

ABSTRACT

Title of Thesis: LIVING ON THE EDGE

Alvaro Edgardo Nunez Alvarez,
Master of Architecture 2026

Thesis Directed By: Professor of the Practice, Peter Noonan, FAIA,
LEED AP, School of Architecture, Planning and
Preservation

Historic fishing towns have long anchored regional and national fisheries, shaping cultural identity while sustaining vital coastal economies. Today, however, these communities face converging pressures: accelerating sea-level rise, recurrent high-tide flooding, aging and unaffordable housing stock, and the economic precarity of small-scale fisheries. Studies show that fishing-dependent communities experience higher impacts from climate change than any other coastal communities in the United States, due to their geographic exposure, economic dependence on vulnerable marine ecosystems, and limited adaptive capacity. These forces endanger not only the physical fabric of coastal towns but also the continuity of fishing-dependent livelihoods and the cultural knowledge embedded in waterfront landscapes.

This thesis argues that historic fishing communities are not simply “living on the edge,” but inhabiting strategically vital thresholds where culture, economy, and geography converge. Their resilience depends not on withdrawal from coastal conditions but on reimagining how architecture can mediate between environmental uncertainty and cultural continuity.

LIVING ON THE EDGE

by

Alvaro Edgardo Nunez Alvarez

Thesis submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Master in Architecture
2026

Advisory Committee:
Professor Peter Noonan, Chair
Professor Brittany Williams
Professor Brian Kelly

© Copyright by
Alvaro Edgardo Nunez Alvarez
2026

Acknowledgements

To my family, thank you for being my constant support system throughout graduate school, for encouraging my ideas, and for always believing in me. To my thesis chair, Professor Peter Noonan, thank you for the opportunity to work alongside you on this project, for believing in this thesis topic, and for your invaluable guidance and thoughtful feedback throughout the process. To the faculty who supported and challenged me along the way, and to my incredibly talented cohort, with whom I shared long nights, laughter, knowledge, and growth, thank you for making this journey so meaningful.

Table of Contents

Acknowledgements.....	ii
Table of Contents.....	iii
List of Figures.....	v
Chapter 1: Introduction.....	1
Chapter 2: Literature Review.....	5
Introduction.....	5
2.1 Global Context: The Escalating Crisis of Rising Seas.....	6
2.2 The U.S. Atlantic Coast: Chronic Tidal Flooding and Regional Variability.....	7
2.3 Vulnerability of Fishing Communities: Physical, Economical, and Social dimensions.....	9
2.3.1 Sea Level Rise Risk Index.....	10
2.3.2 Social Vulnerability and Fishing Dependence.....	11
2.3.4 Business and Infrastructure Exposure.....	11
2.3.4 Integrated Vulnerability and the Need for Adaptive Design.....	13
2.4 Heritage, Identity and the Cultural Value of Fishing Communities.....	14
Heritage as a Living Continuum.....	14
2.4.1 Fishing as Cultural and Economic Heritage.....	15
2.4.2 Tradition, Agency, and Living Heritage.....	16
2.4.3 Critical Regionalism and Cultural Resistance.....	17
2.4.4 Maritime Culture and Blue Urbanism.....	18
2.4.5 Identity, Poverty, and the Threat of Cultural Displacement.....	19
2.4.6 Toward a Contemporary Ethics of Preservation and Design.....	20
2.5 Architecture as a Tool for Adaptation and Continuity.....	22
2.5.1 The Social and Cultural Dimension of Housing in Coastal Communities.....	22
2.5.2 Missing Middle Housing and Adaptable Density.....	23
2.5.3 Linking Economic Patterns to Architectural Program.....	24
2.5.4 Living Shorelines and Landscape Infrastructure.....	26
2.5.6 Floating, Amphibious and Elevated Architecture - Global Precedents / Case Studies.....	27
2.5.7 Toward an Architecture of Coexistence.....	29
2.5.8 From Adaptation to Empowerment.....	30
Chapter 3: Methodologies.....	31
Chapter 4: Precedent Analysis.....	36
Introduction.....	36
4.1 Venice: Urbanism on Water as a Model of Cultural Resilience.....	37
4.2 Tofino Fishing Pier (Leckie Studio): Adaptive Reuse as Cultural Continuity.....	39
4.3 Jean-Marie Tjibaou Cultural Center (Renzo Piano): Vernacular Reinterpreted as Identity.....	41
4.5 Amphibious House (BACA Architects): Living with Flooding Rather Than Fighting It.....	43

