A recent plan by Dutch conservationists to build recycled islands from the rapidly growing 44 million kilos of mainly plastic waste afloat in the north Pacific gyre\(^1\) has raised some interesting responses. These range from the “plastic fantastic” views of recycled islands solving issues of overcrowding while cleaning up dangerous waste to the Dubai strategy of building artificial celebrity islands (with Dutch engineering), and to more serious consideration of similar options for small Pacific nations threatened by climate change.\(^2\)

One writer commenting on the plastic islands suggestion also stated that:

… these ‘Inhabited Artificial Islands in International Waters’ do not need to be static; they could be mobile. Nomads have long roamed the land. Some cultures are based on that. Artificial island states or sub-national jurisdictions could roam the seas. Many islander peoples are already known for their history of sea-based mobility. (Kelman 2010)

While recognising the high degree of mobility of Pacific Islanders, both historically and today, such a view is problematic. It evokes fantasies of islands as floating communities escaping from climate change on a nomadic quest around the Pacific, possibly running aground on countries which may not welcome their arrival and the floating nomads being confined to detention camps in more fixed island locations. To develop artificial islands there are much greater concerns of “engineering and imagineering” such as those found in the artificial constructions of Denmark for example (Löfgren 2007: 244), but there exists a lengthy and serious history to be examined as part of this very modern debate: a debate which should incorporate the idea that “[i]slands are… propelled as sites of innovative conceptualisations, whether of nature or human enterprise, whether virtual or real” (Baldacchino 2007: 165). A wider debate, only briefly alluded to in this paper, might include discussion over the right to occupy as well as issues of ownership, which could possibly involve the development of new international law relating to artificial islands and their sovereignty, as will be discussed in the case of Minerva Reefs (following).

This essay is focused on artificial islands and living spaces as illustrations of dynamism and innovation of Pacific communities and of their willingness and ability to adapt to changing circumstances. Using several case studies,
the paper demonstrates that present day notions of artificial islands as they are currently addressed to Pacific peoples are not really new, given that islanders have for many generations developed and expanded their living spaces in the face of environmental, social and political change, as well as in response to population pressure.

ARTIFICIAL ISLANDS

Artificial or constructed islands have long been a part of settlement history in the Pacific. When Pacific leaders proposed (see Forum Secretariat 2009) that such islands might be a way of combating climate change and rising sea levels, some may have been drawing on widely held local knowledge and precedents. In response to the leaders’ call, Japan provided well-engineered plans for circular islands with enough space for populations with farmland and for businesses. These would be located near the equator and would retain access to “their own fishing grounds… and nation”. Such islands, if desired by Pacific nations, could be available by 2025. Although these concepts may appear quite fanciful and would do little to combat the impacts of climate change, apart from creating another living space, some Pacific leaders were seriously interested, seeing these as the best hope for countries threatened with the loss of their homelands, as well as an alternative to mass migration to new, colder and possibly more hostile countries.

Pacific leaders and their populations are well versed in the creation of artificial islands where needed. Many tourist resorts throughout the Pacific are essentially artificial islands, built either out over the lagoon (such as Momi Bay in Fiji) or more commonly on land reclaimed, often from coastal mangrove areas (such as Vulani and Denarau also in Fiji). But Pacific tourist resorts are not the only examples of artificially created oceanic living spaces. Throughout the world people have always reclaimed land or created innovative ways of providing more space when there is limited residential land, or so much waste that living conditions were made impossible, or as extensions of fishing communities, or where rising seas or enemy invaders threatened the land. For example, Nunn (1994: 342) notes a 1980s plan in Majuro, Republic of the Marshall Islands, where domestic waste from California was to be shipped to RMI in order to extend and raise the level for settlement. Nothing came of that idea, but it seems to be on the agenda again in the Pacific, this time using domestic waste generated within the nations (see note 6).

