Pacific Man – A Future Speculation developed from Pacific Architectonics

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Abstract
Characterised by flexible joints and renewable use of materials, Pacific Architecture contains an integrated tectonic system that is historically used to construct both buildings and highly efficient watercrafts, enabling civilizations to flourish in Oceania. However, its significant architectural languages are widely dismissed in today's utilitarian society. Witnessed in museum, cultural faculties and resorts, Pacific Architecture is often perceived as a cultural artefact that lacks of practical application.
As a celebration of Pacific Architecture, the paper aims to discover how tectonics and construction systems from the Pacific could be revived, radically developed and utilised to accommodate "Future Pacific Living" in the rapidly changing world. Through a collective of speculative architectural propositions, the paper proposes alternatives to the existing postcolonial built environment while fully embracing future technologies. The paper also aims to rethink the current Ekistics Scale by demonstrating possible Oceanic alternatives to land-based human settlements.

The first part of the paper is a review of the author's past project 'The Lomipeau Speculation', a macro-scale visionary proposal to conceive of a city formed by Pacific tectonics. The second part, Pacific Men, is a narrative developed from the past project, exploring how Pacific Architecture can re-define humans' relationship with the Ocean at multiple scales. This speculation will be presented through architectural drawings with references to Doxiadis's Ekistics Territory Scale, while proposing a new unit of Okeanopolis that is positioned outside the existing Scale.

Introduction - Pacific Tectonics

Often linked to ground conditions, stability and permanency, architecture is widely considered as a land-based practice. However, this is an incorrect statement for the Pacific where the Ocean is the genesis of its architecture. Surrounded by an enormous body of water, traditional buildings found on Pacific Islands from Melanesia to Polynesia are closely tied to boat-making technologies (Austin, 2001). This enables a unique palette of architectural languages to evolve in the fluctuating Oceanic environment, forming prosperous human settlements with exceeding mobility, empowering island civilizations to thrive for many centuries.

What makes Pacific architecture extraordinary is that buildings and watercraft share the same tectonics system. The most pivotal feature found among Pacific buildings is the centralised ridgepole structure, which can be

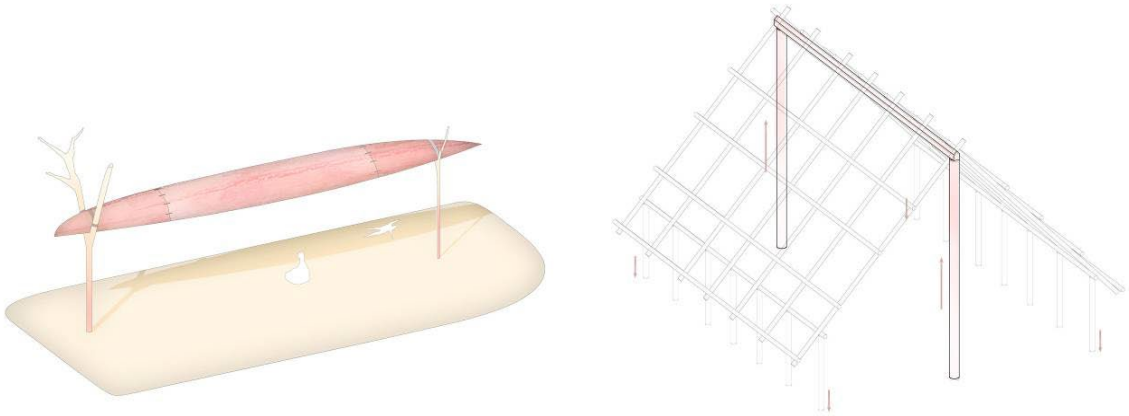

Fig.1: Diagrams showing the fundenmental Paicific Architectural structure.
Left:A Canoe being turned up-side down forming the first Pacific shelter
Right: Ridge Pole being the primary structure of a Pacific House, with roof being tied down to the ground

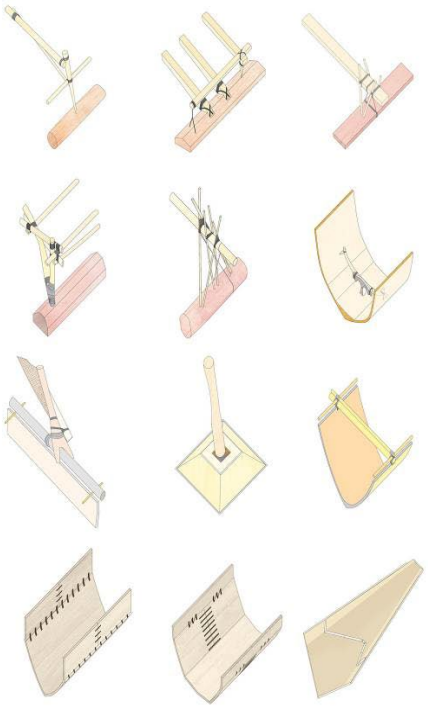

Fig.2: Pacific Vaka tectonic composition

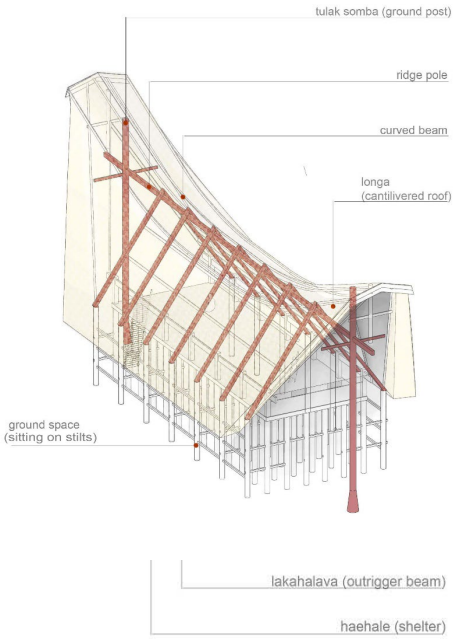

Fig.4: Tongkonan Tectonic Diagram

perceived as a translation of canoe hull (Austin, Treadwell, 2009).A Pacific house prototype can be seen as a vaka (Pacific canoe) turned up-side-down, propped up by central posts and stabilised on the sides (Fig.1).Within this arrangement, a combination of tension and counterweight is achieved in its construction. Its large lightweight roof is tied down to a significant counterweight - the ground, its walls are often non load-bearing, therefore, become screen-like elements to provide efficient climate control.

Construction techniques are crucial in Pacific Architecture. Structural components are commonly connected with lashing joints, allowing some degree of movements and flex, so that building or canoe parts can be easily replaced and renewed when damaged or worn out. This also enables buildings to be more easily rebuilt at new locations for various purposes, gaining traditional settlements mobility. Migration between islands was made possible. In Aotearoa, this also greatly assisted Māori settlements' seasonal migration during the pre-contact period (Brown.2009.

The unique tectonics system of Pacific Architecture can be discovered in most parts of the Pacific Ocean – from as far as Ancient Japan's Ise Shrine to Aoteroa's Wharenui. It makes Pacific architecture lightweight, flexible, and potentially mobile. This is essential to accommodating a 'Pacific way of living' that embraces open space, renewability and migration, forging the collective of highly diverse Oceanic cultures.