4.6 Angsila Scaffolding Pavilion (Thailand): Small-Scale Structures as Social Infrastructure	45
Chapter 5: The Program	47
Program Abstract	47
5.1 ZONE 1 - Working Waterfront Support: Maritime Atelier	48
5.2 ZONE 2 - Living & Dwelling Spaces: Anchorage Row	49
5.3 ZONE 3 - Healing & Well-Being Center: Safe Harbor Clinic	50
5.4 ZONE 4 - Cultural Heritage & Community Interface: Fleet's Forum	51
5.5 Conclusion	52
Chapter 6: Site Analysis	53
Introduction: Site as a Critical Agent	53
6.1 Site Positioning and Selection Criteria	54
6.2 Comparative Site Analysis and Field Research	55
6.2.1 New Bedford	55
6.2.2 Rockport	56
6.2.3 Gloucester	56
6.3 Gloucester, Massachusetts: Historical Context and Site Conditions	58
6.4 Land Use	60
6.5 Historical Evolution of the Waterfront Edge	61
6.6 Existing Landmarks and Urban Anchors	63
6.7 Architectural and Built Environment Analysis	65
6.8 Physical and Environmental Site Analysis	68
6.9 Site Analysis Conclusion	74
Chapter 7: Discovery Phase: Conceptual Testing of the Thesis	76
Introduction: Iterative Process, Massing, and Parti Explorations	76
7.1 Design Proposal: Parti and Spatial Framework	78
7.2 Proposed Site Plan and Spatial Organization	80
7.3 Aerial Axonometric and Waterfront Relationships	82
7.4 Sectional Relationships and Waterfront Resilience	83
7.5 Spatial Experience and Architectural Relationships	86
7.5.1 Community Spaces	87
7.5.2 Work/Live Housing & Maritime Atelier	90
7.6 Tectonic and Landscape Resiliency Strategies	96
Appendices	102
Bibliography	103

List of Figures

Chapter 2

Figure 1: Global Mean Sea Level Rise, 1900–2100 - Source: IPCC, Climate Change 2021: The Physical Science Basis.

Figure 2: Projected Annual High Tide Flooding Days by 2050 (SSP2–4.5 Scenario). Source: Mahmoudi et al., “Escalating High Tide Flooding.”

Figure 3: Projected Relative Sea Level Rise by 2050 Along the Atlantic and Gulf Coasts. Source: Mahmoudi et al., “Escalating High Tide Flooding.”

Figure 4: Sea Level Rise Risk Index for U.S. Coastal Communities. Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

Figure 5: Social Vulnerability Comparison Between Fishing-Dependent and Other Coastal Communities. Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

Figure 6: Number of Seafood Commerce Businesses Affected by Sea Level Rise (1–6 ft). Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

Figure 7: Seafood Commerce Revenue Impact Index Under Sea Level Rise Scenarios. Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

Figure 8: Species Vulnerability and Catch Diversity Among Fishing Communities. Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

Figure 9: Combined Vulnerability Indices for Select Fishing Communities (Lubec, Barnegat Light, New Bedford). Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

Figure 10: Regional Percentages of U.S. Commercial Fisheries Landings and Revenue (2022). Source: National Oceanic and Atmospheric Administration (NOAA), Fisheries of the United States 2022

Figure 11: Gray to Green Continuum. Source: Larissa A. Naylor et al., Greening the Grey: A Framework for Integrated Green Grey Infrastructure (IGGI) (Glasgow: University of Glasgow, 2017).

Figure 12: Strategies of Flood Adaptive Waterfront Living. Source: Jeffrey Huber, Salty Urbanism: A Design Manual to Address Sea Level Rise and Climate Change for Urban Areas in Coastal Zones (New York: Routledge, 2019).

Chapter 4

Figure 13: Venice Map and Canals System – Diagram by Author

Figure 14: MOSE Barrier Section & Foundations system – Diagrams by Author

Figure 15: Old Ice plant built in 1962 vs Adaptive Reuse Tofino Fishing Pier – Source: Leckie Studio

Figure 16: Axonometric Redevelopment Synthesis – Source: Diagram by Author

Figure 17: Vernacular Melanesian Style Huts and Cultural Center Site – Source: Diagram by Author

Figure 18: Renzo Piano Vernacular Tectonics – Source: Diagram by Author

Figure 19: Program and Bioclimatic Sections – Diagram by Author

Figure 20: Flooding Scenarios & Archimedes' Buoyancy Principle – Diagram by Author

Figure 21: Axonometric Section: Flooding Scenario – Diagram by Author

Figure 22: Axonometric: Modular Bamboo Structure – Diagram by Author

Figure 23: Vernacular Craft – Diagram by Author

Chapter 5

Figure 24: Design and programmatic drivers shaping the thesis proposal and architectural response. Diagram by author.