Globally there are many more examples of artificially created islands: The Maldives in the Indian Ocean, Aberdeen Harbour in Hong Kong, the “Oily Rocks” of Azerbaijan and “The World” in Mexico (constructed of plastic bottles). In the Pacific, Nan Madol in Pohnpei and the fishing villages of
Hanuabada and Koki in Port Moresby are just two examples. Some created islands have survived for centuries; others have been destroyed, such as “The World” in Mexico which did drift and was demolished by a hurricane. Others, such as the Republic of Minerva, in the Pacific, aptly illustrate the socio-political complexities surrounding attempts at the creation of artificial islands.

THE REPUBLIC OF MINERVA: QUESTIONABLE SOVEREIGNTY

The Republic of Minerva, south of Tonga on the Minerva Reefs at 23°38′S 178°54′W, was declared a Republic in 1972 by its “president”, Morris Davis. This led, quite predictably, to resistance from Tonga whose troops removed the flag in 1972. Debate over ownership of that island continues to this day, with Fiji also lodging a claim through the International Seabed Authority. The story of Minerva is worth telling here as a little known yet significant case of sovereignty issues surrounding artificial islands.

In 1971 The Ocean Life Research Foundation, a group led by Michael Oliver, arrived on Minerva Reef on board a chartered vessel out of Fiji. This group aimed to establish a new land in order “to escape from high taxes, riots, drugs and crime” and to have a “separation of politics and economics in order to promote maximum prosperity, freedom, and tranquility” (Menefee 1994: 96-97, from Horn 1973). According to Horn, the group proceeded

...to dredge up two hummocks of land, coral wrapped in seven layers of chicken wire and encased in reinforced concrete, to above mean high water. They erected twenty-six foot high markers replete with beacons and radar reflectors and topped by a flag with a gold torch inside a gold circle on a solid blue background, representing the Republic of Minerva-Land of the Rising Atoll. (Menefee 1994: 96)

The first plan was to construct a 400 acre island on the highest parts of the reef, with ultimately “2500 acres of land on the two reefs, 2000 to be residential and 500 for commercial enterprise”, with an elevation of 8-10 feet above mean high tide. “A proposed sea wall was to protect the claim from heavy seas”, and topsoil would “be imported from Fiji to cover the reclaimed area. Ultimately, floating cities... [were] planned for the lagoon” (Menefee 1994: 96). On 19 January 1972 a Declaration of Sovereignty was issued by the “president” Morris Davis (Menefee 1994: 97), which established the Republic, basing its claim to the reefs on actual occupation of terra nullius. The group also claimed a 12 mile territorial sea area and proclaimed a republican government operating under democratic principles. According to Menefee, quoting Horn (1973), the declaration also included the fact that “The Republic of Minerva shall, to the extent possible, assist international shipping, especially in helping ships in distress, and shall promote the cause
of ecological balance, preservation of environment and research in ocean living, particularly as this pertains to an ever increasing world population” (Menefee 1994: 97).

Tourism, commercial activity and industry, including fishing were also planned but predictably neighbouring countries were not impressed. The heads of government of Fiji, Tonga, Nauru, Western Samoa and the Cook Islands raised the issue with Australia and New Zealand on 24 February 1972. Ratu Sir Kamisese Mara said, “The precedent is rather a dangerous one”, voicing concern that such activities “could happen elsewhere in the Pacific” (Menefee 1994: 98). The Kingdom of Tonga was already investigating possible development and jurisdiction over Minerva Reefs and, in February 1972, “placed refuge stations (boxes with emergency supplies and locating beacons) on the coral atolls” (Menefee 1994: 106, quoting Horn 1973). In May, the King, cabinet ministers, troops and prisoners, sailed to the reef towing a barge holding several steel beams in order to erect two permanent structures on them to support a Tongan claim, if one were later deemed necessary. Then on 15 June, the King announced that Tonga was about to issue a formal proclamation of sovereignty over the Minerva Reefs (Menefee 1994: 100).

