ISLAND DYNAMICS

The Aquapelago and the Estuarine City: Reflections on Manhattan

Philip Hayward
School of Communication, University of Technology, Sydney and
Division of Research, Southern Cross University, Lismore
prhshima@gmail.com

Abstract: Over the last decade there have been a number of attempts to both imagine Manhattan's pre-colonial past and to envisage new ways in which the metropolitan island (and the greater New York area) might more productively relate to its location within a major estuarine environment. Rising sea levels associated with global warming have given a particular focus, not to say sense of urgency, to this enterprise. This essay reviews several of the aforementioned projects and discusses their conceptual parameters with reference to recent debates in Island Studies concerning the concept of the aquapelago. Consideration is given to aspects of the cultural imagination of place and conceptions of the integration of human/urban and natural ecosystems. Drawing on these discussions, the essay outlines the manner in which established analyses of aquapelagic assemblages can be expanded to embrace metropolitan island environments.

Keywords: Manhattan, Mannahatta, New York, aquapelago, sea-level rise, oysters

Island Dynamics, Denmark - http://www.urbanislandstudies.org

Hayward, P. (2015) 'The Aquapelago and the Estuarine City: Reflections on Manhattan', *Urban Island Studies*, 1, 81-95.

The Aquapelago and the Estuarine City: Reflections on Manhattan

1. Introduction: Historical visions

In 2009 New York celebrated the occasion of Manhattan's 400th anniversary or, more correctly, the anniversary of Captain Henry Hudson's exploration of the island's west coast; an event that led to the initial Dutch settlement of Manhattan and thereby the origins of contemporary New York. In response to the anniversary, the city organised a variety of events, including an exhibition entitled 'Mannahatta/Manhattan' held at the Museum of the City of New York. The exhibition was organised by the Brooklyn-based Wildlife Conservation Society (WCS) and accompanied by a website (elements of which are retained at http://welikia.org) as well as a large, impressively illustrated volume entitled *Mannahatta* (after the original indigenous name for the island) (Sanderson, 2009). The exhibition and accompanying texts were designed to provide a comprehensive landscape ecology of Manhattan in the early 1600s. Deploying an inventive combination of historical sources and contemporary interpretation and visualisation techniques, the exhibition's texts documented the manner in which the island's original inhabitants, the Lenape, influenced and inhabited the landscape. In sublime contrast to the island's present day existence (as a dense concentration of high-rise buildings, congested roads and occasional park spaces with a population of around 1.65 million), Sanderson estimated that the island was populated on a seasonal basis by between 300-1200 individuals in the early 1600s. Sanderson (2009: 10) also contended that:

> If Mannahatta existed today as it did then, it would be a national park – it would be the crowning glory of American national parks. [...] Mannahatta had more ecological communities per acre than Yellowstone, more native plant species per acre than Yosemite, and more birds than the Great Smoky Mountains National Park. Mannahatta housed wolves, black bears, mountain lions, beavers, mink, and river otters; whales, porpoises, seals, and the occasional sea turtle visited its harbor. Millions of birds of more than a hundred and fifty different species flew over the island annually on transcontinental migratory pathways; millions of fish – shad, herring, trout, sturgeon and eel – swam past the island up the Hudson River and in its streams during annual rites of spring. [...] Oysters, clams and mussels in the billions filtered the local water; the river and sea exchanged their tonics in tidal runs and freshets fueled by a generous climate; and the entire scheme was powered by the moon and the sun, in ecosystems that reused and retained, water, soil, and energy, in cycles established over millions of years.

As will be evident, Sanderson's characterisation of early-17th Century Manhattan island is not simply descriptive but is also imbued with a distinctly contemporary ecological aspect, emphasising the power sources and mechanisms underlying Mannahatta's ecological assemblage. While the primary focus of the *Mannahatta* book and the related exhibition was the island's terrestrial history and ecosystem, Sanderson also provided a vivid characterisation of the significance of Manhattan's estuarine location for its (former) ecological diversity that merits quotation in full:

> History, geography, and climate all set Mannahatta up to be a biological success, but what makes Mannahatta wealthy beyond imagination is its crowning position atop an estuary... By definition, estuaries are the places where the land and sea come together, and the result is like currency, both productive and variable. Freshwater rivers, like the Hudson and the numerous streams that are her sources and tributaries, discharge

> nutrients to fertilize the water, and cut the saltwater with fresh flow. As the seasons turn, the amount of freshwater swells and diminishes, and as the days and nights pass, the tide rises and falls. The competing traffic of freshwater and seawater and the washing of water over land creates a small sea in the glacially evacuated harbor, with layers of warm ocean water lying on top of the cold, fresh stuff. Sea-grass beds take root where the water is shallow enough for light to reach the bottom, beaches and dunes form along the windward shore, and salt marshes thrive in protected corners. The estuary is the motor, the connector, the driver, the great winding way, the central place that gathers all the old neighborhoods together and makes the rest possible (Sanderson, 2009: 143).

Various aspects of this passage are germane to the focus of this article. One is the characterisation of the interaction of layers and types of water in the estuarine environment as crucial to its biodiversity. Another concerns the manner in which the encircling estuarine waters aggregated and regulated the various ecological neighbourhoods on and around the island. The estuarine location is identified as engendering the island's biodiversity and, thus, the conditions that proved conducive to Lenape habitation.