Chapter 6

Figure 25: Comparative figure-ground analysis highlighting fishing industry-related buildings in blue within a one-mile radius in New Bedford, Gloucester, and Rockport. All maps are presented at the same scale to compare the relationship between urban fabric, waterfront access, and the concentration of fishing infrastructure. – Diagram by Author

Figure 26: Regional context map locating Cape Ann within the greater Boston metropolitan area along the North Atlantic coast, illustrating Gloucester's geographic relationship to the broader regional and coastal context. – Diagram by Author

Figure 27: Historical timeline of Gloucester showing major cultural, economic, and waterfront transformations relevant to the thesis. Selected reference imagery. - Diagram by author.

Figure28: Land use and urban morphology analysis of the central waterfront district in Gloucester illustrating the spatial relationship between residential neighborhoods, commercial corridors, institutional buildings, and waterfront industrial infrastructure surrounding the preliminary site zone. - Diagram by author.

Figure 29: Historical waterfront map of Gloucester illustrating the extent and configuration of the harbor edge during the corresponding historical period. Present(2026) - Diagram adapted and annotated by author.

Figure 30: Overlay of historical waterfront edge conditions in Gloucester revealing the gradual transformation, expansion, and reconfiguration of the harbor edge over time. Present (2026) - Diagram by author.

Figure 31: Existing landmarks and civic anchors surrounding the selected site in Gloucester, illustrating the spatial relationship between historic institutions, waterfront infrastructure, public spaces, and the working harbor. -Diagram and photographs by author.

Figure 32: Built environment analysis of Gloucester illustrating the architectural character and material qualities of residential/community, institutional/historic, and waterfront industrial conditions surrounding the study area. Collage and analysis by author using site photography and selected reference imagery.

Figure 33: Vernacular architectural roof forms and material palette observed throughout Gloucester, illustrating recurring typologies and material conditions including gable and saltbox roof forms, dormers, wood siding, cedar shingles, granite stone, and brick masonry. - Diagram by author.

Figure 34: Existing figure-ground and topographic analysis of the selected waterfront site in Gloucester illustrating the FEMA 100-year floodplain elevation (14 ft),

existing urban fabric, waterfront infrastructure, and vulnerable low-lying coastal edge conditions surrounding Harbor Cove. Diagram by author.

Figure 35: Preliminary site opportunity analysis identifying underutilized waterfront parcels, existing parking lots, and structures with potential for adaptive reuse or removal within the selected study area in Gloucester. Diagram by author.

Figure 36: Conceptual site sections illustrating the relationship between existing topography, urban streets, Mean Sea Level (MSL), Mean High Water (MHW), and the FEMA 100-year floodplain elevation (14 ft) across the selected waterfront site in Gloucester. Diagram by author.

Figure 37: Existing seawall conditions and documented flooding during the 2018 storm surge event within the selected waterfront district in Gloucester, illustrating vulnerable edge conditions, storm surge impacts, and deterioration of waterfront infrastructure. Image source: City of Gloucester, 2025 Gloucester Municipal Harbor Plan and Designated Port Area Master Plan (2025).

Chapter 7

Figure 38: Early programmatic iterations exploring spatial organization, circulation, waterfront access, and relationships between community, housing, market, and public open space within the selected site. Diagrams by author.

Figure 39: Programmatic and massing iterations exploring spatial organization, circulation, waterfront access, and relationships between community, housing, market, and public open space within the selected site. Diagrams by author.

Figure 40: Site parti diagram illustrating the spatial and conceptual framework of the proposal, establishing connections between community, history, the working waterfront, and the harbor edge. - Diagram by author.

Figure 41: Site plan of the proposed waterfront intervention illustrating the spatial organization of community, market, housing, health and wellbeing, and maritime programs within the harbor edge. Drawing by author.

Figure 42: Aerial axonometric illustrating the relationship between the proposal, Gloucester Harbor, the Henry Fitz Lane House and Park, and the surrounding urban waterfront context. Drawing by author.

