAO is funded by the New Zealand government through the Royal Society of New Zealand. Further details about the positionality of each author and NUWAO as a group are available at www.nuwao.org.nz.

Oceania

The islands of Oceania (Figure 13.1), scattered across the vast Pacific Ocean, are dynamic and complex systems. Pacific Island communities, who first inhabited these places more than 3,000 years ago, have adapted ways of surviving amid these tropical environments and the waves of foreign influences that continuously bring change to their shores. In this chapter, Oceania refers to the islands of the Pacific, categorized as Micronesia, Melanesia and Polynesia, the latter including Aotearoa New Zealand. Pacific Island architecture and landscape designs (ALDs) embody Pacific worldviews and a close connection with the environment. They have evolved over centuries and vary from island to

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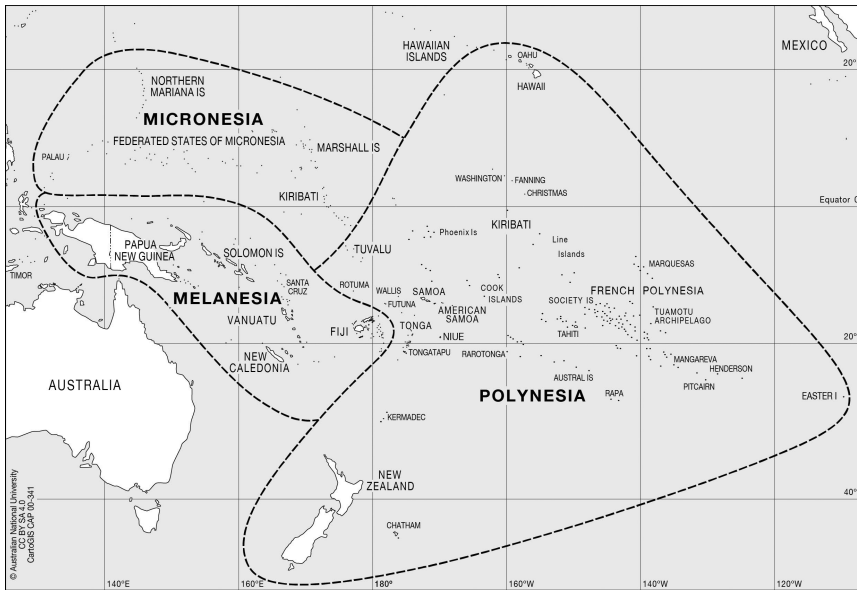

FIGURE 13.1 The islands and regions of Oceania.

Source: CartoGIS Services, College of Asia and the Pacific, The Australian National University under CC BY-SA 4.0 (https://asiapacific.anu.edu.au/mapsonline/base-maps/micronesia-melanesia-polynesia).

island within Oceania. Pacific Island cultures recognize that islands are deeply interconnected socio-ecological systems, in and among themselves, and also in relation to other parts of the world. This knowledge is crucial to the development of nature-based solutions which call for integrated approaches to address climate change, biodiversity loss and other sustainable development challenges (Kiddle et al., 2021a).

This chapter argues that the evolution and continued existence of Pacific Island traditional architecture and the historical designs and structure of their villages, in spite of pressures, demonstrates the resilience of Pacific Island peoples and cultural knowledge. This knowledge is crucial and must be front and center in the development of current and future urban ALD strategies that result in both ecological and human well-being benefits.

This chapter employs a place-based and Indigenous-centric approach to exploring nature-based ALD in Oceania using Samoa as a case study. The discussion begins with a section on Pacific Indigenous understandings of the environment, ALD, and resilience. Secondly, the chapter focuses on Samoa as a case study, specifically the evolution of ALD. The third and fourth sections of the chapter explore the future of Samoan and wider Oceania ALD. Here we draw on lessons from Samoa and make recommendations for future resilient ALD solutions for

both Samoa and the wider region. The chapter is based on a review of the relevant literature as well as findings from a series of group interviews/workshops that were conducted in November and December 2021 with Samoan traditional builders, architects, construction lecturers at the National University of Samoa and government officers working in the Samoan Ministry of Transport Works and Infrastructure. The aim of these workshops was to understand traditional and contemporary knowledge on ALD in light of climate change, continued urbanization and other emerging challenges. Findings from the workshops form the basis of the recommendations discussed at the end of this chapter.

Indigenous Pacific understandings of ALD and resilience

Many scholars working in the Pacific region have emphasized the importance of holistic approaches, but also recognize the importance of a local place-based focus in providing a more realistic portrayal of island societies and their resilience. While there is a great diversity of Pacific Island societies and cultures, all share an emphasis on connections between family, community and the physical-spiritual environment, and the core values of respect, reciprocity, service and spirituality. Pacific island concepts and approaches embody the dynamic and complex nature of these relationships, connections and related activities. Many are difficult to define and articulate in English, but exploring these concepts would provide an adequate understanding of the resilience of Pacific island societies. For example, the Fijian concept *vanua* translates as land, home or tribe, but it means much more than that. *Vanua* has physical, social and cultural dimensions inextricably interrelated. *Vanua* can be understood as an extended kinship system. Each member of the *vanua* is considered to be the soul of the geographical land; without the people, the physical *vanua* would be soul-less and incomplete. Flipping the concept the other way around, the people would also be incomplete without the connection to their land (Ravuvu, 1983). Further, Hau'ofa's (1993) conceptualization of Pacific islands as 'Oceania', 'a sea of islands', reiterates how the islands of the region are connected, rather than separated, by ocean. Pacific islanders have always traversed the Pacific Ocean sailing from one island to another to trade, marry and expand social networks.