The King advised that Tonga would exercise territorial rights within a radius of twelve miles north and south of the Minerva Reefs, noting that the Reefs were outside Tongan territorial waters but within their fishing grounds. There followed threats of forcible removal by Tonga should Davis and his followers continue to trespass, and it was stated that... to maintain its claims to the reefs... Tonga was prepared to go.... [t]o any extent short of war. (Menefee 1994: 101)

Claims and counter-claims continued through the early 1970s with diplomats quoted as saying: “We’ll have every crackpot with an ounce of imagination claiming sovereignty over every last scrap of unclaimed land. The next thing you know, they’ll be demanding loans from the World Bank” (Menefee 1994: 101). By February 1973 the dispute appeared to have died down. Davis was fired as president “for being a dictator” and for “disgrac[ing] the Republic of Minerva by making clandestine associations with persons who were not presented to the other members of the Foundation” ((Menefee 1994: 101).

ISLANDS IN THE PACIFIC

To understand the pragmatism of Pacific Islanders around the creation of artificial islands it is pertinent to look at the origins of small islands *per se*. There are many island types and explanations for their existence. Islands are of course influenced by climate, sea level change and submergence, and
by dramatic events such as undersea volcanic explosions; consequently the number of islands in the ocean constantly changes over geological time. Humans also have considerable influence on their islands, not only in current times with over-production of waste and more dense settlement patterns, but in the past where people affected island survival through deforestation, over-hunting and destruction of species, such as in the cases of Rapa Nui, Mangaia, New Zealand and Hawai‘i (see Clarke 1990, Kirch 2002: 59-62).

There are generally considered to be four main island types in the area described as the Pacific: (i) the island arc (once called “continental”), (ii) high islands (young and the result of volcanic eruptions), (iii) coral atolls that are the later stages of the high islands which eventually sink leaving only the ring of coral reef, and (iv) the makatea islands where atolls have been uplifted (Kirch 2002: 47-50). To add to the obvious on-going activity and change in these islands, there is also the influence of climate. Nunn (1999: 51-53) has reminded us that islands are subjected to both gradual and catastrophic change and that over hundreds of years coastal areas constantly recede and replenish. He cited Bayliss-Smith’s work on Ontong Java Atoll in the Solomon Islands where catastrophic storms have both eroded and built up the islets by depositing debris on the nearby reefs. Giant tsunamis have had similar impacts (Bayliss-Smith 1988, in Nunn 1999: 52). Woodford in his “Notes on the Solomon Islands” (1926) also commented on the submergence of an island near San Cristobal between Ulawa and Ugi around the time of the Spanish voyages in the late 16th century (Allen 1976: 19). And in earlier times, such as in the Little Climatic Optimum of AD 750-1300, Nunn and Britton (2001: 3) have reminded us of rising sea levels that, as they proposed, have encouraged nucleated settlement patterns following the loss of low-lying land.

Such studies demonstrate that islands are not static and not all will disappear in the face of climate change. Recently Webb and Kench in a detailed analysis of the response of reef islands to sea-level rise have noted (2010: 234) that rising sea level is but one factor in island dynamics whereby islands erode, grow, migrate and remain stable over time. How humans have responded to these changes during the period of Pacific human settlement is of particular interest, given the impact human populations, both growing and migrating, have had on islands in terms of building and expanding land. Connecting parts of atolls with causeways, feeding themselves, and producing waste have all propelled the need for more liveable space.

The lesson therefore for those discussing present day floating, artificial landmasses is that islands have always been unstable landforms; they are subject to emergence, subsidence and outright disappearance, owing to geological and climatic events, are prone to human modification and disturbance as well as to increased severity and frequency of storm surges,
often causing inundation. By looking at some of the many instances of early “artificial” or human-constructed islands in the Pacific, I now address the more interesting question of what has prompted the development of artificial islands in the settled Pacific in the past few hundred years.

EXPANDED AND CREATED ISLANDS

Bau, Kubuna, Fiji

The island of Bau, the centre of the chiefly Kubuna confederacy in Fiji off the coast of Tailevu on Viti Levu, was in the 18th century a much smaller island polity rapidly gaining political ascendancy. Over a 30-year period from around 1760, Banuve, the second son of Nailatikau, carried out massive reclamation works on Bau, building sea walls, reclaiming reef flats and constructing canoe docks to cater for what later became, by the 1820s, the site of 20 or more large war canoes, 200 smaller canoes and 20 temples, along with a population numbering 3000 to 4000 people (Derrick 1957: 54-55). The people of Bau in this overcrowded island faced many difficult situations, such as fire and disease, but nonetheless their political ascendancy continued until recent