Archetype Studies

The following section conducts studies on some of the key Pacific building archetypes, demonstrating the coherent tectonic linkages between different parts of the Pacific.

Fale – Polynesia

Often considered as one of the most iconic archetypes of Pacific Architecture, Samoan Fale offers a good example of the ridgepole-to-post system. The middle section of its large roof, named Itu, has a short ridgepole at the centre which is directly supported by the central post. The round sections at the two ends of the roof, named Tala, are lashed to Itu and resting on a circle of side posts (Austin and Treadwell, 2009). The side posts work in tension against strong wind, holding the lightweight roof down to a raised stone platform at the building base which works as the counterweight. The complex structural system together creates a highly flexible space under the roof. No load-bearing walls are required as enclosure is generally achieved by weaved screens placed between side-posts, accommodating a communal life that is unique to traditional settlements in the South Pacific.

Houses on Stilts - South East Asia

Traditional houses in Southeast Asia display many similarities to Fale and other South Pacific archetypes. Visually defined by large lightweight roofs and often incorporate centralised structures, the buildings are commonly constructed on wooden stilts that raise living spaces above the ground. This enables buildings to be built close to water edge or even above water. Thai architect Sumet Jumsai describes the amphibious architectural system as the basis of 'Water-Based Civilisations', forming relatively impermanent but potentially mobile aquatic settlements across the Pacific (Jumsai, 1988). Using the Thai village of Tha Khanon as a precedent, Jumsai suggests that houses can be even built on bamboo rafts that automatically afloat when the ground is flooded (Jumsai, 1988), becoming a hybrid of building and boat.

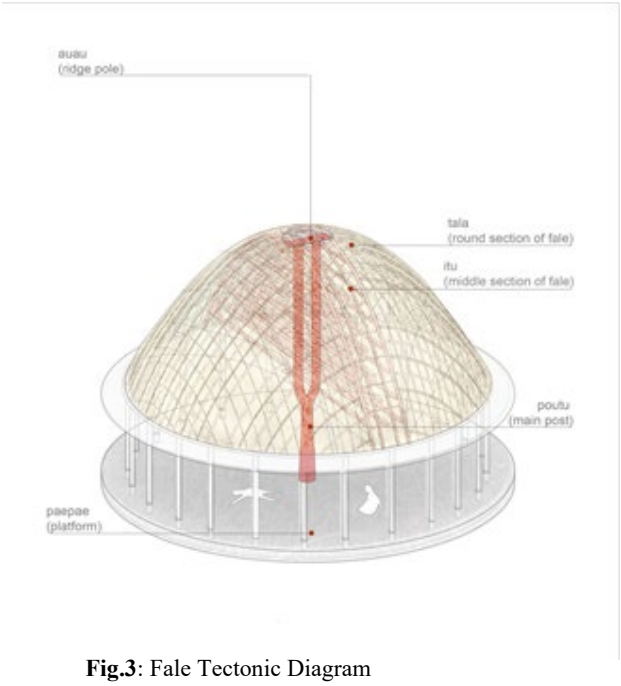

Fig.3: Fale Tectonic Diagram

The houses on stilts sometimes show formal references to watercrafts. Evidence can be discovered on South Sulawesi's Tongkonan. The Indonesian archetype is sheltered by a self-tensioned roof, explicitly resembling an upside down boat.

Ise Jingū (Naiku and Geku) – Japan

The historically significant Japanese archetype exhibits a highly consistent structural system to various buildings found in Polynesia and Southeast Asia. It evidently accommodates the centralised ridgepole system while its raised floor platform is sitting on stilts. The roof is topped by katsuogi: nine to ten heavy cylindrical objects made of hard wood. Originally used as weights against wind, these unique building elements have become purely symbolic and structurally redundant during its later development (Tange, 1965).

Ise Jingū is also a great precedent to demonstrate the remarkable resilience and renewability of Pacific Architecture. Since the 6th Century AD, the shrine complex has been rebuilt on an adjacent site every twenty years as one of the most important Shinto rituals. As Joseph Rykwert describes the reconstruction as an act to "renew time for those who inhabit the land" (Rywert, 1981), Ise Jingū expresses the Japanese perception of perpetuity which is achieved through continuous self-renewal.

Threshold in Pacific Architecture

The archetypes above demonstrate unique spatial conditions offered by Pacific tectonics. Besides being extremely open and flexible in spatial planning, another important shared feature is the ambiguous threshold between spaces. Freed from load-bearing, walls in Pacific architecture can exist in extremely lightweight forms such as weaved blinds and full-height sliding screens, they should be perceived as operable devices rather than space dividers. The threshold is further blurred by the use of raised platform and verandah that create a continuous flow between the interior and the exterior, removing boundaries between human settlements and the broader Oceanic environment. This spatial arrangement can be still witnessed today at Wharenui's paepae and traditional Japanese house's *engawa*.

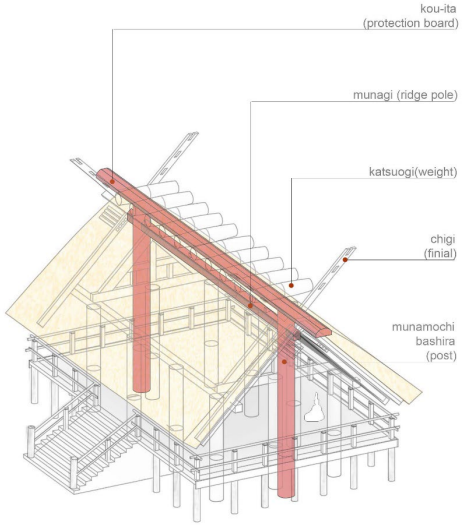

Fig.5: Ise Naiku Tectonic Diagram

Lost in Translation

Many would consider Pacific Architecture a treasure that provokes excellent cultural and historical values, but irrelevant to our everyday life. Pacific Architecture and its tectonic system have been practically dismissed in the region since the post-colonial era, and its development ceased soon after the continental building typologies were introduced in the 19th century. Many contemporary buildings claimed to be Pacific architecture tend to be "post-modern decorative sheds", only borrowing visual and formal elements without incorporating its signature tectonics. They are commonly witnessed in cultural and tourism facilities where monolithic reinforced concrete structures are