Pacific Island peoples and their environments are inextricably linked and this is reflected in the rich variety of ALDs in the region. Traditional island buildings, including dwellings, are well-suited to the tropical climate of the Pacific and have enabled these societies to survive in these harsh environments for thousands of years. Roofs, providing shelter from the hot sun and rain, are typically the most important architectural component. The roof is supported by round wooden posts or pillars. Most, if not all, traditional island buildings do not have walls, allowing natural ventilation in an environment where humidity is extremely high. Traditional building materials are within the economic reach of most of the population and building techniques have been highly refined over many centuries. The tropical climate in the Pacific generates lush vegetation, so

the most common building materials are organic: for example, timber, bamboo, cane, grasses and reeds. These materials are used for framing, thatch and mats to form and adorn buildings that are organic and blend into the environment. For example, traditional Fijian *bures* (huts) comprise strong wooden corner posts which are set in the ground, and a wooden roof frame erected on top of the posts to create the building frame. These are often supported by small vertical posts which help to reinforce the walls in the center. Traditionally, the *bure* is bound together with ropes made from coconut fiber or other natural materials, but in recent years, construction wire has been increasingly used. *Bures* normally have a thatched roof made from pandanus (or in some cases palm leaves). Almost all roofs are high and use a hipped (four sided) configuration. Traditional buildings in other Pacific islands such as Vanuatu, Tonga, Palau, Kiribati, and the Cook Islands have similar characteristics (South Pacific Disaster Reduction Programme, 1998). For example, the *maneaba* (meeting house) in Kiribati also has a large pandanus thatch roof, resting on short coral (or sometimes wooden) pillars, around which are clustered smaller village houses. Wall and floor coverings such as mats adorn traditional buildings in the region and are beautifully patterned and showcase a varied and artistic range of handicrafts developed through weaving and fine lashing techniques (Whincup, 2010).

In cyclone-prone areas of the Pacific, traditional houses are well adapted to cope with this hazard, demonstrating their resilience. Most traditional Micronesian houses, for example, are timber-framed with thatch roofs. The roofs are designed to be lifted off the posts and placed on the ground and secured during strong winds and cyclones, as well as for repairs. Traditional housing in the Pacific is also well adapted to cope with earthquakes because of their ductility, or ability to bend and sway without collapse. For example, Fijian *bures* are quite strong during shaking as the building is bound together with ropes or wire. The corner posts are normally fairly strong and buried sufficiently to resist uplift. However, when damaged, *bures* are difficult to repair and most residents usually rebuild a new structure. Traditional *bure* construction means that even total collapse of the building is rarely life-threatening. For example, the roof may blow off but the structure can remain intact, and it is common practice that the occupants then rush outside and crawl under the roof for the remainder of calmer winds of the cyclone (South Pacific Disaster Reduction Programme, 1998).

Traditional Pacific structures, however, do have shortcomings as they deteriorate rapidly due to weathering and insect attack, and they also represent a considerable fire hazard. This has resulted in the loss of some very important historic buildings across the region. Across centuries, the tradition of rebuilding with the same standardized techniques ensured continuity and aided the evolution of a traditional Oceanic architecture. This evolutionary process, however, was interrupted from the eighteenth century onwards as missionaries and European planters, traders and administrators introduced new ideas and began to use masonry and other more substantial and durable materials such as galvanized iron for building (South Pacific Disaster Reduction Programme, 1998).

Traditional architecture and landscape design also embody cultural and spiritual values of Pacific islands. For example, the interior design of the roofs of many traditional buildings reflects the intricacies of social relationships and connections with spiritual ancestors that are valued by Pacific islanders. A *maneaba* in Kiribati, for instance, and the social space defined by it provide the key to the identity of each individual as well as the whole community. This view is clearly supported by the enormous effort and care expended on its construction and maintenance and the high regard with which the *maneaba* is viewed by the people. The *maneaba* has been considered as the house of the principal deities of Kiribati cosmology, a non-denominational *bangota* (sacred shrine) for the community at large where, in the presence of gods, all the main civil ceremonies, rituals and debates are conducted. In the *maneaba*, religion, law and politics are inextricably mixed and associated ceremonial feasts are highly ritualized (Saini, 1978; Whincup, 2010).

Case study: ALD in Samoa

The independent state of Samoa is located in the south-central Pacific Ocean. It has a west-northwest to east-southeast orientation (Government of Samoa, 2002), and a total land area of 2,934 square kilometres. The island group comprises four inhabited islands, namely Savaii, Upolu, Manono and Apolima, and several nearby islets adjacent to their coasts (Ministry of Natural Resources and Environment (MNRE): Government of Samoa, 2013; Figure 13.2). Samoa, like many islands, has been exposed to the combined effect of tectonic processes, climate change, colonization and globalization. These processes continue to pose environmental and other risks to the development of the country and the lives of its people (Table 13.1).