While Sanderson's rich analytical description of the advantages of Mannahatta's estuarine situation is striking, it was largely contextual for the WCS's project, which concentrated on aspects of the island's *terrestrial* natural history. This is particularly evident in a series of images in the exhibition and within Sanderson's book that contrast visualisations of historical landscapes with images of similar areas of the contemporary island dominated and topographically altered by built structures. Despite the vivid description of layers of the historical estuarine environment quoted above, the book makes no attempt to contrast visualisations of areas of historical water space with the far more sparsely inhabited environments off the shores of present-day Manhattan.

In this regard, the exhibition and book parallel a more general tendency within the field of Island Studies to overlook the waters that define islands (and archipelagos) and, in particular, the tidal inter-zones and coastal shallows in which humans have pursued livelihood activities. While such a criticism may be seen as carping, given that the highly impressive WCS initiative took place over the span of a decade and stretched available resources and ingenuity to its limits; the absence of a comparable characterisation and visualisation of marine-scapes leaves the 'grand tapestry' of the island's pre-European phase incomplete. Visitors to 'Mannahatta/Manhattan' were left unaware of the history of marine vegetation around the island, of the location and nature of various aggregates of shellfish and of the particular habitats that supported various species of fish. Without this knowledge it is difficult to envisage the profound impacts on the island and its waters that resulted from the arrival of European settlers and their development of livelihood activities. One way of approaching and envisaging these is with regard to the concept of the aquapelago and the theorisation of the aquapelagic assemblages that produce it.

2. The concept of the aquapelago

The concept of the aquapelago was developed in response to debates in the interdisciplinary field of Island Studies concerning the nature of those aggregates of islands known as archipelagos. More specifically, the concept was explored and expanded by a group of writers associated with *Shima: The International Journal of Research into Island Cultures* who

sought to identify complex aspects of human interactions with marine environments in particular contexts at particular times. The neologism *aquapelago* was coined in opposition to the term archipelago, which essentially refers to discrete parcels of land dotted within marine environments. In contrast to the latter concept, various writers argued for a greater recognition and analysis of the integrated terrestrial and marine environments of island aggregates and of human engagement with these. The aquapelago concept thus serves as a corrective to the strong terrestrial focus common within Island Studies. This corrective also applies to Urban Island Studies, the foundational theoretical works of which have treated water merely as something that connects and/or separates distinct parcels of land (for instance, Grydehøj *et al.*, 2015) rather than as part of an integrated terrestrial-marine environment. The aquapelago concept was initially advanced by Hayward (2012a), then extended by Suwa (2012), Dawson (2012) and Maxwell (2012); refined in Hayward (2012b); and further explored by Fleury (2013), Cashman (2013), Alexander (2015) and Dick (2015). The concept has also been challenged by Baldacchino (2011) and critiqued by Gear (2014) with reference to "maritime cultural landscapes."

I initially proposed the term *aquapelago* to refer to the integrated marine and terrestrial assemblages generated by human habitation and activity in particular island locales (Hayward, 2012a). I identified that such assemblages are constituted by social units in locations where the aquatic spaces between and encircling islands are fundamentally interconnected with and essential to communities' inhabitation of their locale (and substantially generate their senses of identity and belonging to that place). In this context, I emphasised aquapelagic assemblages as *performed* entities "that come into being and wax and wane as climate patterns alter and as human socio-economic organisations, technologies, and/or the resources and trade systems they rely on, change and develop" (Hayward, 2012a: 27). Such aquapelagic assemblages necessarily involve humans interacting with other actants (entities that perform actions that impact on other entities). These actants may be animate (living) entities, inanimate ones (such as sand, soil, etc.) or the product of energies (such as individual weather events or larger climatic patterns, such as global warming).

Drawing on this perspective, I contended that the humans who constitute aquapelagos through their engagements with terrestrial and aquatic spaces are engaged in interaction with what Bennett (2010: iii) describes as the "vibrant matter" of the environment. A key aspect of Bennett's work, which inspired my own theorisation of aquapelagic assemblages, is apparent in her book's subtitle. This describes her volume as advancing "a political ecology of things." Bennett (2010: viii) speculates how "political responses to public problems" might change "were we to take seriously the vitality of (nonhuman) bodies," and she seeks to articulate "a vibrant materiality that runs alongside and inside humans to see how analyses of political events might change if we gave the force of things more due." These aspects are particularly pertinent for this essay and its consideration of the vibrant materiality of Manhattan's coastline and the broader Hudson estuary.

With regard to the discussion advanced above, we can identify a spectrum of types of aquapelagic assemblage. At one end are assemblages that are low-level in terms of their human population density and the intensity of their human community's utilisation of natural-environmental resources. Typically such uses do not cause severe disruptions to the

landscape, marine flows, environmental chemistry (and thus, terrestrial and marine habitats and the variety and interactive dynamics of the organisms that inhabit the area). The nature of Lenape inhabitation of Mannahatta in the pre-contact period, when a population of around 300-1200 inhabited an area with 51.5 kilometres of coastline and 87.5 square kilometres of terrestrial surface on a seasonal basis, exemplifies this type of aquapelagic assemblage. Such assemblages can be characterised and categorised as sustainable. The majority of discussions of aquapelegos advanced to date have addressed assemblages at this end of the spectrum – albeit with reference to assemblages with somewhat larger population densities and/or impacts upon environments. See, for example, discussions of aspects of Haida Gwaii (Hayward, 2012b) and Vanuatu (Dick, 2015; Hayward, 2015).