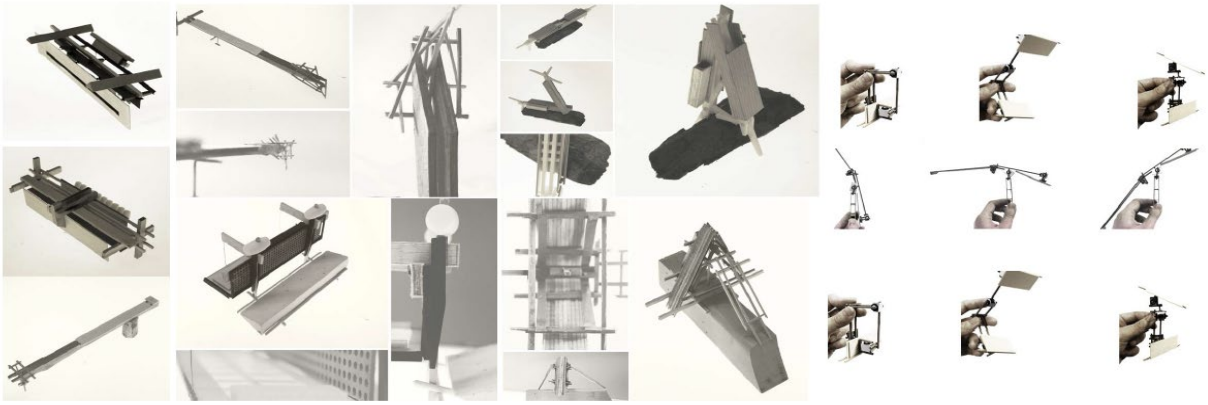

Fig.6: Wei's model studies translating Pacific tectonics into new compositions from Wei's past research on Pacific syntax

crowned with "Fale hats", or decorated with motif precast facades. Such buildings merely display a visual resemblance and spatial mimicking to their historical archetypes, very often represent a commodified image of Pacific Architecture. As architectural academic Jeremy Treadwell suggests, this practice is mere "design for representations" (Treadwell,2006), which turns Pacific Architecture into a symbol of indigenous exoticism. Consequently, human settlements in the Pacific region have been primarily homogenised by their continental counterparts, losing the traditional 'Pacific way of living'. Especially these settlements are prone to the increasingly frequent natural disasters in recent years, and its residents suffer tremendously from water-related disasters such as tsunamis, typhoons and sea levels rise.

Pacific architectural scholar Mike Austin suggests the dull reality of today's Pacific architecture is caused by a "mistranslation" from the traditional Pacific tectonic languages to a contemporary setting - where contemporary Pacific buildings maintain semantics but lost its tectonics syntax. (Austin, 2014). In language, the syntax is generally understood as the systematic arrangement of parts or elements. In architecture, syntax refers to the composition of structure that "persists over time," thereby ensuring coherent tectonic sequences. In language, linguistics semantics are associated with meaning and signification. In architecture, semantics can be understood as referring to those conditions that are changeable; for instance, form, material, and decoration. The syntax is the key to maintaining the translation's coherency, while the semantics is to respond to specific conditions such as culture, climate, and local niche. A good translation, therefore, needs to persistently maintain the syntax while actively changing the semantics to respond to specific contexts. Using this linguistic system, architects and designers can achieve innovation and development based on the original syntax, and architectural language can evolve while generating new possibilities (Austin,2014).

America's Cups racing boats of AC-45 can serve as an excellent example of using Pacific Syntax to achieve efficiency in today's world. Besides the boats are recast in contemporary materials such as steel and carbon fiber, many syntactic features from Pacific canoe archetypes are found in its design. The double hull design demonstrates the historically significant performance of counterweight achieved by two hulls balancing each other. The flexible lashed joints are translated to robotic junctions that accommodate kinetic movements, increasing its capacity to respond to changing water conditions. With the world moving to an era that pursues speed, efficiency, and advancement, the racing boat successfully demonstrates that Pacific tectonics has the potential to embrace the future and create many design opportunities. Because of the transferable nature between building and watercraft in Pacific architecture, AC-45 can serve as a design inspiration for building design and construction in many ways.

The original syntax of Pacific Architecture is somehow coherent to many structures that related to architectural innovation and technological advancement.

Kenzo Tange, the head of Metabolism architects in the 70's Japan, was a significant figure to demonstrate a linkage between Pacific architecture and contemporary adaptation. In the writing of 'Ise: Prototype of Japanese architecture', Tange identifies Ise Jingū as the original prototype of all Japanese architecture (Tange,1965). Its renewability, flexibility and mobility were widely considered as the core philosophies among the metabolists. The movement was to create a system of architecture that would embrace change, growing naturally like a living organism as a response to the rapidly changing post-war Japan. In some way, the metabolism movement could be perceived as a 'modern experiment of Pacific syntax'.

In a number of buildings designed by Tange and many other metabolists, the concept of renewability and flexibility is achieved through a combination of centralised primary structures and flexible secondary components, a syntactical composition that can be frequently discovered in traditional Pacific archetypes. The centralised structure was usually interpreted as vertical central cores, carrying the less permanent secondary 'pods' (smaller rooms). These 'pods' were designed to be removed, replaced and renewed overtime based on the occupants' changing needs. Examples are

Fig.7: Site Plan of Special Autonomous District of Lomipeau

given by Tange's famous Yamanashi Press and Broadcasting Centre and Kisho Kurokawa's Nakagin Capsule Tower (Koolhaas and Obrist,2011). Although most of the proposed adaptation failed due to practical issues, the Metabolism Movement still offers a great deal of inspiration to how contemporary buildings could be designed incorporating Pacific syntax.

Architects of High-Tech Architecture and Deconstructivism movements also demonstrate buildings with many shared features with Pacific buildings. Richard Roger's Inmos Microprocessor Factory innovatively combines prefabricated building components and a lightweight tensile structural system, creating highly flexible industrial spaces that allow alteration and expansion to easily happen. Rem Koolhaas' Casa Bordeaux challenges the concept of gravity, employing a massive counterweight to its central portal beam to enable the house to float above the landscape. Although not directly associated, these can also serve as inspiration to the development of contemporary Pacific architecture.

Speculation Proposals

As the world moving into an Anthropocene era - the Pacific region is facing the most significant challenges in centuries. The ongoing climate crisis is bringing a series of drastic changes, from sea level rise to unpredictable natural disasters such as frequent flooding. Water will have an increasingly substantial presence in our everyday life. Cities and villages built in the last two

Fig.8: Speculated drawing of Lomipeau, with the volcanic island of Kao passing under it (with reference to Katsushika Hokusai's drawing - Great Wave)

centuries are prone to the changes since their lack of flexibility and adaptability, affecting millions of people's lives. This might be a critical time for architects and urban planners to rethink Pacific Architecture.

Historically, migration and voyages were taken as a response to environmental change or disasters in the Pacific. Coastal researcher Mark Dickson demonstrates in his research that a one-metre sea level rise between 3000-5000 years ago could have had a significant influence on Pacific settlements (Irwin,2006). There was a substantial wave of Pacific migration happening during this period after a number of atoll groups were flooded and became uninhabitable (Irwin 2006). According to this historical record, the environmental changes could be seen as a trigger for possibilities in the Pacific. The change catalyses the Pacific people to discover new territories and adapt themselves to a broader range of environments. Needless to say, the flexible tectonic system of Pacific architecture played a vital role in this process to enable Oceanic migration.

If there are opportunities for adapting Pacific Architectonics to the current setting - or even beyond, would it create a positive response to embrace the unpredictable future?