The latest census in 2011 indicated that the population of Samoa increased from 176,710 in 2001 to 195,979 (Samoa Bureau of Statistics, 2016), with more than 70% living in 330 villages along the coasts of the two main islands, Upolu and Savaii (Government of Samoa, 2013). Key aspects of Samoan society which are crucial to understanding this society include *faamatai* and the communal nature of resource ownership which is still prevalent today. The majority of Samoa's population are Indigenous Samoans. More than 80% of Samoa's land is still collectively owned (MNRE: Government of Samoa, 2013), and every Samoan has access to customary land, either through their mother's or father's side. 64% of households live on customary land and 28% live on private or freehold land (Samoa Bureau of Statistics, 2016).

Conceptualizing ALD in Samoa: The guiding concept of *va tapuia*

The central Samoan concept of *va tapuia* frames this discussion of ALDs in Samoa, and we argue must be the guiding principle of future ALD in Samoa. *Va tapuia*

FIGURE 13.2 National University of Samoa *fale afolau*. Photo by Anita Latai-Niusulu.

encapsulates the Samoan holistic worldview of the environment and landscape resilience and, despite foreign influences, it continues to feature in Samoan architecture, landscape design, and urban design today as well as in other aspects of society. Tamasese (2007) refers to the literal meaning of *va tapuia*. The words *tapu-ia* (sacred) and *va* (relationship) imply that in relations with all living and non-living things, there exists a sacred life force beyond human reckoning. It can be argued that the sacredness that Tamasese refers to reflects how awareness of *va tapuia* leads to an attitude that accepts and respects the limits of human knowledge in relation to the physical environment. *Va tapuia* is a set of behavioral codes which give rise to the principle of *va fealoai* that permeates human interaction with the environment as a whole and not to just one element of it. *Va tapuia* governs all Samoan interactions, particularly the way decisions are made in the *aiga* as well as in the village *fono*. *Va* is relationships, connections, affiliations, boundaries, difference, separation, space, distance, responsibility, obligation, state of being, position, standing and so much more. The Samoan phrase *'E atoalio le masina'* which equates life to the roundness of the moon illustrates this holistic Samoan worldview (Aiono Le Tagaloa, 1996a and 1996b).

Samoan architecture and landscape environments

Key features of traditional Samoan architecture, such as the circular and open structure of its buildings and houses, must feature more significantly in future ALD. As this section demonstrates, these aspects of Samoan spatial design are

TABLE 13.1 Glossary of Samoan terms

aiga	Family	*matai*	Chief
alii	High chief	*paepae*	Foundation of a house comprising of rock and/or concrete
eleele fou	New land	*poumuli*	*Flueggea flexuosa,* a deciduous, small tree with a compact crown
faamalama laupapa-	Wooden louvres/shutters	*sa'o*	High chief
faamatai	Chiefly system	*tai*	Coastal side or the coast
fale	Traditional Samoan open house	*tala poo le matuatala*	Rounded ends of a *fale tele*
fale afolau	Long rectangular open house with rounded ends for guests	*togovao*	Mangrove wood
fale eli	Outdoor detached toilet	*tufuga*	House builder guilds
fale ese	Toilet	*tulagafale*	Land on which a house has been constructed
faleo'o	Small open house	*tunoa*	Formal word for outdoor detached kitchen
fale tele	Oval or round open house for meetings	*umukuka*	Outdoor kitchen
fono	Village council	*uta*	Inland
itu	Side	*va*	Space
malae	Village green or gathering space	*va tapuia*	Sacred space
Matagi-ala-lua	Splitting of the wind	*va fealoai*	Mutual respect

crucial to the resilience of Samoan people and communities and have been adapted in various ways by local people. The structures themselves are resilient and sustainable and assist in the development and maintenance of peoples' health and well-being. They continue to be seen in the landscape despite a shift toward using foreign construction materials and the building of larger closed European-style houses. Because traditional buildings tend to be without walls, and because of the tropical climate, definition between interior space and external landscape is not as defined as it would be in other parts of the world, meaning many traditional structures are inherent parts of the landscape physically but also culturally.

The Samoan *fale*

The *fale* is an important element of Samoan material culture. The *fale afolau* and *fale tele* are the two main types of traditional buildings that dominate the social-cultural landscape of Samoa (Allen, 1994; Kramer, 1995; Stucky, 2011). Embodied in these two types of buildings are the architecture and aesthetics of

traditional Samoan design reflecting customs, social structure and ethos (Engels-Schwarzpaul & Refiti, 2018; Taylor, 1999; Van der Ryn, 2016). According to legends of Samoa, the art of house-building originated from Tagaloa-matua, who created the model for the first *fale tele* (Buck, 1930), inherited by *tufuga*, the house-builder guilds of the Sa-Tagaloa (family of Tagaloa) and Aiga-sa-Sao (Taylor, 1999). Constructing the *fale tele* and *fale afolau* require great skill and knowledge beyond that of the ordinary individual, hence the need for specialized skills of *tufuga*. The construction of these buildings often involves all members of the family and broader assistance from the village community (Latai, 2014). The *fale tele*, and its more modern version observed throughout Samoa in the present, are built on raised platforms or *paepae* of rock or concrete, primarily for protection against flooding and heavy rainfall, but more importantly to reflect chiefly hierarchy in the village (Taylor, 1999). The site on which the *fale tele* is built is called the *tulagafale* (Tuvale, n.d). Every extended family in the village, particularly the founding families, will have a specific *tulagafale* in the village that is connected to the family chiefly title managed by the head *matai/sa'o* of the extended family.