At the other end of the spectrum are assemblages where the intensity (and/or pace of intensification) of resource use and/or disruptions to the environment mark them as both short-lived and unsustainable. These aspects result from two (often overlapping) factors:

a) an intensification of exploitation of particular types of marine species for commercial gain in regional, national or international markets (and/or significant increases in the populations of localities that cause similar surges in demand)
b) a growth of human population that severely disrupts the locale's landscape, seascape and environmental chemistry (and thus, terrestrial and marine habitats and the variety and interactive dynamics of the organisms that inhabit the area).

In contrast to the sustainable type of assemblage, which is characterised by its stability, the unsustainable assemblage has a predictable narrative of resource decline and environmental disruption that principally varies in terms of key components and/or the duration of its cycle. In the case of contemporary Manhattan, factors a) and b) (above) were inter-related. As the following section relates, a particular activity, oyster harvesting and its support industries, constituted a crucial historical hinge between the early indigenous inhabitation of Mannahatta and the later, massively disruptive, industrialisation of the city's foreshore.

Kurlansky (2007) has provided a vivid overview of the marine/terrestrial interface that was crucial to the pre- and post-contact populations of Manhattan. His book, entitled *The Big Oyster* (in allusive contradistinction to the city's 20th Century nickname of 'The Big Apple'), provides a detailed historical account of the centrality of the Hudson River's oyster beds to the development of the island during the first 300 years of its modern settlement. His study facilitates a characterisation of the island's modern history in terms of two distinct types of aquapelagic assemblage, the artisanal and industrial. The artisanal is a low-impact and sustainable system. On Manhattan this was generated by a population that numbered around 50,000 in the early 1800s that had access to a large area of oyster habitat that was not significantly disturbed by human construction activities. Its transition to an industrial system resulted from the rapid increase in the island's population, which rose to 500,000 by 1850 and peaked at 2.3 million in 1910 (Angel & Lamson-Hall, 2014). As Kurlansky relates, the industry attempted to service the escalating population by intensifying its local operations. At its peak, in 1880, the waters around Manhattan were dominated by an industrial aquapelagic assemblage that employed a wide range of personnel in gathering, delivering, shucking, wholesaling and retailing the mollusc (alongside others employed in constructing and maintaining oyster barges, docking facilities, etc.). This created multiple nodes of interaction

between estuarine and terrestrial environments for those involved in the production, distribution and marketing of the aquatic resource. The industrial operation delivered a staggering 700 million oysters per year to local markets. As extensive and intensive as the assemblage was, it was also completely unsustainable. The period of peak production around 1880 was followed by a complete collapse that coincided with the island's peak human population. The population rise created something of a 'perfect storm' for the local oyster industry. A cluster of factors combined to obliterate the industry, chief amongst which were massive stock depletion; dredging operations and land reclamation, which decreased the area of oyster habitats; and increasing pollution, which affected both the quality and toxicity of remaining local oysters. These factors rapidly terminated the local industry as less compromised stock was sourced from farther afield, with the final local oyster bed closing in 1927.

In tandem with the above factors, the city's rising prominence as a port, serving both its own internal populace and the broader region, also severely impacted the oyster's coastal habitats. As Gastil (2002) has detailed, from the mid-19th to mid-20th Century, shipping facilities came to dominate the southern half of Manhattan and the East Side, requiring coastal flats to be constructed to allow direct shipping access. Foreshores and wetlands were also drained and/or built over in order to allow ships' cargos to be transferred to land and dispatched via rail and road. With its oyster industry in rapid decline, the city lost a major element of its innate livelihood connection to its adjacent waters. In just over 300 years the complex and bountiful ecological diversity that Sanderson emphasised as the island's "crowning" aspect in the early 1600s had been all but obliterated. Instead of utilising local seafood resources, the city became a consumer of marine goods supplied by a network of fisheries located outside the Hudson estuary that were delivered by ships to the Fulton Street Fish market, in lower Manhattan, which became one of the world's largest fish markets (until it was relocated to the Bronx in 2005).

The use of large tracts of Manhattan's coast for port facilities created an industrial buffer zone around the island's interior that severely inhibited public access to shorelines and thereby to coastal waters. This buffering restricted the construction of the type of coastal frontage housing that could maintain a visual-imaginative identification of the city as an island surrounded by waterways (see Swaminathan, 2014 for a discussion of this aspect with regard to the development of Mumbai as a modern city). Faced with such exclusions from its waterfront, parks – and the city's iconic Central Park, in particular – became a focus for the population's leisure activities. In many ways, Central Park can be imagined as a 'walled garden', hemmed in by the high-rise buildings that surround its four sides on an island whose residential areas were constricted by the commercial dock facilities that surrounded its shores. The decline of Manhattan's shipping industry from the 1960s on, accelerated by the introduction of container shipping suitable for large, automated dock facilities, brought little relief and even ossified the situation. Waterfront facilities were variously locked off and/or re-assigned for new coastal roadways that also blocked public access to the foreshore and to its (severely depleted) fishery (Gastil, 2002).