Figure 43: Longitudinal site section perspective illustrating the spatial relationships between community programs, public open space, seafood market, fishermen’s housing, and the working waterfront within the proposed harbor framework. Drawing by author.

Figure 44: Site sections illustrating the relationship between topography, floodplain conditions, public waterfront space, elevated habitable programs, and resilient coastal edge strategies within the proposal. Drawings by author.

Figure 45: Conceptual spatial parti diagram illustrating the organizational and circulation framework of the community-oriented waterfront spaces. Diagram by author

Figure 46: Community-centered waterfront spaces illustrating the architectural atmosphere, public gathering conditions, and experiential qualities of the proposal. Renderings by author.

Figure 47: Conceptual spatial parti diagram illustrating the relationship between live/work housing, the fishermen’s courtyard, resilient waterfront edges, and the link with the community pier. Diagram by Author.

Figure 48: Work/live housing, fishermen’s courtyard, and maritime atelier illustrating the relationship between housing, labor, public waterfront space, and resilient coastal occupation. Renderings by author.

Figure 49: Live/work housing floor plans illustrating the spatial organization, residential typologies, and mixed-use framework supporting Gloucester’s fishing community. Drawings by author.

Figure 50: Tectonic and resilient construction diagrams illustrating helical pier foundations, timber-to-steel structural connections, glulam beam assemblies, and coastal envelope strategies. Diagrams by author.

Figure 51: Living shoreline and reinforced seawall strategies combining salvaged granite edge conditions, tidal marshes, submerged aquatic vegetation, stepped planting systems, and localized stone armoring to create a layered gray-green coastal resilience framework. Diagrams by author.

Figure 52: Exploded tectonic diagram illustrating elevated live/work housing supported by helical pier foundations, timber structural framing, and adaptable coastal construction strategies above the FEMA floodplain. Diagram by author.

Appendices

Figure 53: School of Architecture and Business School buildings overlaid onto the site for comparative scale analysis. Diagram by author

Figure 54: Fishing as Cultural Identity.- Diagram by author

Chapter 1: Introduction

Historic fishing communities along the U.S. Atlantic coast sit at the intersection of accelerating environmental change, economic precarity, and cultural fragility. For generations, these towns have relied on intimate relationships with the sea, socially, economically, and ecologically. Their built environments, from wharves and net lofts to clustered housing and narrow harborside streets, encode centuries of labor, knowledge, and cultural identity. Yet rising seas, recurrent high-tide flooding, and intensifying storms threaten not only physical structures but the continuity of maritime life itself. According to contemporary sea-level projections, many Northeast and Mid-Atlantic towns could experience between 30 and 60 high-tide flooding days per year by 2050, transforming episodic inundation into a chronic condition that tests affordability, safety, and long-term habitability.¹

These environmental pressures converge with social and economic vulnerabilities. Studies of fishing-dependent communities demonstrate consistently higher social vulnerability indices compared to other coastal towns, shaped by lower incomes, limited adaptive capacity, aging housing stock, and waterfront economies concentrated in vulnerable zones. As sea level rise disrupts commercial piers, fish houses, markets, and processing facilities, the effects ripple beyond infrastructure: they jeopardize livelihoods, weaken intergenerational continuity, and erode the cultural identity rooted in working waterfronts.²

¹ IPCC, 2021: Chapter 9. In: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*

² Lisa L. Colburn et al., “Indicators of Climate Change and Social Vulnerability in Fishing Dependent Communities along the Eastern and Gulf Coasts of the United States,” *Marine Policy* 74 (2016): 323–333, <https://doi.org/10.1016/j.marpol.2016.04.030>

The loss of a pier or processing plant is not merely functional, it destabilizes the symbolic core of community life.

Simultaneously, affordability in many coastal towns continues to decline. Housing markets shaped by seasonal tourism, speculative investment, and shrinking working-waterfronts have displaced the very populations that sustain maritime culture. Without accessible dwellings for fishers, seasonal workers, or young families, these communities risk hollowing into preserved façades devoid of the living heritage that once gave them meaning.

The problem area is therefore multifaceted: environmental instability, housing insecurity, economic fragility, and cultural erosion combine to threaten the survival of historic fishing communities as living systems rather than nostalgic artifacts.