The *fale tele* and *fale afolau* are mainly reserved for extended family and village activities. Activities related to cooking and everyday living take place in two separate houses: the *umukuka* and *faleo'o*. The *fale ese* is located further away from the rest of these buildings. Overall, the architecture of the Samoan *fale* mirrors and constitutes the culture and life of Samoan people, being deeply connected to *va* and the values of kinship, ancestral past, land and community. The spaces outside and inside of the *fale* are pivotal to cultural form, ceremony and ritual. Architectural concepts are incorporated in Samoan proverbs, oratory and metaphors, and linked to other art forms such as boat building and tattooing (Latai, 2014; Van der Ryn, 2016).

Openness is the most outstanding characteristic of Samoan *fale*. All traditional structures from the *fale tele* to the *faleo'o* have no walls, no doors, and a single indoor space. Blinds, woven from coconut leaves, surround the building for protection against the rain or hot sun (Stucky, 2011; Van der Ryn, 2016). In a similar way to the buildings of other islands in Oceania, Samoa's tropical climate dictates the open design of its *fale* to accommodate the hot and humid conditions. The all-year-round warm climate and cool breeze eliminated the need for permanent walls and people can enter and exit from any side of the building. Openness also embodies the relational character of the Samoan person as well as the Samoan family as large and extended. According to Latai (2014), just as the inner space of the house extends outwards, so does the Samoan family and its members in their social relations within the family and the wider community. In short, the family is not an independent entity, but an integral part of the community. Openness has many practical benefits such as ease of cleaning, childcare, and supervision of family chores. Openness also allows for community observation of behavior and shared responsibility in keeping family members' actions in check (Rohinger, cited in Stucky, 2011: 38). The openness of the *fale* does not mean that there are

no restrictions associated with certain parts of the *fale* and family life. During family gatherings, the *fale* becomes highly structured and certain spaces within the *fale* such as the front and sides are restricted to chiefs, elders and guests. Children and untitled members are restricted to other areas (Schoeffel, 1995).

Indigenous traditional architecture in Samoa (and Tonga) is also characterized by its circular shape (Van der Ryn, 2016). In Samoa, for example, the rounded ends (*tala poo le matuatala*) of the *fale tele* are where the highest ranking *alii* sits during village *fono*. This greatly enhances the visibility of other people sitting in the *fale*. In addition, from an engineering perspective, rounded ends are also more aerodynamic and can better withstand cyclone force winds (Van der Ryn, 2016).

Modifications and additions to the *fale* and new types of building

The combined effect of many foreign influences (e.g. the arrival of missionaries and other colonizers and also the modern availability of foreign building materials) and natural disturbances (e.g. cyclones and the devastating 2009 tsunami) have seen Samoan *fale* evolving over the years. The *fale afolau* has changed primarily because the distance between the two ends of the building were too far apart for guests and hosts seated on opposite ends of the house to hear each other and conduct a proper conversation, hence the need to reduce the length of the middle straight portion (*itu*), while increasing the width and the height of the roof to compensate for other requirements (Buck, 1930; Figure 13.2). It is now rare to find a *fale afolau* around the country, as cyclones which hit the country in the 1960s and 1990s destroyed most of these traditional buildings. Out of these two traditional structures, the *fale tele* is the more common. In recent decades, a notable use of the *faleo'o* in modern Samoa is related to the development of beach *fale* accommodations in the tourism industry.

Over time, dwellings in Samoa have varied in their size and in the materials used in their construction, often depending on the economic means of the family. These changes have been beneficial but also challenging at times for Samoans. The arrival of Europeans saw the emergence of closed houses (Latai, 2014). The most influential imported building form in Samoa has been the German 'verandah' type houses which were built from the later part of the nineteenth century to the end of World War One. Verandahs, however, which were the most characteristic component of this type of German house, were not introduced because of cost. By 1945 concrete floors and corrugated iron roofs had become standard in Samoa. By this time, the curvilinear end of the traditional *fales* had been replaced by right-angled wooden posts or concrete block ends also (Saini, 1978; Figure 13.3).

The 2006 Samoan Census recorded ten categories of residential buildings, ranging from the traditional open *fale* to multi-story closed European houses (Table 13.2). About 90% of traditional open *fale* in the country are located on customary owned lands. Overall, there is significant variation of residential

FIGURE 13.3 A square open *fale*, which has now become common in Samoa. Photo by Anita Latai-Niusulu.

dwellings located on customary owned lands, while closed European houses are common on privately owned lands. Additionally, the post-2009 tsunami period saw the emergence of various types of pre-fabricated square open *fale* on the landscape funded by the Samoan government and built by various community groups and companies (Government of Samoa, 2011).