To answer the question above, the author employs the practice of Architectural Speculation to demonstrate the potential development of Pacific Architecture and its tectonics system. Inspired by 'paper architecture proposals' in the 20th century such as the Archigram and Japanese Metabolism, the article will present two design proposals in the form of visionary architecture that project Pacific Architecture beyond its commodified image into an extreme new future. Being highly speculative, the projects do not tend to provide buildable solutions for the current world, nor will they be fully technically resolved with the available technologies. They are to demonstrate the greater inspiration found in the extraordinary architectonic system, exploring its creative and generative potential beyond the confining perception of Pacific Architecture.

The first Project, Super Pacific City – The Lomipeau Speculation, was completed in 2014 as part of the author's masters graduation project supervised by Jeremy Treadwell. The project aims to present a vision of what it is like to construct a large scale human settlement only with Pacific architectural tectonics. With the key architectural languages translated from the traditional Pacific elements, it is to seek a radical alternative from the existing city-building model. The second Project, Pacific man, takes the form of architectural illustrations with a micro approach, positioning the philosophies of Pacific architecture into everyday life in Auckland Tāmaki Makaurau.

Project One - Super Pacific City - Lomipeau Speculation

Background

The proposal sets in a speculated future scenario where climate changes drastically alter Oceanic environments. Existing cities on several islands are made uninhabitable by rising sea levels and other natural disasters. Started with the Marshall Islands and Vanuatu, several significant island nations have been completely underwater. There will be more and more human settlements affected by the ongoing changes. As a response, Pacific Nations united under the title Pacific Forum, are establishing a Special Autonomous District of Lomipeau at Rangitaiki Plain, Bay of Plenty, New Zealand. The citizens of the settlement are made up of people coming from all around the Pacific Ocean: primarily environmental refugees, craftsmen/technicians and researchers. The city acts as a production and research base, developing Pacific tectonic system into an efficient and adaptive building system for the rapidly changing Pacific environments.

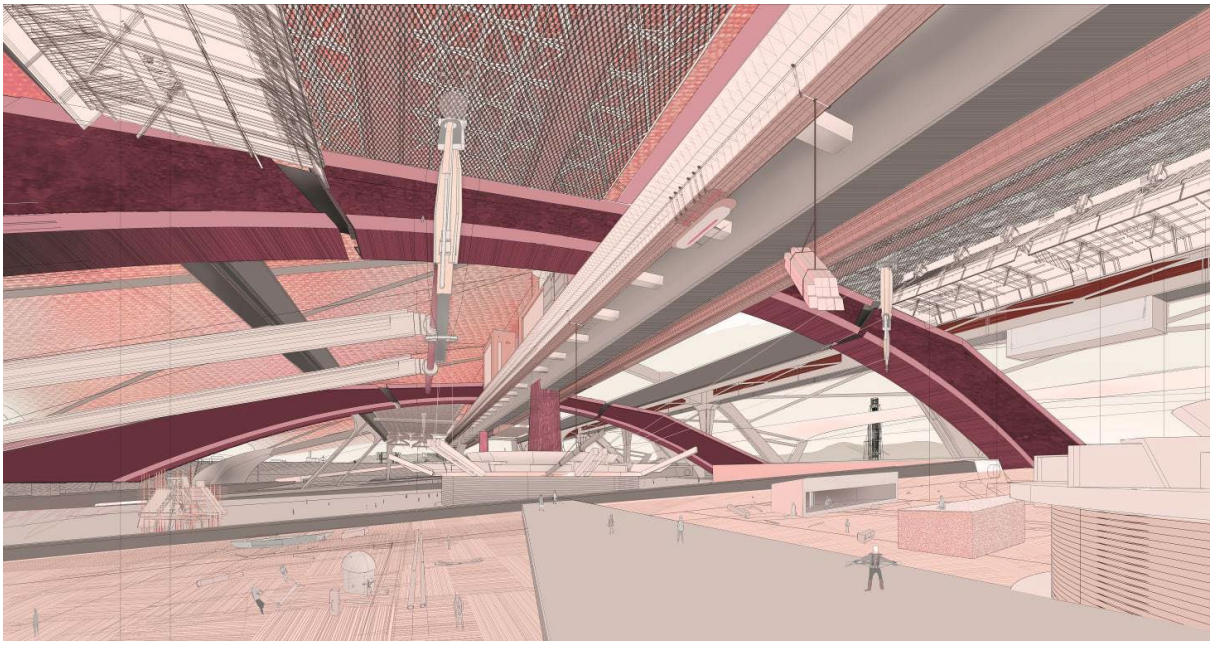

Fig.10 Platform view of the making ground

Etymology

Lomipeau was a giant double-hulled canoe discovered in Togan oral tradition. Capable of carrying four thousand men, it was constructed to transport workers and volcanic rocks for tomb building between islands. The canoe was so large that the volcanic islands of Kao and Tofua could pass under the platform between the two hulls (Martinello, 2006). Although there was no conventionally authoritative historical evidence on how such a giant canoe was built and sailed with the technologies available at the time, the myth does provoke a speculation of architectural formation at a scale never realised in the Pacific in the past. The myth is referenced to be the genesis of a Pacific City, becoming the symbol of Pacific architecture at an urban scale

Site Location

The flat site at Rangitaiki Plain was originally swamp land, formally occupied by the people of Ngāti Awa since the fourteenth century, and significantly represented by several archaeological sites including the significant pā site of Kohika (Irwin,2004). The wetland provided plentiful food supplies, abundant flax farming and efficient waterways that connect to the outer coast and the inner forests (Irwin,2004). Canoeing was the primary transportation system for the people to gain accessibility to the surrounding environment, especially crucial for costal communication (Irwin, 2004). However, after a series of severe flooding, the swamp land was abandoned by Māori residents in the eighteenth century. In the early twentieth century and entirely replaced by a generic post-colonial landscape in the 1930s to accommodate dairy farming and crop plantations. Since then, the site had been altered continuously by natural forces such as earthquakes and persistent floods. In the speculated setting, the plain becomes mostly flooded and uninhabitable under the ongoing sea level rise.

Planning

The unique flooded condition of the selected site invites an opportunity for a Pacific City's establishment. The presence of water initiates Pacific urbanism in the Pacific City. It is to provide an alternative to traditional Cartesian urban planning that is based on "universalising and cardinal directions" (Austin,2001). The Pacific City's urbanity is driven by a two-direction orientation: seawards and landwards, which Austin claims to be the original spatial organisation of Pacific settlement (Austin,2001). The seawards accommodates social, industrial and commercial activities, and the landwards accommodates housing communities. The water now becomes the connector between the two orientations, enabling residents to circulate freely in the city through water transportation. Suspended rail system is also introduced as land is scarce in the flooded coastal regions.