In terms of the discussion advanced above, we can characterise that, between the mid-1800s and early 1900s, Manhattan abandoned its aquapelagic orientation. The parallel collapse of the oyster industry, the rise and fall of Manhattan as a shipping hub, and the continuing

ascendancy of the island as a global commercial centre reflected a retreat from a more general aquapelagic interaction with the island's coastal fringe. All of the aspects outlined above were brought into clear focus by a major weather event that impacted the lower Hudson estuary in 2012, Hurricane Sandy.

3. Rising currents: Hurricane Sandy and re-engagement with the aquapelagic

Hurricane Sandy was a Category Three storm that crossed the North American coast close to Atlantic City (200 km south of New York City). The hurricane produced a storm surge up the Hudson that hit Manhattan, adjacent islands and coastal locations on 29 October 2012, causing major flooding of low-lying areas and major disruption to transport routes dependent on tunnels and subterranean facilities. The same narrowing estuarine location that Sanderson (2009: 142) characterised as "the connector [...] that gathers all the old neighborhoods together" provided a funnel for storm surge inundation and damaging wave action. Storm surges around Manhattan rose as high as 3.85 metres above normal tide, causing extensive flooding. While fatalities were limited (with 72 deaths in the United States being directly linked to the hurricane), 650,000 homes were either destroyed or damaged. The financial cost of the disruption has been estimated at just under $50 billion overall and $19 billion in New York City alone (Blake *et al.*, 2013). If New Yorkers had largely forgotten their estuarine location and the fundamental interconnectivity of their land areas with the marine environment that surrounded them, Sandy's impact served to remind them of it. The hurricane's impact underlined the primacy of the geo-physical space New Yorkers inhabited, its "chiasmatic idiosyncrasy" (Maxwell, 2012: 23) and the broader "onto-story" of their location, i.e. of "nature doing what it does" (Bennett, 2010: 116-119).

The (previously discussed) design and materiality of the city's built foreshore was a major factor in the damage that resulted from the storm surge. As Grizzle and Coen (2013: 327) have emphasised:

> The urbanized shorelines of New York Harbor have long been hardened by seawalls, bulkheads, docks and other structures... but in large measure these are structures that are essential for a working port. The hardened shorelines were designed to withstand the hydrodynamics and other conditions typical of busy harbors [...] [not] to withstand extreme storm events.

The images of the immediate aftermath of the storm screened on television and online showed metropolitan spaces inundated with water in a manner that resembled Venice's (planned) incorporation of waterways within its heart. This vision had been presented before, albeit in far less compelling form. Activists warning about Anthropocene climate change have produced impressions of what particular cities would look like were sea levels to rise significantly. A notable example occurred in Al Gore and Davis Guggenheim's 2006 film *An Inconvenient Truth*. One sequence of the film visualised what New York might look like if ocean levels rose by several meters due to glacial melting, showing the East River moving into central lower Manhattan. This possibility was also picked up in a related *Vanity Fair* article (Hertsgaard, 2006). The cover of the May 2006 issue in which the article appeared provided a vivid photographic visualisation of Manhattan's high-rise buildings surrounded by water, clustered together like individual islets in the Hudson. As I have discussed with regard to changes in spatial conditions of the (present-day) Haida Gwaii region since the end of the last Ice Age (Hayward, 2012b), the effects of climate and sea level

changes on human habitation patterns are complex and not necessarily negative for humans, particularly for those who have portable habitation structures and livelihood technologies. For instance, homes in locations such as the barrier reef islands of the Carolina coast (see Kaufman & Pilkey, 1979) were (formerly) built to be easily transported since coastlines varied as the sand islands 'migrated'. The situation is, however, significantly different for immobile built environments.

From the late 1990s on, concerns about the potential impact of storm surges and a general increase in sea levels (largely if not conclusively attributed to human-produced global warming) prompted a number of artists, architects, theorists and planners to explore potential futures for New York that addressed its estuarine location in a more integrated and interactive manner. One particularly influential study was the 'On the Water/Palisade Bay' project (henceforth 'OTW/PB'), led by Guy Nordenson, Catherine Seavitt and Adam Yarinsky from Princeton University's School of Architecture, in 2007. Taking as its starting points New York's and New Jersey's location in the estuary of the Hudson River and the phenomenon of rising sea levels, the study aimed to both lower the risk of flooding events and to create a new, more integrated interface between metropolitan built environments and estuarine spaces. The team identified their proposals as being based on a "soft", flexible and adaptive infrastructure:

> which aims to synthesize solutions for storm defense and environmental enrichment along the coast. It is an adaptable solution that adjusts to varying climatic conditions and urban demands by balancing environmental, technical, and economic priorities. Our goal is to layer these priorities throughout the harbor zones to not only create a comprehensive storm defense system but also to provide new places for recreation, agriculture, ecologies, and urban development. By arraying these activities on the water, the bay becomes a regional centre, and the city refocuses on the body of water it surrounds (Nordenson, Seavitt, & Yarinsky, 2009: 12).