Large-scale changes in architecture are evident in Samoa's capital of Apia, located on the island of Upolu. New architecture that now dominates the skyline and landscape mark important developments in the making of modern Apia. New buildings have gradually replaced the colonial buildings that once characterized the township. For example, the Apia Courthouse built in 1902 by the German administration was one of the last surviving colonial structures in the South Pacific, but was demolished in 2020. In addition, the original traditional oval-shaped open parliament house with thatched roof and concrete floor has been replaced by more modern form buildings over the years. The latest building, opened in 2020, is a circular, closed and air conditioned, and is built in a somewhat futuristic-looking European style. Many other multi-story buildings (four to eight floors) have been built in recent decades. However, many of these buildings model European design perhaps better suited to temperate regions. In Apia, all of the buildings constructed in the past 30 to 40 years are closed European structures with significant air conditioning systems. Overall, building for durability and comfort was central to building design, and working in an artificially cooled offices provided a comfortable working environment as far as the Samoan mindset of the time was concerned. However, high-energy costs and impacts were not fully considered in the design of these modern buildings. In addition, the sustainability of the reconstruction of major government buildings has been questioned. For example, a number of these buildings, including

TABLE 13.2 Type of building by land tenure, 2006

Type of building	*Land tenure*							
	Total	*Customary*	*Freehold*	*Leased*	*Government*	*Church*	*Employer*	*NS*
Total	46,048	32,521	9,929	1,259	231	1,843	237	28
Open Samoan *Fale*	12,770	10,396	1,812	199	47	275	37	4
Open Samoan *Fale* with ext.	3,022	2,101	710	90	11	88	20	2
Closed Samoan *Fale*	753	481	205	35	4	16	11	1
Closed Samoan *Fale* with ext.	482	281	149	26	5	16	5	–
Open European *Fale*	10,658	8,705	1,363	181	22	350	33	4
Open European *Fale* with ext.	4,727	3,355	970	138	12	222	25	5
Closed European House	6,883	3,771	2,198	330	81	432	64	7
Closed European House with ext.	5,754	3,131	2,000	197	35	359	30	2
European House 2+ stories	879	219	497	61	11	80	10	1
Samoan *Fale* 2+ stories	75	48	19	2	3	2	1	–
Others	33	25	5	–	–	2	1	–
NS	*12*	*8*	*1*	–	–	*1*	–	2

Adapted from Samoa Bureau of Statistics (2006).

Parliament, are located on Mulinu'u Peninsula on the northern coastline of Upolu within central Apia. But at only one-metre above sea level, the Mulinu'u Peninsula is particularly vulnerable to flooding and storm surge from tropical cyclones, and the risk will increase significantly with rising sea levels (Pacific Australia Climate Change Science and Adaptation Planning, 2013).

Samoan household compounds, village landscapes and the environment

A typical Samoan household compound is made up of a number of discrete buildings deliberately arranged within the landscape to ensure the survival, health and well-being of Samoan families. This diversity of living space becomes crucial during challenging times such as during a funeral or when a cyclone hits. The multiplicity of buildings means there is always space to accommodate visitors or when one structure is destroyed, there is an alternative structure to live in, thus adding to resilience of the family and community. Outdoor kitchens and toilets are common, which helps create healthy living conditions and clean landscapes. Samoan households typically have a *fale tele* or *fale afolau* at the front of the compound. Immediately at the back of the traditional guest house is often a partially closed or closed European house. Further back (or sometimes on the side) one would find a *faleo'o,* a *tunoa* and a *fale eli*. Overall, flexibility and versatility characterize the use of *fale* and domestic space, which is both interior and exterior in Samoa. Eating, weaving, praying, sleeping, meeting and many other activities (other than cooking and toilet related activities) may occur within the same space at different times (Figure 13.4).

The majority of Samoans shifted to the coast in the late 1700s to early 1800s and lived in village settlements where housing was oriented around the village *malae* in a circular/oval shape. The arrangement of villages considered environmental and social sustainability, health and well-being. The majority of villages have *tai* and *uta* sections. Village/extended family *fale tele* typically front on to the *malae,* with smaller *fale* (*faleo'o, umu,* and *fale ese*) situated behind each extended family's *fale tele*, and sprawled out towards the village plantations, cemeteries and bush lands. Figure 13.5 shows a typical example of this layout for one village in northwestern Upolo. A lack of fences and walls in the village mean that the exterior and interior of the *fale* are experienced as one continuum, which walls and fences would disrupt (Shore, 1982; Stucky, 2011). Plantations and cemeteries were mostly located inland and separated from where people lived.

Changes to household compounds and village and town landscapes

The interplay of natural disturbances and human influences have also resulted in the evolution of village landscapes in Samoa, some of which have disrupted human *va* connections with their physical environments. Historic volcanic

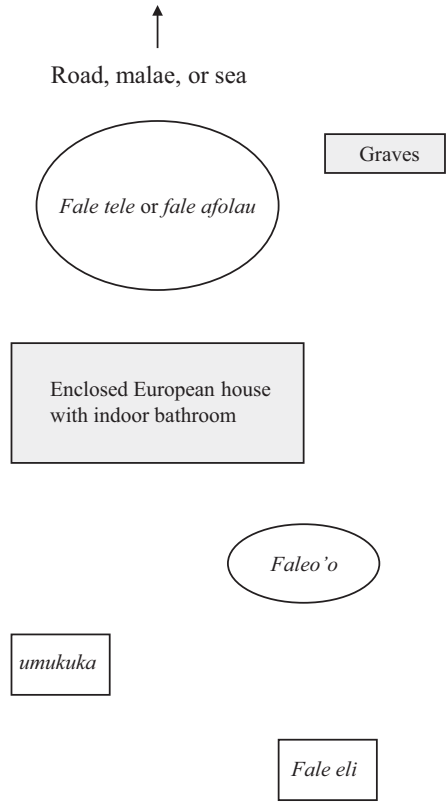

FIGURE 13.4 Layout of Samoan household compounds. Drawn by Anita Latai-Niusulu.