Figure 1. The island of Bau, Kubuna, Fiji. (Reproduced from Fiji and the Fijians, Vol. II, by James Calvert).
times (Routledge 1985). Their location on a very small island, the need for additional land and protection from traditional enemies clearly prompted the reclamation works on Bau. In this the Bauans were not alone, as demonstrated by similar expansions in the Wailevu Delta of Viti Levu where people used the intricacies of the delta ecosystems not only for settlement, but also for fortification and protection (Routledge 1985: 32-34). Further evidence exists in other parts of the Pacific; I have chosen the examples of Nan Madol in Pohnpei, and Langalanga and Tai lagoons, Solomon Islands.

*Nan Madol, Pohnpei*

Nan Madol is the ancient centre of the Sau Deleur dynasty of around 25,000 people in Madolenihmw in Pohnpei, Federated States of Micronesia. It consists of 93 artificial islets across 81 hectares of sheltered reef near Temwen Island (Ayres 1983: 135, Kirch 2002: 195). The main development of Nan Madol appears to have occurred between AD 800 and 1500 when the huge residential basalt temples were constructed (Ayres 1983: 139). The islets themselves are built of stone, “with coral and rubble fill, the entire complex bounded… by massive seawalls or breakwaters, some of them incorporating islets” (Kirch 2002: 195). Nan Madol was described as the “Venice of the Pacific” by William N. Morgan in his 1988 “Prehistoric architecture in Micronesia” (quoted by Kirch), and I would agree.

My own visit to this remarkable and very sombre and overpowering site was in 1999. I was struck by the massiveness of the individual basalt slabs used to construct the walls of the tombs and residences. It is not easy to obtain an overall picture of the size of Nan Madol because it is so vast. The canals, threading between and around the structures, are large and not at all dwarfed by the basalt constructions, some of which consist of columnar slabs of basalt easily weighing up to half a ton each. Kirch (2002: 196) reported that Nanauwas tomb, for example, has a base of 79m by 63m, rising 7.6m above canal level. Pohnpei was settled around AD 1 and construction of Nan Madol may have commenced shortly thereafter, although the megaliths are dated at around AD 1200-1600 (Kirch 2002: 197). The settlement continues to have enormous sacred significance and there are many stories about the supernatural powers associated with it. There is some debate as to how the construction was able to take place, and whether the ability to build on such a large scale implied a rigid social structure and centralised political power (Peterson 1989: 23). Whatever social structure underlay the facility to build, it is noteworthy that in other parts of the Pacific, notably Tonga, monumental architecture, such as the megalithic Lapaha tombs, suggests powerful chiefly leadership during both the development of the chiefdom and the construction of the tombs (Clark, Burley and Murray 2008: 994).
Figure 2. Basalt columns, Nan Madol, Pohnpei. (Photograph, J. Bryant-Tokalau, 1999.)

Figure 3. One of the canals at Nan Madol, Pohnpei. (Photograph, J. Bryant-Tokalau, 1999.)
Basalt stones and their association with political status, power and sacredness are not unknown in other parts of Micronesia. In Kiribati and Marshall Islands, for example, special stones have great significance, and obviously the basalt had to be transported to those island groups from high island sites such as Pohnpei and Kosrae (Goodenough 1986: 561). Research on Nan Madol is on-going and is far from explaining its full history but the purpose may have more to do with power, influence and religion over a much larger area than simply Pohnpei—in effect a regional power or centre of influence as understood through the legendary stories of Kachaw, or the sky world (Goodenough 1986: 551).

Langalanga and Tai Lagoons, Malaita, Solomon Islands
Also several centuries old (possibly as much as ten centuries according to Nunn 1999: 46) are the Lau and Langalanga lagoon islands of Malaita, where there exist complexes of artificially constructed coral rubble or boulder islets inhabited by fisher-folk living close to the coasts. Parsonson (1966) describes these artificial islets as most often being constructed in shallow waters, though with deeper water at one end enabling easy fishing from the houses (Parsonson 1966: 5). These coastal people may have sought an expanded area of living space to enable the community to live together. Some explanations for the development of villages over the sea include protection against enemies and refuge from mosquitoes. Parsonson (1966) and Ivens (1930) are in agreement that malaria may have been the catalyst for the location of the many lagoon islands of Langalanga.