In contrast to 'hard', monumental infrastructural developments (such as those constructed for ports and for modern ship berthing, in particular), the team's approach engaged with the New York's estuarine harbor space as "a fluid body with a porous boundary" where the "figure-ground relationship of the water and the land constantly changes as it is subject to forces ranging from diurnal tides, floods and dry seasons, and modes and intensity of use" (Nordenson, Seavitt, & Yarinsky, 2009: 20). In this manner, the team focused on the city's immediate costal fringe and, significantly, the "intensity of use" of that area. The latter aspect identifies the livelihood activity core to the constitution of aquapelagic assemblages in environments that are constantly subject to change. These require ingenious and adaptive patterns of human use of spaces that are "soft" in the sense of being both "fluid" and "porous". The final project report proposed three initiatives:

- the construction of "an archipelago of islands and reefs along the shallow shoals of the New York-New Jersey Upper Bay to dampen powerful storm currents as well as to encourage the development of new estuarial habitats,"
- the revitalisation of the waterfront "by designing a broad, porous, 'fingered' coastline which combines tidal marshes, parks, and piers for recreation and community development,"
- the enactment of "zoning formulae that adapt efficiently in response to the impact of storms in order to increase community resilience to future natural disasters" (Nordenson, Seavitt, & Yarinsky, 2009: 22).

As will be apparent, these initiatives promoted a flexible engagement with the city's marine spaces based on an embrace and accommodation of the marine environment.

Substantially inspired by the example of the 'OTW/PB' study, Barry Bergdoll, curator of Architecture and Design at New York's Museum of Modern Art (MoMA) in 2007-2013, secured funding for an initiative entitled 'Rising Currents'. This comprised the research, visualisation and proposal of five projects for New York's waterfront that aimed to identify innovative approaches to combating problems of rising sea levels and integrating metropolitan and estuarine spaces in a productive and sustainable manner. In terms of the debates advanced in this article, the projects essentially involved the re-imagination of the island/estuarine/archipelagic nature of modern-day New York in more aquapelagic terms. The selected projects were developed by different teams in consultation with Bergdoll and others and were presented for public scrutiny and feedback at an exhibition at MoMA in October 2010, together with an accompanying book (Roberts, 2011). Significantly, and appropriately for the venue, the project teams were given the brief of producing work that could inspire and facilitate a re-envisioning of New York (re-)integrated with the Hudson estuary. As Bergdoll (2011: 20) has emphasised, the teams:

> did not temper their visions by responding to existing real estate interests or current land-use regulations. […] I regularly reminded the teams of the task at hand: "Your mission is to come up with images that are so compelling they can't be forgotten and so realistic they can't be dismissed.

In an influential early contribution to debates around the aquapelago, Suwa (2012: 13) explored the concept with regard to the Japanese notion of *shima*, a term that he characterised as connoting an inhabited locale as "a lived world […] a space generated by livelihood or cultural conduct […] a spatio-temporal concept and a work of imagination where landmarks generate a sense of reality." This characterisation has resonances with Bergdoll's vision, in that he was effectively attempting to create new *shima* around New York in an initiative that required dramatic visions of "landmark" projects that could generate a sense of how an alternative estuarine metropolis might constitute itself. The timeliness of the topic, favourable publicity and a groundswell of public interest ensured high attendance at the exhibition, which attracted 881,520 visitors (the highest attendance at any art and design exhibition internationally in 2010; Walhimer, 2011). While it is impossible to accurately gauge whether the images on show *were* sufficiently compelling to be remembered or the extent to which the radical visions of the design groups resisted dismissal; the exhibition and its accompanying catalogue include a number of dramatic visualisations of proposed projects. In terms of the discussion advanced in this essay, they were also significant as striking examples of aquapelagic futurism, the imaginative envisionment of alternative, more integrated ways of inhabiting coastal/estuarine locales.

The 'Rising Tides' projects addressed the particular environmental issues of specific areas and included the remediation of former 'dirty' industrial sites into clean, sustainable facilities and local projects intended to minimise the impact of inundation. Two of the projects, for Zones 2 and 4, are of particular relevance to this article's discussions by dint of proposing 'acupunctural' planning work in an estuarine environment. The notion of 'acupunctural urbanism' is closely associated with the work of Jaime Lerner (2014), former mayor of the

Brazilian city of Curitiba. The premise of acupunctural urbanism is that the city is effectively a living organism with particular pressure points that can be addressed by highly targeted interventions that can alleviate stress and/or malaise within the broader system. Drawing on this, Marco Cassagrande (2013) has promoted the concept of "biourban acupuncture," which promotes local green initiatives in urban contexts. The latter include so-called "guerrilla" vegetable gardens and the preservation (and enhancement) of natural grow-back. These are far from incidental initiatives; they are ventures that change people's senses of urban space and of their potential to reconfigure that space, creating new environments from the detritus of metropolitan history and the pollution it has caused. Manhattan has a shining example of the latter. The vegetation that established itself in the 1990s on Manhattan's disused High Line railway, on the island's Lower West Side, inspired the creation of the acclaimed elevated High Line Park, which opened in 2009. The park has had a major impact on the use, community perception and sense of space in the area and has led to a wider 'greening' of the surrounding part of the city (David & Hammond, 2011).