eruptions have influenced human settlement patterns such as shifting entire villages from Savaii to settle on parts of Upolu island. Cyclones have also led to major transformations in village landscapes in Samoa. Cyclones Ofa and Val, for example, in early 1990 and late 1991, are regarded by many in Samoa, including researchers and officials, as the first signs of anthropogenic climate change. After these cyclones, many Samoans started to seriously think about building alternative homes away from the coast. For many living on the northern coast of Savaii, families immediately shifted inland after the cyclones and built houses on lands they had previously used for cultivating food (shown in the area around Saleimoa in Figure 13.7). For many other households and villages in other parts of Upolu, the move to inland parts of the island has been slower and incremental, with some movement not being permanent. For example, younger family members would move to build and live in alternative houses inland but the rest of the family would still occupy the coastal residence and land. Those living inland would often visit the coastal residence and land as demonstrated by the two headed arrows in Figure 13.5.

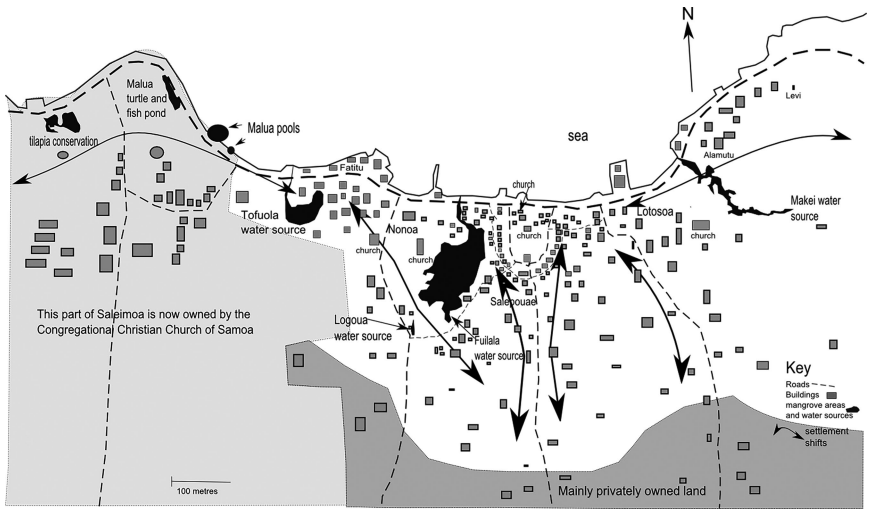

FIGURE 13.5 Village settlement and physical features of Saleimoa village.
Source: Latai-Niusulu (2017).

Many tsunamis have also affected Samoa over the years. The most recent and most devastating in modern times, hit the south coast of Upolu in September 2009, affecting the coastal parts of 20 villages. The tsunami waves reached more than 14 m in height and inundated a zone stretching up to 400 m inland along on the south coast of Upolu. 143 people were killed, and many sections of the coastline were eroded and coastal vegetation destroyed. The majority of people affected have now resettled in inland parts of the affected villages (Government of Samoa, 2011).

There is evidence of growing haphazard development in some parts of the country due to the lack of proper planning and land management thus threatening the resilience of landscapes. The emergence of high-rise buildings in Apia has also been closely related to the loss of green and open spaces. Substantial land reclamation of the Apia waterfront in the early 1970s was necessary to resolve land shortages for urban development. The government building and central bank complex are built on reclaimed land known as *eleele fou*, which was later renamed *Matagi-ala-lua*. In addition, recent developments to upgrade the Apia waterfront in 2018 have resulted in the expansion of impervious concrete pavements for parking and pedestrian footpaths that have contributed to an increased urban heat island effect and thus, the need for increased air-conditioning.

New road developments in Apia in recent years have also dramatically altered the urban landscape, accelerating the path to further inevitable change (Taua'a, 2018). Many roads cut into villages and have impacted the orientation of some houses within. This has sometimes created discord and uncertainty. For example, some families have been left uncertain as to whether their houses should face the

road or the village *malae* (Van der Ryn, 2016). In addition, the combination of road upgrades, seawall construction, housing construction, mangrove harvesting, and sand mining have led to the disappearance of beaches in many villages. Further, mangrove areas, particularly in Upolu and northern parts of Savaii, have been separated by roads and bridges from the sea (Boon, 2001; Latai, 2008; Latai-Niusulu, 2017).

The future of Samoan and Pacific Islands' ALD

Taking into consideration the predicted impacts of climate change and other environmental challenges, we envision future Samoan and Pacific Islands' ALD to comprise traditional building styles and methods and variations of these. Samoan society, like those in many of her Pacific neighbors, has evolved in many ways and we cannot separate or ignore these changes in our search for ways to cope with emerging challenges. Due to climate change and the impacts of COVID-19, there has been a renewed desire in many Pacific islanders to look for solutions from within their own cultures and ways of life. This section discusses sustainable and resilient ALDs found in Samoa, which could be adapted to other parts of Oceania with similar physical and socio-cultural conditions.