Central Making Ground: The Making Ground located at

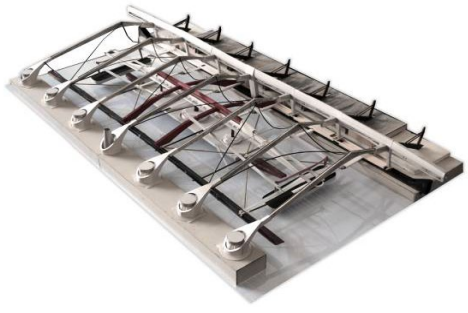

Fig.9: Make Ground Model

the coastal edge of the city, it is the heart of the Pacific City and acting as a centralised workplace and social platform for its citizens. The Making Ground fabricates all of the city's tectonic structures - including houses, vessels and infrastructure, while the structure itself being

Fig.11: Yard of Renewability – where materials are salvaged from abandoned structures from all over the Pacific. Foreground shows a Pacific worker carrying a Fale Tagata (Water-Jet device that gains him extra strength through hydraulic power)

continuously constructed and modified. Although a production facility, the Making Ground does not operate in a generic industrial model. It is the genesis of the new Pacific tectonics that integrates making, researching, and learning.

The Making Ground consists of many parts that perform a variety of programmes: including Central Marae (The Social Ground), Ocean Paepae (Wave Power Generator), Afolau Lomipeau (Boatshed), and Renewable Yard (The Material Centre). The combination of these centres determines not only Lomipeau's productive system but also the urban composition of the city.

The largest structure of the Making Ground - Afolau Lomipeau, the boatshed, consists of two parts: 'the shed' and 'the vaka'. Translated from Pacific's ridgepole syntax, it is constructed in a manner where the canoe and the shed form one tectonic entity. It is a static complex that belongs to the land of Lomiepau City, but part of it can be detached and becomes a canoe-like urban scale mobile structure that circulates all around the Pacific. Because of the critical role as a productive centre, the structure spans 1200 metres long that can be divided into several working zones flexibly, enabling a range of products, buildings and even infrastructural components to be made. It will incorporate frontier industrial technologies to achieve maximum production efficiency. More importantly, it will contain a high level of urbanity - that the structure itself is a moving part of the city.

Technology

Making and fabrication is a primary function for the city. Water-jet technology is highly developed to allow production to be fully hydraulically aided.

A system called Fale Tagata (man-carried fale) is introduced to embrace the craftsmanship with contemporary technology. The detachability of the fale's syntax is now utilised in the citizens' work mode. Man-Itu is a hydraulically powered device that workers carry on the back, containing hydraulic pumps that provide extra strength to muscles. Man-Tala is the common name for all the equipment that are changeable. These changeable elements include water-jet blades used for fabrication, or outriggers that turn the human anatomy into a canoe - providing citizens a method of flexible transportation, or a carrier that gives citizens extra strength to move heavy objects. When equipped with Fale Tagata, the new citizens of the Lomipeau City hence gain the abilities to utilise water and the Ocean as a part of their making – as well as living. It offers the citizens additional power and mobility, making them 'super-human of the Pacific'.

Material supply

It is challenging to assemble materials directly from nature for building the settlement and its structures, due to its tremendous scale and the need for a high quantity of material. On the other hand, the industrial refining process of materials would create severe pollution to the waterborne settlement. This is highly inappropriate for a 'watery city'. An alternative could be achieved by looking into recycled materials. Treadwell and Austin documented that salvaged wood from rivers were often used as the material for the making of buildings and canoes in Papua New Guinea settlements (Austin, Treadwell, 2009). This provides an inspiration that the materials for Pacific construction are not necessarily obtained from nature directly, they could be recycled.

The materials for fabricating Lomipeau and the canoe are transported from the east end of the site, which is a place called 'Renewable Yard', or 'Salvage Yard'. It is water hollow that accumulates contemporary reusable construction waste from all around the world. Retired ships, airplanes, and disassembled oil rigs are also among the acceptable. Materials will be transported through the water pathway, and 'reincarnated" through a series of

processes along the water path to Afolau, becoming completely reusable when it reaches the Lomipeau's making space. The process will be fully incorporated with water-jet technologies, which achieves a low pollution reuse process

Environment

Pacific tectonics also embraces an ecological approach towards settlement building. The watery settlement is primarily powered by renewable energy from solar, wind and wave sources. Its water quality is closely monitored to ensure it is suitable for human habitation and marine habitats. Water-based plants such as mangrove trees can be introduced to improve environmental quality as well as increasing the settlement's biodiversity.

Housing

Housing is one of the major outputs of the Pacific City. Here, Whare the housing units are constructed with a centralised ridgepole system, constructed with contemporary industrial materials. The house ridgepoles are primarily prefabricated as an integrated services core. The secondary structures, such as walls, floors, and windows, are customisable. Citizens can fabricate these elements according to their preferences and needs. Since the centralised structure takes all the structural responsibilities, these secondary elements, therefore, achieve a higher degree of flexibility. They are easily replaceable and detachable. Thereby, lightweight materials such as timber and light steel are mainly used. These non-structural components can be potentially operational, working as mechanically operated façades that can completely open up.

A Wharenui (Big House) prototype is also designed, becoming a community anchor points for residents. Big house is a traditionally important part of Pacific settlements, this archetype can be found all around the Pacific Ocean, such as Tambaran(the spirit house) in New Guinea and Manihiki in the Cook Islands. The iconic buildings contain large shared spaces that are not designed for specific functions, allowing flexible arrangements and acting as the centres of communities. The Big House can possibly be identified as a universal space to host any community programmes.

Lomipeau – Vaka Form

Even though Lomipeau visually resembles a giant 'canoe', its proper definition is a large, hydraulically powered 'making facility' that rests on three hulls – with one large hull and two outriggers. It floats on water and functions as a mobile part of the settlement, capable of being detached and launched from the Afolau. The extremely large Lomipeau provides a platform for building-fabrication, infrastructure-making, and vessel-production.

The mobility of Lomipeau denotes a new voyage that is meaningful to the new Pacific. Voyage was a significant activity in Pacific history since Pacific people sailed to connect islands as a holistic entity. It was an activity that is profoundly social and political, which shaped Pacific people's life. The significance of sea journeys has been largely decreased after flights became a standard method of transport. Through airports, travel between islands is made faster and perhaps more accessible. However, long-distance sea journeys became a form of luxury activity such as cruises, with its traditional significance dismissed.

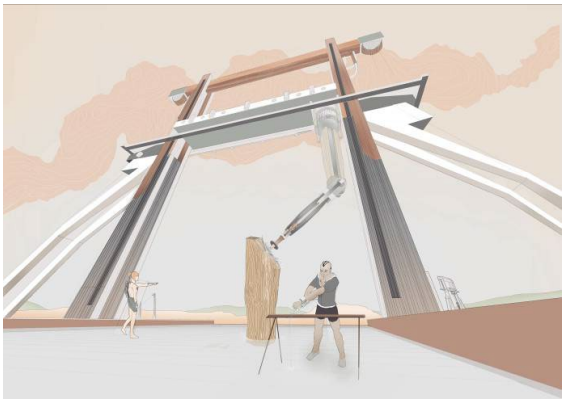

Fig.12: A fabrication station demonstrates water jet technologies being used by workers and a robotic arm

The moving function of Lomipeau demonstrates that a new form of voyages. It allows the fabrication facility to sail into the sea. With foiling devices equipped, high-speed movement is made possible to complete new tasks in the vast Ocean. This activity is named 'the Grand Voyage' which is entirely different from the past definitions of sea journeys. Lomipeau's voyage has several purposes, including building new settlements around the Pacific, rapid disaster relief for settlements that encounter natural disasters and conducting research missions. It adapts settlements with frontier technologies and enables them to regain the traditional flexibility of Pacific architecture.

