Towards a Floating Urbanism: Adapting to Water as a New Ground

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TOWARDS A FLOATING URBANISM
Adapting to Water as a New Ground
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Towards A Floating Urbanism: Adapting to Water as a New Ground

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Syracuse Architecture Class of 2019 Undergraduate Thesis

Advisory Group: Alternative Urbanism (Professors Lawrence Chua, Lawrence Davis and Mitesh Dixit)

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Table of Contents

Pg. 3. Introduction

Thesis Prep
Pg. 4-20

Thesis
Pg. 21-24 Site Analysis
Pg. 25-27 Precedent Analysis
Pg. 28-34 Float Block
Pg. 35-40 Urban Design

Pg. 41 Apertures

Pg. 42 References
Introduction

Climate change offers myriad challenges to society, including a rising sea level and increasingly intense storms. Resilience to climate change, particularly the reliance on hard barriers, only protects certain areas and raises the risk of catastrophic failure. More deeply, these approaches reflect an attempt to preserve society as it exists today, denying the reality that the multi-millennia process of climate change necessitates a more profound reevaluation of how society operates. Adaptation takes this need as a given, arguing for the retrofitting of infrastructure to regular inundation when possible and the abandonment of at-risk areas when not. However, these strategies are either expensive and technically difficult over the long term or massively disruptive to communities, deeming large stretches of the world’s most densely populated coasts ultimately uninhabitable. I propose a more flexible alternative, the development of a floating infrastructure, allowing for an ongoing habitation of coastal areas while adapting to the deluge of both temporary storm surge and the long-term rise in sea level over decades and centuries. This pragmatic adaptation posits the architectural and urban question of how to reconceptualize water as a new form of ground.

New York City is selected as an urban center that is highly shaped by its waterfront and nautical history, along with the relative scarcity of land to build on. The choice of selecting a city as a site reflects the larger need for shelter from the open ocean as well as the necessity, at least in its early development, of integrated economy and infrastructure between land city and water city.

Littoral cities such as Amsterdam or Venice are largely constructed around land reclamation, and thus face their own unique challenges from climate change. However, their intimate connection to water provide a historical analogue for a water centric urban design strategy. The Netherlands represents a society that is increasingly attempting to adapt to the natural transformations of a complex water system and the interconnectedness between the layers of built infrastructure networks and human habitation. Venice reflects a society deeply integrated with water across the levels of politics, culture and economics, replicating and transforming urban typologies typical to more conventional land cities.

Floating architecture, like ships, can be prefabricated in dry docks: this would potentially limit costs while removing size limits imposed by city streets. To counter this tendency to repetitive efficiency, the structures would implement a process of self-built incremental design superimposed on a prefabricated superstructure. This would also allow communities to better shape the built environment to their needs, developing a local sense of community and character for an otherwise new and artificial neighborhood.
Framing of Climate Change Responses

1. Do Nothing

2. Mitigation:
   - Shrink Global Economy
   - Zero Carbon Energy Transition
   - Develop Carbon Sinks
   - Geoengineering

3. Resilience:
   - Hard / Artificial Barrier
   - Soft / Ecological Barrier
   - Enhanced Evacuation Plans

4. Adaption:
   - Retreat from coastal areas
   - Retrofit existing infrastructure
   - Floating Infrastructure

Climate Change

Sea level rise and Increased Storm Severity
Speculative Timeline of Aquatic Urbanism

San Francisco
Inhabiting the Quake
(Lebbeus Woods 1995)
LOCATION: San Francisco Bay, California
ELEVATION: sea level
MATERIAL: Scavanged steel and existing dock pilings

Lagos Shanty Megastructures
(Lebbeus Woods 1995)
LOCATION: Lagos, Nigeria
ELEVATION: sea level
MATERIAL: Scavanged steel sheeting and existing urban fabric

Lagos Shanty Megastructures
(Kenzo Tange 1960)
LOCATION: Tokyo, Japan
ELEVATION: sea level
MATERIAL: Steel Reinforced Concrete

Noah’s Ark
(Yahweh and Noah (Architect of Record) 4th Century BC)
LOCATION: Mount Ararat
ELEVATION: 16,854 ft
MATERIAL: Gopher Wood

Walking City
(Ron Herron, 1964)
LOCATION: Global
ELEVATION: Global
MATERIAL: Steel

Periscoping access tubes allow entrance from ground level host cities and other walking city modules.

Long steel legs and wheels allow for traversal of rugged terrain of post-apocalyptic land and sea.

Office blocks suspended from grounded concrete piers.

Large terraces provide public pedestrian space and room for raised vegetation.

Multilevel highways form the spine of the residential structures, interconnecting them to the larger urban context.

Gondolas provide an alternative to the interminable congestion of downtown Lagos surface traffic.

Raised pedestrian paths provide parks separated from ground level pollution and offer resilience to flooding.
FORTRESS NEW YORK

A closed coast creates conditions for catastrophic failure. Combined with the failure to seriously mitigate climate change, both hard and soft resiliency will eventually become inadequate in the face of inexorably rising seas.