Other explanations have been offered, such as location near to places of exchange transactions for bartering fish and other products such as taro and nuts (see Ivens 1930: 53-55). Such necessary exchange could have been fulfilled by living on the mainland if the people had rights to those areas. In support of Ivens, a recent explanation for the on-going survival of the lagoon people has been proposed by Hviding (1998: 259), who notes that “their adaptation relied... on the institutionalised exchange with bush people of fish and other marine resources for root crops and forest products”.

An example of an entirely constructed island is the case of Sulufou, a village built in Tai Lagoon, Malaita. Tippett (1967: 166-68) explained that people transported coral rock from the reef, built up the foundations and then surfaced the island with fine coral gravel. Space was at a premium and, although Tippett gave no dimensions for the island, he noted “economizing on space” with approximately 40 houses (back to back with doors opening in opposite directions), as well as graves, a men’s house (built over the water), church, net making house, the central public area and streets arranged in crescent shapes. Tippett claimed that the construction of such islands “was
used in pre-Christian times by the salt-water people for defence purposes” and that this was effective as they owned all the canoes. “The bush people, on the other hand, had to fortify their villages with stone walls and keep continual watch”. He further commented that even after the wars between the salt water and bush people, villagers who had moved ashore for gardening land, continued to construct artificial islands (such as Ngeoleana, also in the Tai Lagoon) and returned to the sea environment, visiting the mainland for crops, “preferring this [Ngeoleana] to the sandflies on the mainland”.

Tippett also discussed in some depth, the “industriousness” and “innovation” of the people of the artificial islands of Malaita. These remarkable, artificially constructed islands, which demonstrate “specific planning and architectural achievement” (Tippett, 1967: 166), do indicate that the history of artificial islands is nothing new in the Pacific, and indeed such constructions may have long been “sites of innovative conceptualisations” (Baldacchino 2007: 165). Now, in the 21st century, when the need for land is partially predicated on a new stimulus, inundation rather than war, the concept of nomadic, floating islands is likely to be problematic and introduce new problems of sovereignty.

ARTIFICIAL ISLANDS IN THE TWENTY-FIRST CENTURY

Pacific Islanders, like other coastal peoples, have from time to time built and extended or constructed land from rubble in order to accommodate growing populations or as a means of control. In current times the expansion of coasts for tourism purposes, military bases, housing or industrial sites can lead to conflict between the protection of the physical environment and perceived development needs, or between landowners, governments and investors. In Tuvalu, the leading example of Pacific climate change, land has been both constructed and taken away, especially on Funafuti Atoll where the capital is located. United States military construction of the airstrip during the Second World War left behind the borrow pits which are now so problematic in terms of land rights and waste disposal. Migrants from outer islands are settling along the pits, and the urban waste of Funafuti rapidly is filling them (see Bryant and Kumarasuriyar 1994: 33). The borrow pits did not add to the coast but they certainly reduced the amount of land available for settlement. Funafuti Atoll is now home to 47 percent of Tuvalu’s total population of 11,149 (Secretariat of the Pacific Community 2010) and, given the small land area available for urban development of 2.36 km$^2$ (Bryant and Kumarasuriyar 1994: 27), the capital’s population density of over 2,000 people per km$^2$ places considerable pressure both on waste disposal and possibilities for settlement. Bryant and Kumarasuriyar suggested (1994: 33), in view of the need to dredge
sand from the lagoon in Funafuti and also the problem of land shortage, that the sand be used to fill in the borrow pits. This has not happened and the pits are used for waste disposal.