As Epeli Hau'ofa states in his revolutionary essay, the Pacific Ocean should be perceived as a holistic entity of Sea of Islands - where the Ocean connects all the landmasses (Hau'ofa,1993). Lomipeau demonstrates that Pacific architectonics is an essential component for the island nations to be reconnected in an unpredictable future scenario. The traditional architectural languages can be developed into a tectonics system that enables human settlements to be radically mobile and flexible, making the Pacific a truly holistic entity - an alternative to any existing land-based settlement, which can be named as 'Okeanopolis'

Project Two - Pacific Man of Tāmaki Makaurau

Context

Situated in a prominent location in the South Pacific, the Auckland isthmus is surrounded by a large group of harbours and bays. It is connected to the broader Pacific Ocean by sea trade and houses the highest Polynesian population in the world. Although exhibiting such unique environmental and cultural conditions, Auckland City was created using the same design and planning method as any other colonial port cities around the world, without references to the Māori and Polynesian settlements initially established in the region. As a result, the city has become a system of the Cartesian grid with clear boundaries between land and water, dismissing the human

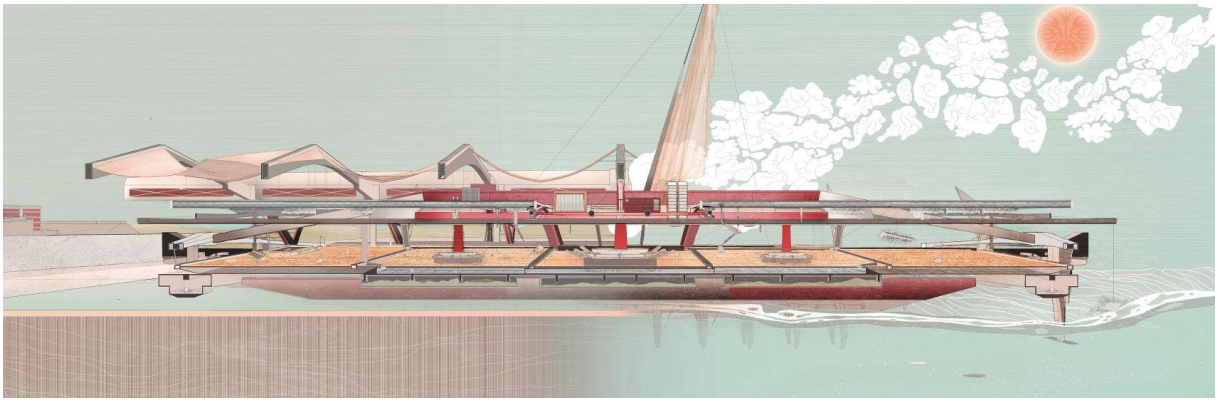

Fig.15: Sectional drawing of Lomipeau showing two modes of operation: Land mode (left) where the canoe is attached to the Afolau, and the Voyage mode (right) which gains Lomipeau mobility

and Ocean connection once existed in traditional Pacific settlements.

Historically, water was a crucial element that determined how human settlements operated in the wider Tāmaki Makaurau region. During the pre-contact period, canoe was the most effective means of transport for Māori people (Hayward,1983). With human settlements extensively built along shorelines, not only the Ocean provided essential resources, but also it kept communities closely connected through canoe travelling. In the early colonial times, shallow water zones at bays acted as prominent meeting places for Aucklanders. As of late architect Richard Toy recorded, the bays were people's "community centres" and "accommodated an almost infinite variety of conditions and combinations of human belonging and withdrawal." (Toy, 2005). Water was the bonding element between different groups of people, showing great social significance that was later disregarded. Water edges were not merely spaces accommodating recreational and commercial activities, but also acted as knots that connected settlements socially.

As a critical speculation, this project aims to reimagine how future Auckland can become a true Pacific City by reinventing the human and water connection.

Proposal

The project imagines a future Pacific life in Auckland Tāmaki Makaurau. The scenario envisions a possible three-metre sea levels rise that drastically changes Auckland's water edge conditions. Auckland CBD is under the threat of frequent flooding, while many coastal areas are entirely submerged. Many consider that wharves, waterfront, and sandy beaches were the defining elements for Auckland. Due to flooding, these places are now replaced by 'shallow water zones', distributing along the coastline of the city. The altered water edge condition now creates blurred, ambiguous thresholds between the land and the Ocean, which resembles spatial qualities of verandahs in Pacific architecture (refer Archetype studies in the article). Instead of taking a pessimistic approach that keeps us away from the water edge, these semi-flooded zones can be perceived as essential spaces that define the city's future.

Centred on Pacific tectonic elements, especially vaka-making – the project conducts a series of drawing exercises to demonstrate a speculated future for Auckland's water edge. Four scenarios are presented with reference to Ekistics Territorial Scale, ranging from the interior of a house to the entire Pacific Ocean. The proposal is to envision how water can affect the human settlement at different scales.

Ekistics Scale - Household

Occupants: House Residents
Programme: Learning, Recreation

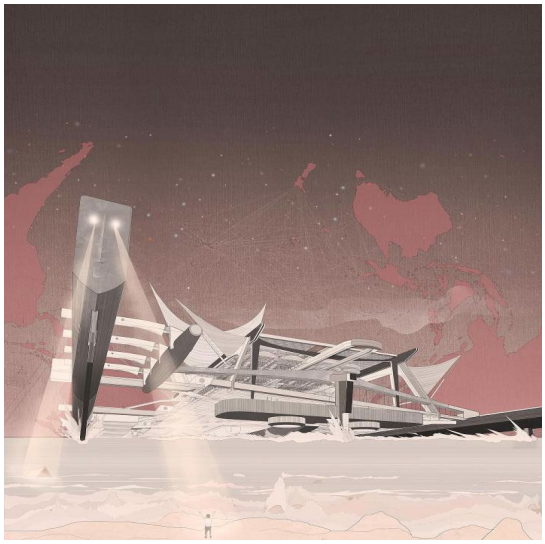

Fig.16: Lomipeau on a voyage to provide disaster relief (deploying temporary shelters) and rebuilding to a settlement destroyed by a natural disaster in Oceania