“Everyone thought it would happen gradually, and out in the boroughs it did. But they had built a surge wall about a hundred years before... You could lose your balance if you looked at both sides at once. It kind of made you sick to your stomach. Because the water was higher than the land... That day is why they’ll never polder the harbor. I don’t know why people even talk about that. Dam the Narrows and Hell Gate, pump the Hudson into the sea—it’s crazy. Something breaks and boom, it would all go under again. Including Brooklyn and Queens and the Bronx. I can’t even imagine how many people would get killed.”

-New York 2140

FLOAT BLOCK

Re-imagining Koolhaas’s New York for an aquatic future, the urban substrate of asphalt is replaced with water. This intensifies radical cross-pollination of contrasting adjacent programs.

“Manhattanism is the one urbanistic ideology that has fed, from its conception, on the splendors and miseries of the metropolitan condition - hyper-density - without once losing faith in it as the basis for a desirable modern culture. Manhattan’s architecture is a paradigm for the exploitation of congestion.”

-Delirious New York


One existing instance of floating architecture is the Vannon C. Bain Correctional Center. Future implementation must be wary not to emphasize segregation between urban land and water.

Heatherwick Studio’s Rolling Bridge is a modern interpretation of the draw bridge, in a city where city blocks can rearrange themselves and boat traffic is constant, flexible connections are essential.

In addition to as built floating architecture, the city could utilize repurposed ships no longer seaworthy but still usable in the harbor.

Without street crosswalks bridges will become central to pedestrian transportation, these will become central to the resurgence of pedestrian oriented urban life.
INCREMEN-THAL PERFAB

Prefabrication fosters inexpensive mass produced floating architecture. The concept of incremental housing and bottom up design development allows for flexible use across regions, responding to the specific needs of its inhabitants and empowering communities to shape their built environment.

‘When dwellers control the major decisions and are free to make their own contribution to the design, construction or management of their housing, both the process and the environment produced stimulate individual and social well-being’.

-The Autonomous City


Picturesque Atlantis

“Sun blazed off canals and made the rank-and-file forest of buildings look like rows of standing stones in some half-sunk Avalon. Black pillars drowned to the knees, it was a surreal sight, there was no coming to terms with it, it never ceased to look bizarre, even though she had lived in it all her life. What a fate. A somewhat glorious fate.”

-New York 2140

Imagining Manhattan as a picturesque ruin, submerged by storms but now serene in its transformation. After all the devastation, its inhabitants sail the avenues of the same city, utterly changed.

Repurposing of the Brooklyn Navy Yard from shipbuilding to the construction of floating architecture. The potential of prefabricated structure is unfettered from the size of a truck bed, only constrained by the width of a drydock and the height of the lowest bridge; it can be an apartment block or a city park.
Collage 6: Plug In
**Float In**

*Plug In*

"Often likened to insects, these mobile pods would be able to roam the globe, containing all of the services they needed to survive, as well as the ability to plug into the resources of whatever location they happened to be in. They could strike out on their own or combine and recombine with other pod cities in an endless game of musical chairs of place and community... it could be anything that was needed. It could walk itself to a rural area if safety and distance were called for, it could combine with other walking pods and form larger communities, or, it could even join up with a major metropolis."

-Allison McNearney

With water as the new ground, architecture is no longer constrained to a static location. With this flexibility, architecture can better serve the particular needs of coastal areas around the world: whether a temporary event space or a permanent augmentation to existing infrastructure. The unlocking of new Real Estate provides flexibility to cities with scarce land available.

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Climate Change

The Upright Distribution of Catastrophes in North Carolina:
A recent study by the geologists at the Department of Earth Science at the University of North Carolina at Chapel Hill has revealed a significant shift in the distribution of catastrophic events in North Carolina. The study, published in the *Journal of Geophysical Research*, found that in recent years, the frequency and intensity of hurricanes, tornadoes, and floods have increased dramatically, posing a significant threat to the state's infrastructure and inhabitants. The researchers attribute this change to climate change, highlighting the need for urgent action to mitigate the effects of global warming.

New York 2140:
The new book by Kim Stanley Robinson, *New York 2140*, presents a dystopian future where the city is engulfed by rising sea levels. The narrative explores the challenges and solutions of a future New York City, where the ocean has advanced to the brink of the city, forcing inhabitants to adapt to a new reality. The book is a powerful reminder of the urgency of addressing climate change and the importance of planning for a sustainable future.

The Windup Girl:
Paolo Bacigalupi's novel *The Windup Girl* offers a bleak vision of our future, where the world has been decimated by overpopulation and environmental degradation. The story follows a woman who works for a company that produces artificial muscles, a key technology in a world where natural resources are scarce. The novel raises critical questions about the future of humanity and the need for innovation in the face of environmental challenges.

Autonomy / Incremental Housing

The Autonomous City:
Alexander Vasudevan's book *The Autonomous City* examines the role of self-organization in urban development. The author argues that cities of the future will be shaped by autonomous, self-organizing communities that operate independently of traditional hierarchies. The book offers a vision of a more equitable and democratic urban future, where the control over urban spaces is decentralized among the people who inhabit them.