South Tarawa in Kiribati was a land area of 15.8 km$^2$ with around 44 percent (approximately 44,000) of the nation’s population (Asian Development Bank 2008). There, reclamation for settlements is common and this is largely carried out by dumping rubbish (Hunt 1996). In Betio, South Tarawa, despite a commonly held view that through population growth “land is being degraded, water tables polluted and exhausted and foreshores… eroded to the point that they offer little resistance to tidal surges” (Storey 2006: 23), there is plenty of visual evidence that people, through the construction of sea walls, groynes (coral jetties) and other reclamation, have expanded available land by as much as 30 percent (Webb and Kench 2010: 244).

Such reclamation is unsurprising on a series of atolls where population density is as high as 2,558 persons per km$^2$, with up to 15,000 people per km$^2$ in overdeveloped islets such as Betio (ADB 2008: 5). These reclamations, as a response to the need for residential and industrial urban space obviously

Figure 4. Burrow pits, Funafuti. (Photograph by J. Bryant-Tokalau.)
cause a change in tidal processes, leading to erosion elsewhere (Webb and Kench 2010: 244), but do indicate the way in which communities respond when under pressure for more urban land.

On many atolls (and most famously on Funafuti, Tuvalu) waste disposal is such an enormous issue that there is nowhere to put it, apart from in the borrow pits, and anywhere else there is empty space on the restricted land area. Despite the implementation of several waste management projects involving reduction, composting and recycling (for example Australian Aid 1996, ADB 2005), rubbish has piled high on Funafuti in the last five years with no working compactor, leaving the islanders to depend on occasional visits of the New Zealand military to clean up. It may now be time to take seriously McCall’s recent comment (2010):

Perhaps this is a solution for Tuvalu: to live on plastic? From my last visit to Funafuti a few years ago, they have a good start to making their own plastic island. Waste disposal on such a place, then, could become very legitimate

Figure 5. Two weeks after US landing at Betio, December 1943. (Ex.342-FH-3A > 43460, National Archives and Records Administration, College Park, MD)
‘land’ fill, there being no real land, of course: the more plastic packaging they received and discarded, the larger their island!

Students in my own class recently made a similar suggestion: turn waste into a useable resource. So the possibility of “plastic islands” may not be so far fetched as one might imagine, and it may therefore not be such an unusual step to now commence the construction of entirely new islands from rubbish, as suggested by the Japanese and Dutch plastic islands projects.

Although beyond the scope of this article, it is clear that international legal issues and requirements would come into play if new floating artificial islands were to be created. This can be demonstrated by international examples such as competing Exclusive Economic Zones (for example between China and Japan) as well as the fact that new, or artificial islands are legally undefined and the UN Law of the Sea refers to states and not individuals (Kardol 1999: 35-37). As such they may be especially vulnerable to definitions and ownership in terms of fisheries, coastal protection and, most especially, who has the right to occupy.

If new islands of plastic are to be created in the Pacific there is ample historical and contemporary evidence to hand that demonstrates that island states, communities and individuals have through necessity created additional land, and found ways of dealing with that space. Obviously there are contested concepts of ownership, such as in the Tuvalu borrow pits where traditional title is threatened by in-migration and growing urban settlement, but there is also over time much give and take and adjustment by communities, such as in coastal Mangaia (Hviding 1998: 259).

Islands entirely constructed of rubbish are most likely to be in sovereign states with an unmanageable rubbish problem, and thus the State will have to make its own laws for the use of that land. Until the globe can minimise waste everywhere, the possibilities of plastic islands, or at the very least, island extensions, should be seriously considered.

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NOTES

Artificial and Recycled Islands in The Pacific

6. Grant McCall’s comment on “Recycled plastic floating Pacific island proposal”, posted to sicri@googlegroups.com Monday, 9 August 2010 3:12 pm.

REFERENCES


**ABSTRACT:**

Artificial islands are not new in the Pacific, but recent discussions of “recycled” and artificial developments as an innovative means of creating additional living space and possibly negating climate change do not recognise the early history of such developments. By looking at the long practice of island building and adaptation by Pacific communities, this paper suggests that Pacific populations are well versed at dealing with the need for more living space, and would not find the use of artificial waste to provide that space particularly unusual. Historically, such communities have quite pragmatically learned to adapt to the need for land.

*Keywords*: Artificial living space, Malaita, Bau, Minerva, Tarawa, Funafuti, plastic imaginings.