This thesis responds to the connection of these pressures through the lens of architectural and urban design:

The thesis question positions architecture not as an isolated formal exercise but as a mediating force, one capable of reinforcing heritage, strengthening community agency, and enabling coexistence with dynamic coastal conditions. Architectural design intersects with social resilience when it supports the continuity of daily practices, intergenerational knowledge, and vernacular spatial logics. It intersects with economic resilience when it provides infrastructural support for fishing economies, live-work typologies, cooperative workspaces, or mixed-use waterfronts that embed economic activity within community life. And it intersects with environmental resilience when it integrates adaptive strategies such as elevated housing, amphibious foundations, modular systems, and living shorelines that work with natural processes rather than against them.

Thus, the built-environment responses emerge as layered propositions:

1. Climate-resilient dwellings

Elevated, adaptable, or amphibious residential forms that respond to rising waters without erasing the scale, intimacy, and patterns of historic housing.

2. Housing affordability and diversity

Missing Middle Housing models such as duplexes, live-work units, courtyard clusters, that maintain harbor-adjacent populations and prevent displacement of working residents.

3. Economically embedded architecture

Mixed-use infrastructure that supports fisheries: cooperative processing spaces, markets that double as cultural centers, and harborside live-work housing for seasonal or multi-generational workers.

4. Landscape-architecture integration

Living shorelines, restored marsh edges, and amphibious thresholds that soften flood impacts while maintaining public access and cultural relationship to the water.

5. Culturally grounded design logic

Vernacular spatial patterns, orientation, clustering, materiality, craft reinterpreted through contemporary construction techniques that simultaneously honor tradition and support new forms of resilience.

These strategies converge on an architectural ethic grounded in continuity rather than replication. The goal is not to freeze fishing villages in time, nor to impose abstract forms of resilience, but to strengthen their capacity to evolve without losing the cultural and economic practices that anchor identity. In this framing, architecture becomes a tool for empowerment: a means of enabling historic fishing communities to inhabit a future of environmental uncertainty

without surrendering the heritage, livelihood, and belonging that define them as living coastal cultures. This chapter therefore sets the foundation for the thesis by articulating the urgency, stakes, and opportunity of designing for coexistence at the water's edge.

Chapter 2: Literature Review

Introduction

This chapter synthesizes the body of literature that frames the central concerns of this thesis: how historic fishing communities can endure at the water's edge amid climate uncertainty while maintaining affordability, cultural continuity, and economic viability. The review draws from environmental science, cultural heritage theory, and architectural design, reflecting the interdisciplinary character of coastal resilience. Together, these perspectives clarify both the forces threatening coastal settlements and the critical role architecture can play in mediating between environmental adaptation and cultural survival.

Three interrelated dimensions organize this discussion. The first examines climate change and sea-level rise, situating fishing towns within the broader discourse on coastal vulnerability. This body of work outlines the measurable risks posed by intensified storms, recurrent flooding, and ecological degradation, establishing the urgency of adaptive design. The second explores heritage, identity, and the cultural value of fishing communities, emphasizing that these towns represent not only physical infrastructure but living heritage, dynamic systems of knowledge, craft, and collective memory that shape regional identity. The third addresses housing, architecture, and coastal resilience, engaging contemporary design strategies that bridge environmental adaptation with social and economic needs. Here, scholarship on housing diversity, ecological infrastructure, and amphibious architecture reveals pathways for preserving both livelihood and place. By weaving these strands together, the chapter positions architecture as a mediating practice, one capable of translating environmental challenges into opportunities for continuity, agency, and coexistence along the shifting edge of the ocean.

2.1 Global Context: The Escalating Crisis of Rising Seas

Climate change has redefined the relationship between human settlements and the ocean. Over the past century, global mean sea level has risen by approximately 20 centimeters, with the rate of increase nearly doubling since 1990. This rise results from both the thermal expansion of seawater and the melting of land-based ice, producing cumulative effects that are increasingly visible in low-lying coastal areas. The Intergovernmental Panel on Climate Change projects that global sea level will continue to rise through the twenty-first century, reaching between 0.28 and 1.01 meters by 2100, depending on greenhouse-gas emissions and the planet's response to warming.