The Zone 3 and 4 projects explored acupunctural approaches in ways that tacitly recognise that the humans who are implicated into aquapelagic spaces necessarily interact with a wide range of actants. The Zone 4 project had historical resonance in that it explicitly acknowledged the decline of New York's oyster industry under the pressures of excessive harvesting and habitat destruction and involved a concept that the landscape architect Kate Orff (2011) has termed 'Oyster-tecture'. The project was designed to remediate Brooklyn's Gowanus Canal and its area of entry into the Hudson around the Bay Ridge Flats. The canal is widely regarded as one of the most polluted waterways in the United States, as a result of seepage of residual pollutants from earlier industrial gas plants in the area. Orff's vision was to create a network of oyster beds and underwater rope scaffolding for shellfish that would create an offshore storm surge barrier, a new habitat for marine life, a filtering system for the polluted canal emissions and a livelihood and recreational space for locals (Orff, 2011: 90-99). Orff's 'soft' infrastructural proposal involved the growing of new structures within the harbour by stimulating shellfish clusters in the former location of (once commercially exploited) oyster beds. Her project reflected a more general concern to regenerate oyster beds around New York that developed in the 1990s and early 2000s based on an awareness of the need to restore the city's marine and terrestrial habitats. Similar strategies have been advocated by environmental artist Mara Haseltine, who has undertaken a number of projects over the past decade to facilitate and publicise the restoration of oyster populations around New York. These include designing a solar-powered artificial reef structure, which was installed in McNeil Park in Queens in 2007; designing optimal shapes for the clustering of oyster populations in artificial oyster bed structures; and teaching a course at Manhattan's New School in 2008-2012 entitled 'The Art of Urban Oyster Restoration' (see Levitt, 2009). Haseltine's work has been premised on the concept of 'Geotherapy', a practice that encourages humans to counter Anthropocene impacts in part by stimulating and deploying natural processes. Orff's structural skeins utilise 'soft' infrastructures in a manner that evokes comparison to Haseltine's work and that extends her vision into metropolitan planning. The symbolic aspects of returning to a specific species (i.e. oysters) to rebuild coastal marine environments and provide a protective, filtering fringe for the city will be apparent and may be regarded as a partial attempt to regenerate and 're-aquapelagise' the area.

4. Envisaging the 'Aqueous City'

The most ambitious project in the Rising Currents initiative was Zone 3 'New Aqueous City', envisaged by Eric Bunge and Mimi Hoang for the Verrazano Narrows between Staten Island and Brooklyn. This project went further than others in the 'Rising Tides' initiative by imagining a *network* of new structures of various kinds in the estuary. Bunge and Hoang (2011: 100) state:

> This project blurs the boundaries between land and sea, extending the city into the water. Habitable wave-attenuating piers (supporting housing, public leisure areas, and protected wetlands) provide docking points for a network of biogas ferries, and an archipelago of man-made islands connected by inflatable storm barriers encourages silt accumulation, fostering natural resilience against storm surges. At the same time, the water is extended into the city, which is punctuated by a network of infiltration basins, swales, and culverts that absorb storm runoff and function as parks in dry weather.

Figure 1: Man-made islets in the Hudson – Zone 3 Project visualisation (nARCHITECTS, 2010)

The Zone 3 project was conceived as both a new aqueous settlement in its own right and a venture that could significantly modify the character of the greater New York area by creating a new aqueous/aquapelagic fringe. In contrast to Manhattan's boxed-in interior spaces, the proposed aqueous settlement was envisaged as requiring habitation in a manner that is more fundamentally connected to and interactive with the region's estuarine environment. In addition to a series of striking images depicting a radical re-envisioning of a metropolitan interface with an estuarine environment (such as that in Figure 1 above), the project included a clearly articulated team statement in which Bunge and Hoang (2011: 100) describe their vision of the aqueous city growing quasi-organically from:

- "archipelagos interconnected with dynamically inflatable barriers,"
- "piers extending land-based transportation out into the water," and
- "bridgelike structures that would allow the suspension of lightweight housing over the water."

The architects have described how they envisaged these "infrastructural armatures" as "seeds" that could not only accommodate ecological growth, but also lead to new technologies and "evolving mind-sets" (Bunge & Hoang, 2011: 108). The "soft" patterns of aggregation and interaction envisaged here mirror the organic structures in coastal waters that have allowed humans to inhabit and profitably exploit aquapelagic assemblages (Manhattan's 19th Century oyster industry being a case in point). The radical re-imagination of the city's foreshores and estuarine environments that Bunge and Hoang propose would require its developers and inhabitants to negotiate and interact with the estuarine locale in a flexible and interactive manner, implicating themselves in the region's and planet's ongoing "onto-story". Key to this vision is a sense of the creation of a particular form of domicile, referring to a person's place of residence or ordinary habitation to which they have some form continuing identification and/or commitment. The particular domicile that Bunge and Hoang propose involves humans actively inhabiting the coastal fringe and utilising its waters (rather than simply exploiting them from terrestrial bases).