Traditional Samoan ALDs are crucial aspects of such solutions as they embody Samoan *va* connections to each other as well as to their physical, social and spiritual environment. Finding ways to revitalize traditional Samoan ALDs is crucial to strengthening peoples' *va* connections to the land, sea and all other aspects of the environment. This is key to the sustainability of Samoan society and the well-being of its people. Additionally, future ALDs must also draw on (but not necessarily replicate in all aspects) traditional building styles and methods because these designs and methods are robust, sustainable and reflect a culturally relevant response to the specific ecology and climate of the place. They have been trialed for centuries, and they continue to persist and survive. Traditional building and landscape designs and methods also tend to be more flexible in that they can be made affordable to the local people as the next section demonstrates.

The *faleo'o*

The Samoan *faleo'o* is an innovative, flexible and feasible solution for Samoan people to continue to draw upon, adapt and modify. The *faleo'o* is an affordable option because its size can be determined by the owner's access to resources. It is built from local materials which are readily available such as the *poumuli* and coconut; trees that are commonly found on the plantation lands of most Samoans. Minor modifications which some people are using include the use of tires, rocks, bricks and fishing nets to hold down the roof and tarpaulins to replace coconut blinds (Figure 13.6).

The design of the *faleo'o* is not only climate-appropriate but also energy-effective. These important aspects of building design for Samoa are emphasized

FIGURE 13.6 A family at Lano moved to build this *fale* after their coastal residence was destroyed by the 1990s cyclones. The family maintains both their inland and coastal residences.

Source: Latai-Niusulu (2017).

in the Apia Waterfront Plan 2012–2026 (Ministry of Natural Resources and Environment & Samoa Tourism Authority, 2016) and Samoa's Building Code (Ministry of Works, Transport and Infrastructure, 2017) which are key national documents guiding the current and future development of buildings and landscape design. The Samoan *faleo'o* not only provides natural ventilation due to its open sides, but can be easily raised using posts or moved inland as the sea rises (Figure 13.7). Mechanical systems for cooling air temperature (e.g. air conditioners and refrigeration), solar panels and other weatherproof building materials are foreign, meaning they must be imported at great expense. The *faleo'o* can also be re-built easily when it is destroyed by natural events such as cyclones.

Circular and open designs for large Samoan buildings: Heat reduction designs

Circular and open buildings, such as at the Samoa Tourism Authority village and the National University of Samoa *Fale*, should be encouraged in the architectural design of government buildings in the future as this would result in cooler interior conditions and will be more energy effective. It would also enhance

FIGURE 13.7 *Faleo'o* adapted into what is now commonly known as a beach *fale* seen here at Lano, Savaii.
Source: Latai-Niusulu (2017).

Apia's identity and sense of place as Samoa's urban area continues to grow. The recently built Faleolo International Airport is an example of a large building in open style; fully taking advantage of the sea and land breeze throughout the year (Figure 13.8).

Techniques such as large overhangs, verandahs, high circular roofs, and multiple large side doors, that are kept open when the building is being used, are great heat reduction features of other big buildings such as the Catholic Cathedrals at Leulumoega Tuai and Mulivai (Apia). Samoan art, patterns and stories reflecting values such as family, community and spirituality could be incorporated into the design of all government buildings and public spaces. Other simple heat reduction techniques include the use of *faamalama laupapa* in closed buildings, thermal curtains and the growing of plants around the house that are pruned before the wet/cyclone season begins.

Household compounds and landscape diversification

The multiplicity of Samoan household compounds and family access to land parcels are important adaptive strategies to endure the multidimensional nature of climate change and its impacts. As indicated earlier in the chapter, having many

FIGURE 13.8 The newly built Faleolo International Airport with its high roofs and wide-open ground floor. Photo by Виктор Пинчук (2019) under CC BY-SA 4.0.
(https://commons.wikimedia.org/wiki/File:Faleolo_International_Airport.jpg)

buildings of different sizes, styles and functions means that if one is destroyed, the *aiga* has the other buildings in which they can live. Building and living on two or more parcels of land (often one inland and one more coastal) is another common strategy employed by many Samoan households. This is another way of diversifying places of residence and reducing the risk of being left homeless when a disaster hits.

Green spaces and landscape spatial arrangement

Green spaces should be incorporated in current and future landscape designs as these reflect the Samoan holistic worldview and *va* connections with physical aspects of the environment. These features are still evident in many villages today, but many are also reducing in size due to road and building developments as discussed. For this, and also the development of forested areas, *malae*, mangroves and wetlands, plantation and bush lands, it is important to draw on the traditional village landscape layout and experiences of village councils, who manage village lands and waters. In addition, relevant government ministries and development agencies which are advocating and financing activities to conserve and revitalize these landscapes or think about adaptation to climate change are key stakeholders in nature-based landscape design in Samoa.