What makes this phenomenon particularly significant for coastal communities is its nonlinear impact. Even small increases in sea level lead to exponential growth in flooding frequency and duration. Coastal towns historically adapted to periodic storms now face chronic inundation that erodes both infrastructure and habitability.³

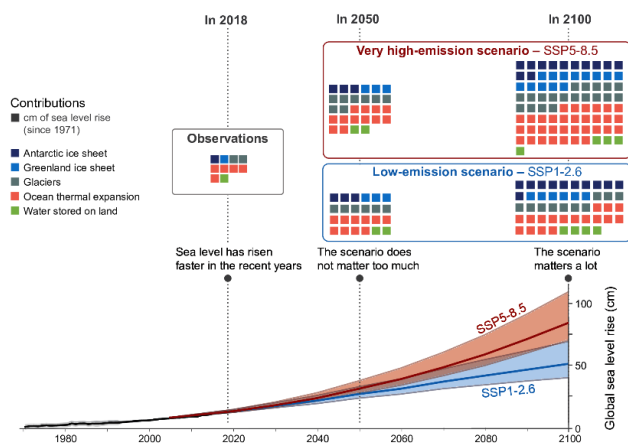


Figure 1: Global Mean Sea Level Rise, 1900–2100.

Source: IPCC, *Climate Change 2021: The Physical Science Basis*.

³ IPCC, 2021: Chapter 9. In: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*

Figure 1.1 illustrates the difference between a low-emission pathway (SSP1-2.6) and a high-emission pathway (SSP5-8.5). The lower trajectory shows a moderate rise of roughly half a meter by 2100, while the upper trajectory exceeds one meter. The visualization clarifies that mitigation efforts in the coming decades will determine whether coastal change remains manageable or becomes transformative, an inflection point that defines how future waterfront communities, including historic fishing towns, will be forced to adapt their built and cultural landscapes.

2.2 The U.S. Atlantic Coast: Chronic Tidal Flooding and Regional Variability

Nowhere in the United States is the impact of sea level rise more evident than along the Atlantic and Gulf coasts, where low elevation, tidal range, and historical development have combined to heighten vulnerability. The transition from occasional storm flooding to frequent high tide flooding (HTF) is already underway. In the 1950s, most East Coast cities experienced fewer than five HTF events per year. By 2010, that number had increased to twenty or more, and projections indicate that by 2050, many coastal towns will experience 30–60 flood days annually.

This escalation is especially pronounced in the Mid-Atlantic corridor from Delaware Bay through Cape Cod where tidal amplification and land subsidence accelerate the effects of global sea level rise. The Chesapeake Bay and Pamlico Sound are projected to face more than 90 flood

days per year by 2050, while Gulf Coast regions such as Louisiana and Texas are expected to endure some of the highest relative rises due to subsidence.⁴

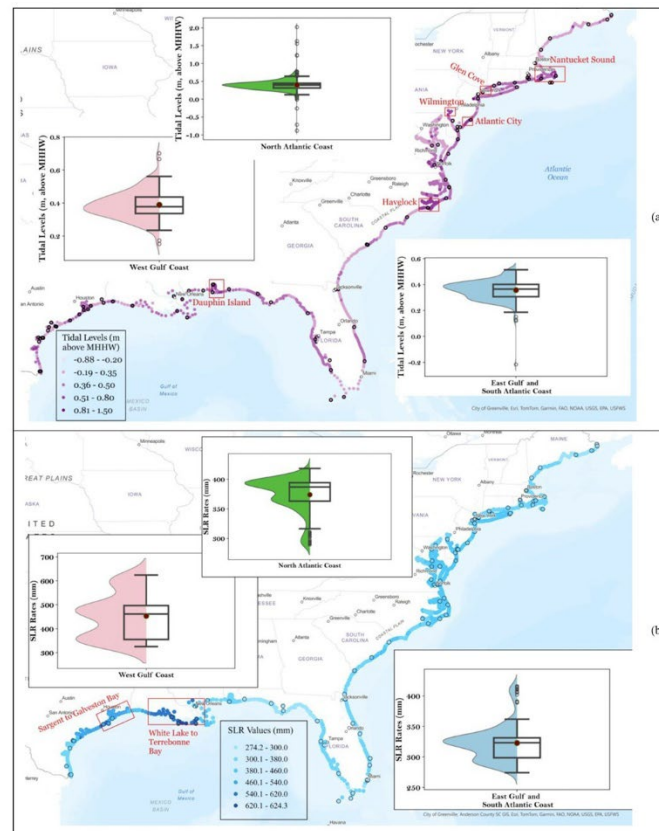


Figure 2: Projected Annual High Tide Flooding Days by 2050 (SSP2-4.5 Scenario).

Source: Mahmoudi et al., “Escalating High Tide Flooding.”