This model of aqueous domicile is less novel than might first appear. It has parallels in traditional floating population clusters, such as the communities of Vietnam's Halong Bay; in cities closely integrated with their marine environments, such as Venice; and in the proposal and development of large-scale 'sea-steading' enterprises on what are effectively mobile islands (see Gramlich, 1998). Domiciles of the kind proposed by Bunge and Hoang require a substantial degree of sustainability – in order to justify long-term investment and development – and a utilisation of marine resources and environments that is beneficial to the humans most closely involved with it.

The imagination of a new aqueous city extends out into the waters of the Hudson but stops short of a re-imagination of the complexity of those waters and how their former ecological diversity might be regenerated or refigured. As Sanderson (2009: 143) has elaborated, prior to metropolitan development, the Hudson was a highly complex, layered, three-dimensional space that altered in seasonal cycles, with varying proportions of salt and fresh water. The potential for 'acupunctural urbanism', let alone 'biourban acupuncture', in a modern-day estuarine environment that is bounded by hard infrastructure and polluted by various run-offs is staggeringly complex. Aquapelagic spaces may be constituted by human agency (Hayward, 2012a, 2012b) but they are not *determined* by that agency. The vitality of non-human elements comes into play, more specifically their capacity "not only to impede or block the will and designs of humans but also to act as quasi agents or forces with trajectories, propensities, or tendencies of their own" (Bennett, 2010: iii). Projects such as Bunge and Hoang's 'new aqueous city' and related ventures represent important steps towards envisaging and developing a new type of coastal metropolitan settlements and, more broadly, a more harmonious relationship between dense urban aggregations and adjacent waterways but they are not so much environmentally restorative as innovative.

5. Conclusion

This essay has attempted to characterise and assess various aspects of the re-envisioning of Manhattan and the wider New York area apparent in the 'OTW/PB' and 'Rising Tides' projects. In terms of the aquapelago debates identified in Section 2, the projects can be seen as imaginative engagements with the possibility of forging new integrated relationships with

New York's estuarine environments. The implicit or explicit reference point for many of these projects is the more innately integrated *habitus* of Manhattan's pre-metropolitan populace, for whom the surrounding waterways were a crucial livelihood source. While it is beyond the scope of this essay and the competence of its author to assess the viability and practicality of the specific schemes proposed within the 'OTW/PB' and 'Rising Currents' initiatives, my discussions have sought to emphasise that their vision is timely and important, given the significant variations in sea levels that seem likely to occur in this and subsequent centuries. The projects' visions of a new metropolitan aquapelago accreting around the shores of Manhattan and adjacent areas of the Hudson estuary are inspirational, for all the questions the proposals leave unanswered. The proposals' main achievement, in this context, is to have imagined how a metropolis located in an estuarine situation might engage with its environment in a more advantageously aquapelagic manner. The realisation of such visions would require a thorough embedding of the underlying approach in policy and practice. The extent to which this might occur depends on the capacity of relevant individuals and institutions to rise to the challenge and to re-envision Manhattan with a productive aquapelagic future rather than a flood-threatened, monumentally frozen present.

Projects such as 'OTW/PB' and 'Rising Currents' represent an important step towards envisaging and developing new types of coastal metropolitan settlements and, more broadly, a more harmonious relationship between dense urban aggregations and adjacent waterways. The projects also suggest the potential to develop more ambitious domiciles along the aquatic fringes of metropolitan centres in a manner that might have profound implications on how human societies attempt to respond to the challenges of rising sea levels. The projects proposed include those in which engineering and design attempt to either remediate already urbanised coastal locales, so as to improve their productivity in a variety of ways (fisheries, storm surge abatement, pollution control, recreation, etc.), or else to create new urban settlements that make productive and sustainable use of their marine locations. In both cases, the imagination of these initiatives requires their designers to go beyond a terrestrial model in which the marine aspect is regarded as an external factor. What is instead needed is an integrated, holistic vision that sees livelihood activities, environmental stewardship and urban planning and development as occurring in dynamic and mutually implicated aquatic-terrestrial assemblages.

References

1. Alexander, R. (2015) 'Career Decision Making in island Communities- applying the concept of the Aquapelago', *Shima*, 6(1), 38-52.

2. Angel, S., & P. Lamson-Hall (2014) 'The Rise and Fall of Manhattan's Densities, 1800-2010', New York University Marron Institute of Urban Management, Working Paper 18. Available at: marroninstitute.nyu.edu/uploads/content/Manhattan_Densities_High_Res,_1_January_2015.pdf. Accessed 25 August 2015.

3. Baldacchino, G. (2012) 'Getting Wet: A Response to Hayward's Concept of Aquapelagos', *Shima*, 6(1), 20-26.

4. Bennett, J. (2010) *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press.

5. Bergdoll, B. (2011) 'Rising Currents: Incubator for Design and Debate', in R. Roberts (ed.) *Rising Currents: Projects for New York's Waterfront*. New York: Museum of Modern Art, pp. 12-31.

6. Blake, E.S., T.B. Kimberlain, R.J. Berg, J.B. Cangialosi, & J.L. Beven (2013) 'Tropical Cyclone Report – Hurricane Sandy', National Hurricane Centre. Available at: http://www.nhc.noaa.gov/data/tcr/AL182012_Sandy.pdf. Accessed 20 October 2014.