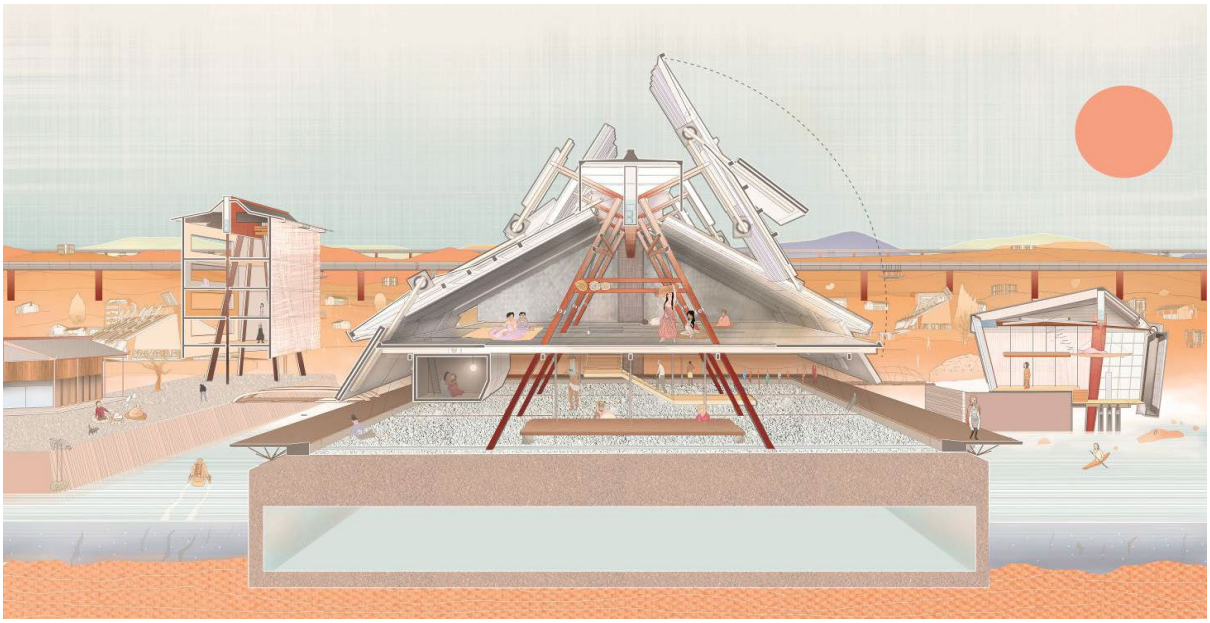

Fig.14: A close up section of a new Pacific Housing community. A Wharenui (Community big house) is shown in the middle, surrounded by a diverse range of individual houses customised by citizens. Centralised ridgepole and stilts are demonstrated.

With the assistance of drastically developing technologies, Aotearoa's much-celebrated DIY culture is now remarkably advanced. Most of the households own their own fabrication workshops, equipped with 3D printing devices and other digital fabrication devices to produce tools and utensils for daily usage. These technologies also enable residents to make equipment that improves their relationships with the surrounding natural environment.

As wharves and beaches gradually vanish, Auckland's water edges become ambiguous spaces with no defined social functions. However, these shallow water zones are soon found very suitable for launching lightweight watercrafts such as outrigger canoes. To effectively utilise these spaces, ordinary residents start building personal vakas through both personalised design and open-source information. With critical joints / Components, 3D-printed and performance optimised through computer software, sophisticated watercraft can be made within family workshops. These contemporary vakas are usually fabricated in sections using recycled materials, which allows them to be easily transported to and assembled at the water edges before sailing into the sea.

Although personal vakas are often built at a small scale and are mainly undertaken for leisure purposes, many Aucklanders start to rethink the long lost relationships between human and water. Being culturally and socially important, the trend of vaka making soon becomes a social movement named 'Vaka Revival'.

Ekistics Scale - Neighbourhood

Occupants: Community locals
Programme: Ritual, Local water transportation

Vaka building is traditionally a community activity that requires collective workmanship. This tradition is now revived at a neighbourhood scale following the popularity of household workshop. Vaka making becomes an event to bring locals together, forming collaborative learning groups where knowledge and skills are exchanged. It is also an opportunity for people of different generations to learn from each other. In this scenario, vaka-making is not constrained within the traditional sense of wood carving/crafting. It is also a celebration of advancing technologies.

Vaka launching becomes a vital community ritual for Auckland's bay neighbourhoods. As collaborative making enables the production of larger vakas, these vessels are capable of carrying a large number of passengers and are slowly forming into a new public transport network between bays. Communities in Auckland can be tightly connected through water, creating various new centres along the water edges.

Ekistics Scale - Metropolis

Occupants: Residents of Wider Auckland
Programme: Urban social gathering, national & international water transportation, wave barrier

The revival of community vaka making changes urban inhabitants' collective attitudes towards the Ocean, which leads to a series of policy changes around the urban water edges. They eventually become new urban social hubs where major social activities occur, especially around the former Queens Wharf / Princes Wharf sites where the submerged wharves have become ideal vaka launching platforms. As the rising sea-level frequently brings in floods into the city centre, the urban water edge also forms a defence line and a buffer zone. A marae-like sloped platform is constructed along the edges, serving as both a portage for vaka launching and sea wall for wave barrier. The substantial portage space at the city centre allows a large number of vakas to set off at the same time, serving national and international voyages and establishing a network of coastal communication at a grander scale. Mass-launching events are held on a routine basis, paying respect to Polynesian traditions while creating a new Pacific urban culture.

Pacific('Okeanopolis')
Occupants: Global citizens
Programme: Trans-Pacific free movement

Historically, long Ocean voyages were often made to expand human settlements in the Pacific, establishing sea routes between islands for commercial activities and migration. In the post-sea level-rise times, voyages can be more flexibly taken by individuals to strengthen the network created by their ancestors.

With travel speed and safety drastically increased through future technologies, many have found vaka travelling a feasible method for personal trans-Pacific travelling. The act is further assisted by a highly developed remote-working system so that many workers and professionals are not constrained by a fixed workplace and prefer to spend a better part of their time travelling by sea. The Ocean is now perceived as a flexible platform that allows citizens of Pacific nations to freely circulate using either personal or communal vakas, making the Pacific Ocean an area of free movement. Benefiting from the excellent geographical location, Auckland becomes a popular voyaging set-off point and destination. It is now truly the City of Sails.

While people are becoming much closer to the Ocean, offshore seaweed farm is now a booming industry. Used as a source of food, biofuel and acid neutraliser, the demand of seaweed surges. Parts of the water territories are leased to seaweed farmers. Commercial vakas are used for routine maintenance, observation, and harvesting. These farms can also be used to increase the biodiversity of specific regions of the sea and revitalise damaged ecosystems. With all seaweed farms joined together, continuous green belts between islands are formed underwater. These belts are often used to mark inter-island voyage routes, as well as providing safety and resources to voyagers.

Summary: The proposal demonstrates a series of substantial changes to Auckland's ekistical formation by speculatively inserting the element of Vaka-making. By developing a new tectonic approach to the natural and built environment from a personal scale to a much broader extent, many opportunities arise and further lead to the global revival of Pacific's voyage culture. This can eventually activate a chain of cultural, social and technological movements that redefine Pacific human settlements.

Although voyages were historically made to fulfil essential purposes such as discovery and trading, voyage in the future world can accommodate a much wider range of activities - or can be simply understood as a way of living. It marks the genesis of the new Oceanic Civilisation, the birth of Pacific Man.