The rapid increase in flooding frequency shown in figure 1.2 illustrates a shift from episodic to chronic inundation, redefining waterfront life along the U.S. Atlantic coast as a continuous negotiation with water rather than an occasional disturbance.

⁴ S. Mahmoudi, H. Moftakhari, D. F. Muñoz, S. Radfar, W. Sweet, and H. Moradkhani, “Escalating High Tide Flooding along the Atlantic and Gulf Coast of the United States due to Sea Level Rise,” *Earth’s Future* 13 (2025): e2024EF005328, <https://doi.org/10.1029/2024EF005328>

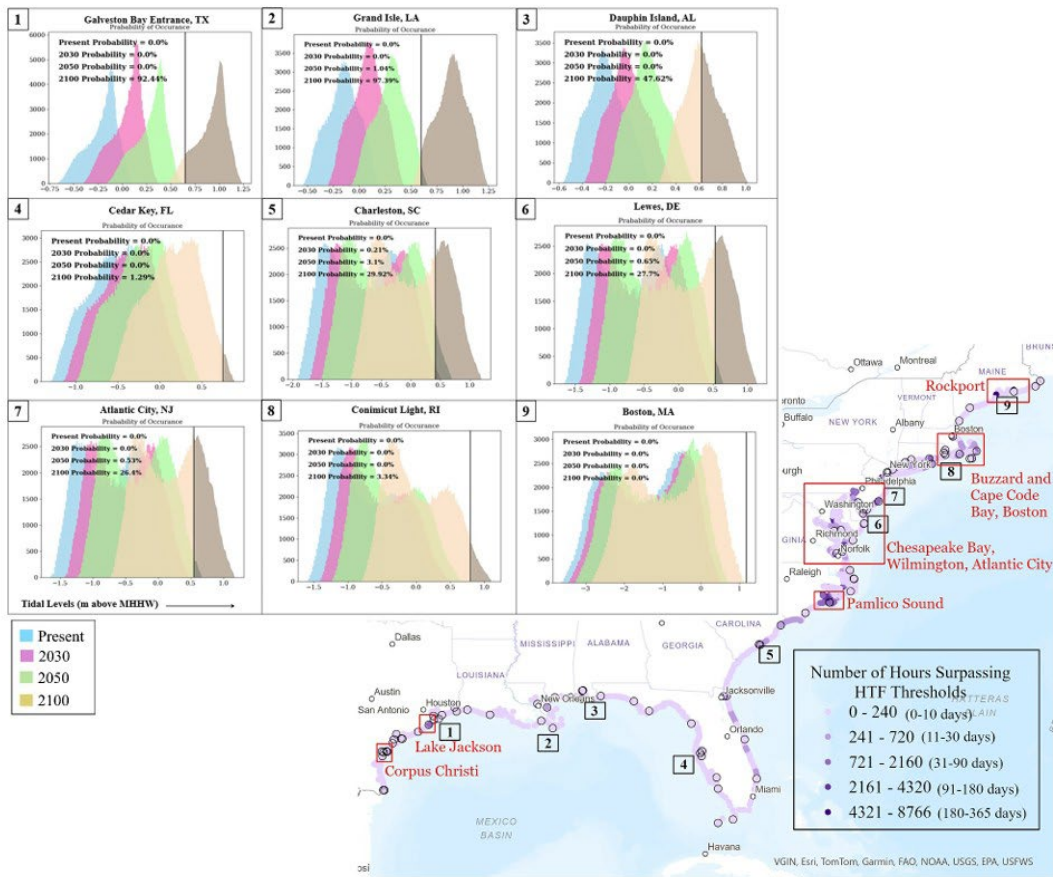


Figure 3: Projected Relative Sea Level Rise by 2050 Along the Atlantic and Gulf Coasts.

Source: Mahmoudi et al., “Escalating High Tide Flooding.”

The concentration of sea-level rise in the Mid-Atlantic and Gulf regions reveals how even modest topographic differences create disproportionate vulnerability, emphasizing the need for localized adaptive strategies rather than uniform defensive measures.⁵

2.3 Vulnerability of Fishing Communities: Physical, Economical, and Social dimensions.

Beyond the physical metrics of water rise, studies demonstrate that vulnerability in coastal America is deeply intertwined with social and economic dependence. Using NOAA’s Community Social Vulnerability Indicators (CSVIs) and Climate Change Vulnerability Indices

⁵ Mahmoudi et al., “Escalating High Tide Flooding.”