Protecting and expanding green spaces is an urgent need for Apia in particular, to make the city cooler during the daytime and provide spaces for peoples' health and well-being. Green spaces could also help rejuvenate urban and coastal biodiversity in an area that is increasingly covered by concrete surfaces and human-made structures. Turning Apia into a 'green' or 'living' city is possible as currently evident in the development of green spaces at *Matagi-ala-lua*, carried out by the Ministry of Natural Resources and Environment and Samoa Tourism Authority as part of the Apia Waterfront Development Project. Further options could be preventing cars from entering the city center, declaring the city center as a park, replanting the area with appropriate native tree species, and ensuring that working with nature, as understood by traditional knowledge, drives new development. Increased urban green space, and indeed culturally relevant nature-based solutions to building and infrastructure challenges, would not only help residents and visitors cope with the heat, but could be part of Samoa's efforts to increase carbon sequestration, support biodiversity and adapt to climate change (Kiddle et al., 2021b). Apia could be developed to encourage a sense of place and well-being for Samoans. Here, Samoa could draw on the development of urban green and blue spaces elsewhere, notably how parks become places that contribute to ecological health in urban settings, but are also for people to meet, socialize, exercise, and generally enjoy the benefits of close proximity to nature. All of these activities contribute to the development of improved physical and mental health and well-being (Pedersen Zari, 2019; Soderland & Newman, 2015).

Moving forward

Ensuring sustainable and resilient building and landscape designs in the Pacific Islands' region is a whole-of-society undertaking that requires collaboration across various government agencies, development and humanitarian actors, and between national and village authorities. The Samoan government has already developed a holistic framework of national governance where all of the 14 core sectors of the government share responsibilities in decision making with non-government groups, communities and development partners (Ministry of Natural Resources and Environment & Samoa Tourism Authority, 2016). This holistic approach is inclusive and enables partnerships and collaborative activities between government, communities and international and local agencies and civil society groups. This framework could enable the mainstreaming of traditional knowledge driven nature-based ALD goals and activities into the plans of key government sectors, local communities and international partners and could be a model for other parts of Oceania.

The role of relevant government agencies in the development of national strategic goals and objectives is crucial to ensuring sustainable building and landscape designs in the Pacific Islands' region. We recommend that any efforts to develop nature-based ALD goals and activities must consider not only vernacular

and traditional knowledge-driven approaches to the creation of spaces alone but also how these relate to the existing legislation and national strategic documents in place.

It is also important for governments to consider the significant role of master/traditional builders in the development of national strategies relating to nature-based resilient ALD. These people possess knowledge and skills crucial to these aspects of development. Traditional master builders should also be key consultants in government construction projects and building programs. The education sector also plays a significant role in the sustainability of traditional skills and methods of ALD in Samoa and the Pacific region as a whole. Tertiary institutions should consider traditional ALDs in the development of construction and building programs and courses, particularly in relation to climate change adaptation and resilience initiatives. For example, the Faculty of Technical Education and the Centre of Samoan Studies at the National University of Samoa could consider developing courses that cover Samoan traditional ALDs. To date, the process of building a Samoan *fale* and its significance is taught, at a general level, as part of the Samoan Language and Culture curriculum in schools. However, traditional skills and methods of building *fale* are not part of the construction and joinery curriculum at tertiary level. In 2021, building a model of a *fale Samoa* became a part of the National University of Samoa Culture Week; however, the process and skills are not a formal part of the training of construction workers and builders at the university. Other key government ministries to assist in this area would be those responsible for the environment and forestry. The current activities of the Ministry of Natural Resources and Environment and the Ministry of Agriculture, Forestry and Fisheries in developing awareness of native tree species and their replanting programs have been, and will continue to be, crucial to the development of nature-based traditional ALDs in Samoa, and are key to climate change adaptation and resilience efforts. In addition, future replanting initiatives to increase the resilience of landscapes could consider planting programs for trees, such as *poumuli, togovao*, and certain varieties of coconut and breadfruit, which are necessary to building Samoan *fale*, but also play critical roles in working with ecologies in order to further adapt to the impacts of climate change.

Conclusion

Traditional, nature-based ALDs are tangible aspects of Pacific culture and worldviews. In Samoa, this is encapsulated in the concept of *va tapuia*, the sacred and complex relationship between all living and non-living elements of the socio-ecological realm. In Samoa and the wider Pacific region, buildings and landscapes are interconnected and have evolved in various ways and forms over centuries and showcase the inextricable connection between Pacific peoples and their island and ocean environments. This connection is the foundation of ongoing ability to adapt to an interlinked changing climatic, ecological, political and

social context, and must therefore be a critical aspect of future resilient spatial designing which incorporates interconnected architectural and landscape conceptualization, designing and occupation. Using the lens of *va tapuia* from our Samoan case study to analyze these changes helps to identify building types and landscape patterns that are sustainable and therefore likely to be more resilient for the context of Oceania, and those which are not.

It is crucial that models of urban and landscape design for climate change adaptation developed outside of the region are not simply transplanted in the Oceania context. Rather, our Samoan case-study has shown that design driven by traditional ecological knowledge is the most important, localized, starting point for nature-based, resilient, ALD. Such traditional ecological knowledge is the foundation of ongoing ability to adapt to changing contexts in the region. Worldviews and lessons from Oceania, such as the Samoan example of *va tapuia*, can also be used to inform and adapt nature-based ALDs in other parts of the globe.

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