Further Discussion on Ekistics Scale:
Proposed by Doxiadis, Ekistics Scale was initially used to classify settlements according to their size. The Scale is particularly used for settlements on habitable land (Dioxiadis, 1974). While radically speculating that all human settlements would eventually grow into an 'Ecumenopolis', Dixoadis defines water as 'the most restrictive element' for the formation of the global settlement. (Dioxiadis, 2005). Since water is deemed uninhabitable, we are unable to position Lomipeau and the fourth scenario of the Tāmaki Makaurau project anywhere in the existing Ekistics Territorial Scale.

In contrast, Epeli Hau'ofa's Our Sea of Islands offers a refreshing statement that challenges the Doxiadis' understanding of water. Although ocean-voyaging does

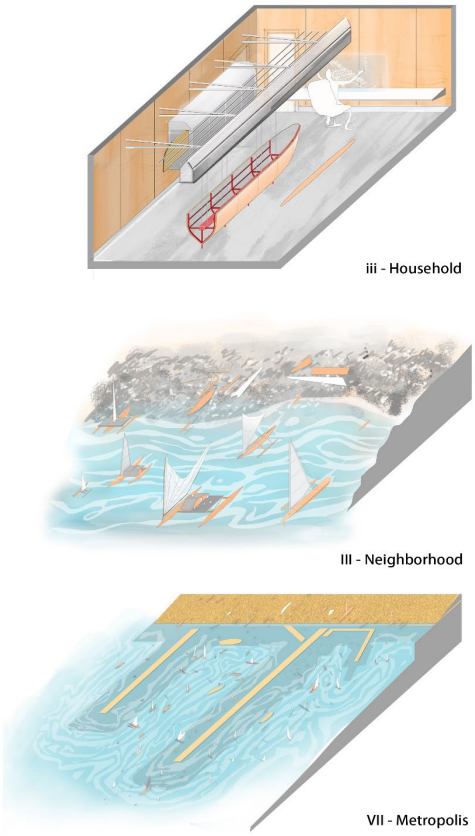

Fig.17: Speculated vaka activities at different Ekistics Territorial Scale units

not involve any activities on habitable land, the activity connects Oceania as a holistic entity, integrating isolated islands into a borderless network (Hau'ofa, 1993). In addition, Pacific Architecture reinforces Hau'ofa's statement as it blurs the boundaries between buildings and watercrafts. With the assistance of Vakas, the Ocean can therefore be perceived as an enormous inhabitable space

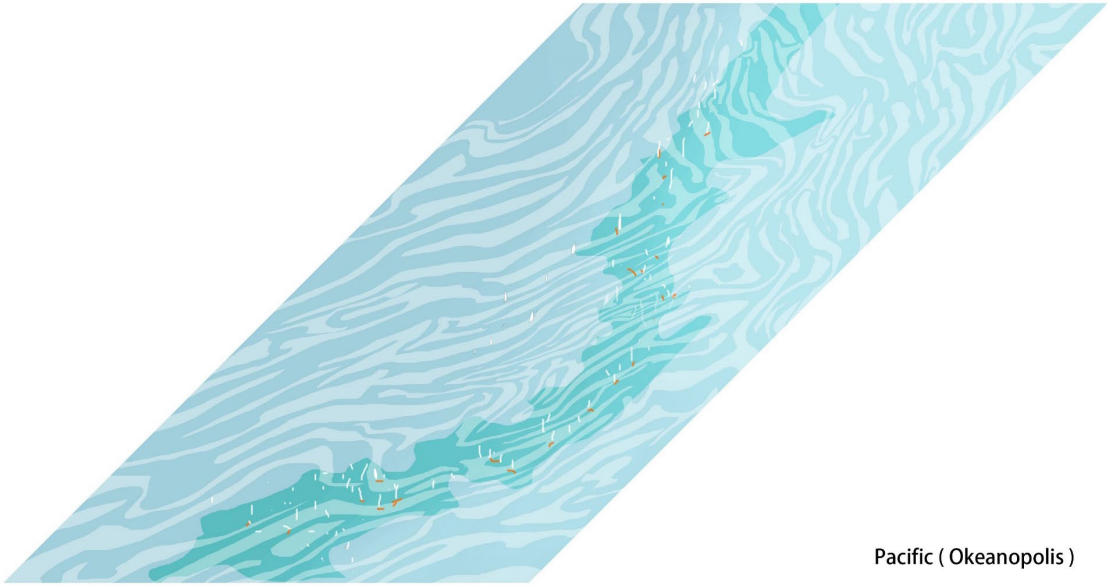

Fig.18: Underwater green belts (seaweed farms) marking Pacific voyage routes

that accommodates social, cultural and productive activities. There is potential that the entire Pacific Ocean can be practically developed into a collective settlement where activities of individual islands are closely linked by frequent and efficient voyages. In this article, we name this type of voyaging settlement 'Okeanopolis'--- a new unit that sits outside of the current Ekistics Scale. By proposing complete alternatives to any static, logarithmically growing land-based settlements, Okeanopolis demonstrates a highly fluctuating form of human inhabitation, providing unique possibilities for the future Pacific.

Conclusion

The two proposals present two different speculated possibilities of Pacific architectonics. Lomipeau Speculation is a radical vision that pays tribute to utopian architectural proposals, it showcases how the world can develop Pacific architecture to an extreme extent and completely changes the way human settlements function. It is purposely disconnected from the current mode of city-building and proposes a complete alternative. By contract, Pacific Man is a vision based on our contemporary society and applies comparatively subtle changes - starting from a personal level (within household workshops). In this project, Pacific tectonics is integrated with many topical technological developments such as digital fabrication and open source design, making it more relevant to our everyday life.

While the world is becoming more and more globalised, the Pacific Ocean is perceived as an increasingly important region where trading, development and investment opportunities flourish. Instead of being continuously influenced by continental superpowers, it is important that Pacific nations must form a cohesive network for collective resilience. Although taking two different approaches, both of the projects embrace the Pacific as a holistic settlement named Okeanopolis. Pacific architectonics plays a vital role in this process, enabling Pacific people to revive their traditional activities of voyages, creating a shared optimistic future for the island nations.

Both projects are also proposed while carefully studying Ekistics units and elements grid created by C. A. Doxiadis. Although the presented projects are visionary speculations rather than accurate predictions, they do tend to respond to each of the ekistics elements (nature. anthropos, society, shells and networks) to address issues in Pacific settlements. The article is also to emphasis that the ekistic elements should be approached very differently in an Oceanic context because of its unique cultural and tectonic histories. Designers and policy makers should avoid transplanting continental models to design these settlements, as well as thinking outside the existing Ekistics Scales and Gird which were created to merely study land-based settlements.

While the presenting 'paper architecture' projects, the author is passionate about making Pacific architecture practically applicable in real life, and believes that Pacific architectonics offers endless design inspiration for architectural practitioners in Aotearoa and the wider Pacific region. It is hoped that this article could help readers to rethink Pacific architecture more creatively, to recognise its significance and to promote its unsung languages.

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