Elements of Venice:


The Poetics of Construction in Nineteenth and Twentieth Century Architecture.


Thesis
Site Analysis: 10 Foot Zones and Bathymetry

0' Mean Low Water Level
-10'
-20'
-30'
+10'

The Big U
West 57th Street
East 42nd Street
Brooklyn Bridge (127')
Manhattan Bridge (134')
Williamsburg Bridge (133')
Queensboro Bridge (131')
RFK Bridge (138')
Hell Gate Bridge (134')
Roosevelt Island Bridge (40'-99')
Wards Bridge (55'-136')
TriBoro Bridge (54'-136')
Willis Avenue Bridge (25'+)
3rd Avenue Bridge (27+')
Park Avenue Bridge (25'-135')
Madison Avenue Bridge (25+')
145th Street Bridge (30'+)

East River
Harlem River
Newtown Creek
Pulaski Bridge (39')
Greene Point Bridge (30')
Kosciusko Bridge (125')
Hudson River
Hudson Bay

Bathymetry and Bridge information based on NOAA Office of Coast Survey

Flood Projections based on Surging Seas Risk Zone Map
Site Analysis: Potential Sites and East River Bridge Analyses

Lawrence Point: Heavy Industry / Light Industry / Residential

East Harlem: Residential / Commercial / Retail / Parkland

Hunters Point: Light Industry / Heavy Industry / Residential / Parkland

Brooklyn Navy Yard: Heavy Industry / Light Industry / Residential / Docks

Minimum Channel Depth: 15'
Precedent Analysis: New York City Block Typology Analysis
Linear residential and industrial fabric along urban infrastructure spine.

Houseboats encrusted along urban block edge.

Residential

Light Manufacturing

Narrow lot width maximizes individual access to waterfront.

Elevated block corners raise bridge spans to allow boat traffic while facilitating water access at mid-block.

Uniform screen applies order to varied massing of offices, shops and cultural institutions.

Monumental public square framed by interplay of commercial, private and cultural institutions.

Constricted alleys provide sense of communal privacy to ostensibly public pathways.

1. Inner Residential courtyard
2. Outer Ferry Courtyard
3. Ferry Pier

Footbridge as active surface for civic and commercial activities.

Precedent Analysis: European City Block Typology Analysis
Historic Aquatic Precedents

**MS KINGSHOLM**
- Blohm + Voss
- 1928
- 1428 Passengers

**Unité d’Habitation**
- Le Corbusier
- 1952
- Marseille, France
- 1600 Residents

**Triton City**
- Buckminster Fuller
- 1960s
- Tokyo Bay, Japan
- 5000 Residents

**New Grounds**

**Vernacular Translation**

**Module**

**Cell Biology**

**Parasitic Module**

**Core and Branch**

**Historic Japanese Idioms**

**International Modernism**

**Metabolism**

**Land Scarcity**

**Detach From Ground:**
- Into the Sea
- Into the Air

**Historic Aquatic Precedents**

- Historic Aquatic Translation
- Vernacular Aquatic Precedents

**Module**

- Core and Branch
- Cell Biology
- Parasitic Module

**Historic Japanese Idioms**

**International Modernism**

**Metabolism**

- Land Scarcity
- Detach From Ground: Into the Sea Into the Air
Float Block: Bounding Box
Float Block: Macro Design Precedents
Float Block: 1. Typical Floatblock 2. Shallow Floatblock 3. Longitudinal Section
Float Block: Plans
Float Block: 1. Transverse Section 2. Residential Unit 3. Micro Urban Condition
Floatblock: Incremental Development of Atriums

INDUSTRIAL

CARNIVAL

FOREST

ART HOUSE
Urban Design: Urban Transport Hierarchy

East River / Manhattan

Brooklyn / Queens
Urban Design Callouts: 1. Interblock Connections 2. Connection to Dryline 3. Connection Flooded District
Urban Design: Looking southeast towards Brooklyn
Urban Design: Looking west towards Manhattan
Urban Design: Looking west towards Manhattan
- The project was presented as a narrow snapshot of floating urbanism at a “mature” development level, alternatively:
  1. How could origins have been explored more, i.e., Dry-dock construction system, initial implementation and relationship to coastline, transition pre and post major flooding.
  2. More interestingly, what does floating urbanism look like over multiple human generations (or building module generations, how are they decommissioned? Artificial reefs, permanently docked, continuously patched? What’s the life span of a float block?) How long until habitation of artificial ground becomes socially “normal” for its tenets.

-To what degree must these structures that act as both singular discreet architecture and plural blended urbanism cater to the heightened fragility of inhabitants? Is this fragility heightened by the chaotic impact of severe climate change?

-What about leaving NYC, or even just moving up or down the east River? How do blocks rearrange over time?

-How would more specialized floating cultural institutions develop? I.e. theatre districts, art museums etc.

-How do blocks form individual identities communal identities? What is the value of inter block rivalries vs. the necessity of large scale rivalries? Should each block be self sufficient or interdependent because of the distribution of essential infrastructure? How does the design of inter-block connection facilitate these relationships?

- How does this subvert earlier relationships to parkland and water in the 19th and 20th century?
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