7. Bunge, E., & M. Hoang (2011) 'New Aqueous City', in R. Roberts (ed.) *Rising Currents: Projects for New York's Waterfront*. New York: Museum of Modern Art, pp. 100-109

8. Buttenweiser, A.L. (1987) *Manhattan Water-Bound: Planning and Developing Manhattan's Waterfront from the Seventeenth Century to the Present*. New York: New York University Press.

9. Cashman, D. (2013) 'Skimming the Surface: Dislocated Cruise Liners and Aquatic Spaces', *Shima*, 7(2), 1-13.

10. David, J., & R. Hammond (2011) *High Line: The Inside Story of New York City's Park in the Sky*. New York: Farrar, Strauss and Giroux.

11. Dawson, H. (2012) 'Archaeology, Aquapelagos and Island Studies', *Shima*, 6(1), 17-21.

12. Dick, T. (2015) 'Chorographing the Vanuatu Aquapelago', *Shima*, 9(2), forthcoming.

13. Fleury, C. (2013) 'The Island/Sea/Territory Relationship: Towards a Broader and Three Dimensional View of the Aquapelagic Assemblage', *Shima*, 6(2), 1-13.

14. Gastil, R. (2002) *Beyond the Edge: New York's New Waterfront*. Princeton: Princeton Architectural Press.

15. Gramlich, W. (1998) 'Seasteading: Homesteading on the High Seas'. Available at: gramlich.net/projects/oceania/seastead1.html. Accessed February 2014.

16. Grizzle, R.E., & L.D. Coen (2013) 'Slow Down and Reach Out (and We'll Be There: A Response to "Shellfish as Living Infrastructure" by Kate Orff', *Ecological Restoration*, 31(3), 325-329.

17. Grydehøj, A., X.B. Pinya, G. Cooke, N. Doratlı, A. Elewa, I. Kelman, J. Pugh, L. Schick, & R. Swaminathan (2015) 'Returning from the Horizon: Introducing Urban Island Studies', *Urban Island Studies*, 1(1), 1-19.

18. Haseltine, M.G. (2012) 'Sustainable Reef Design to Optimize Habitat Restoration', in T. Goreau & R.K. Trench (eds) *Innovative Methods of Marine Ecosystem Restoration*. Boca Raton: Taylor & Francis, pp. 245-261.

19. Hayward, P. (2015) 'Sounding the Aquapelago: The Cultural-Environmental Context of ni-Vanuatu Women's Liquid Percussion Practice', *Perfect Beat*, 15(2), 111-128.

20. Hayward, P. (2012a) 'Aquapelagos and Aquapelagic Assemblages' (2012) *Shima*, 6(1), 1-10.

21. Hayward, P. (2012b) 'The Constitution of Assemblages and the Aquapelagality of Haida Gwaii', *Shima*, 6(2), 1-14.

22. Hertsgaard, M. (2006) 'While Washington Slept', *Vanity Fair*, May. Available at: http://vanityfair.com/politics/features/2006/05/warming200605. Accessed 20 October 2014.

23. Kaufman, W., & O. Pilkey (1979) *The Beaches are Moving: The Drowning of America's Shoreline*, Durham: Duke University Press.

24. Kurlansky, M. (2007) *The Big Oyster: A Molluscular History of New York*. New York: Vintage.

25. Lerner, J. (2014) *Urban Acupuncture*. 3rd ed. Washington: Island Press.

26. Levitt, J. (2009) 'Interview: Mara G Hasletine', Worldchanging. Available at: http://www.worldchanging.com/archives/009854.html. Accessed 20 October 2014.

27. Maxwell, I. (2012) 'Seas as Places: Towards a Maritime Chorography', *Shima*, 6(1), 27-29.

28. Nordenson, G., C. Seavitt, & A. Yarinsky (2009) *On The Water/Palisade Bay*. Available at: http://www.palisadebay.org/Chapters/01%20Introduction_lr.pdf. 21 October 2014.

29. Osnos, E. (2001) 'Manhattan's Waterfront is Changing', *Baltimore Sun*, 15 July. Available at: http://articles.baltimoresun.com/2001-07-15/news/0107150154_1_waterfront-prospect-park-central-park. Accessed 8 December 2014.

30. Roberts, R. (ed.) (2011) *Rising Currents: Projects for New York's Waterfront*. New York: Museum of Modern Art.

31. Sanderson, E.W. (2009) *Mannahatta: A Natural History of New York City*. New York: Abrams.

32. Shorto, R. (2004) *The Island at the Centre of the World: The Untold Story of Dutch Manhattan and the Founding of New York*. London: Transworld.

33. Stratford, E, G. Baldacchino, E. McMahon, C. Farbotko, & A. Harwood (2011) 'Envisioning the Archipelago', *Island Studies Journal*, 6(2), 113-130.

34. Suwa, J. (2012) 'Shima and Aquapelagic Assemblages', *Shima*, 6(1), 12-18.

35. Swaminathan, R. (2014) 'The Epistemology of a Sea View: Mindscapes of Space, Power and Value in Mumbai', *Island Studies Journal*, 9(2), 277-292.

36. Walhimer, M. (2011) '2010 Top Art Museums', *Museum Planner*, 26 December. Available at: http://museumplanner.org/2010-top-art-museums. Accessed 01 September 2015.