(CCVIs), their analysis measures how fishing-dependent communities along the Atlantic and Gulf coasts experience compounded risks, from loss of livelihood to limited adaptive capacity.⁶

2.3.1 Sea Level Rise Risk Index

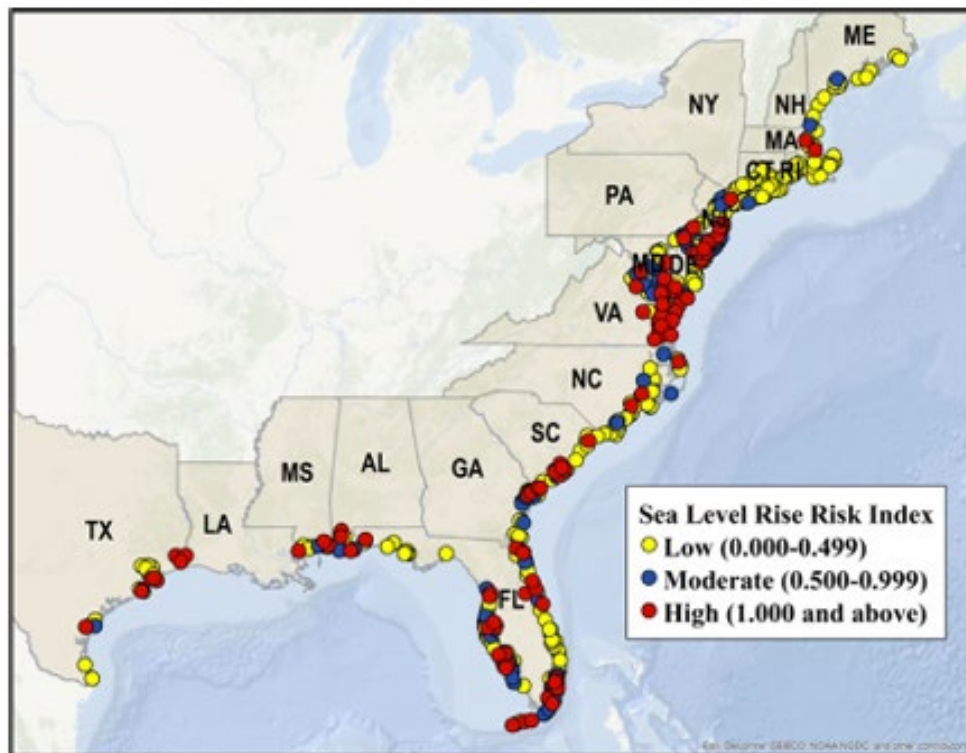


Figure 4: Sea Level Rise Risk Index for U.S. Coastal Communities.

Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

The map reveals geographic unevenness in exposure, showing that even relatively high-elevation New England towns face acute risks where economic life and cultural identity are concentrated on narrow tidal flats and harborfronts.

⁶ Lisa L. Colburn et al., “Indicators of Climate Change and Social Vulnerability in Fishing Dependent Communities along the Eastern and Gulf Coasts of the United States,” *Marine Policy* 74 (2016): 323–333, <https://doi.org/10.1016/j.marpol.2016.04.030>

2.3.2 Social Vulnerability and Fishing Dependence

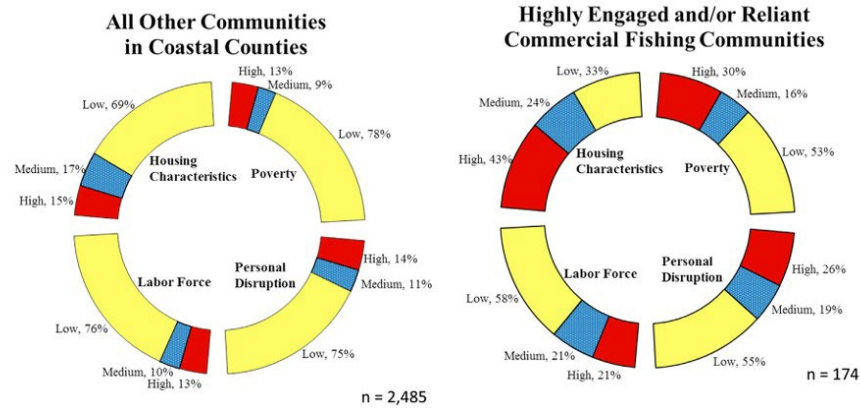


Figure 5: Social Vulnerability Comparison Between Fishing-Dependent and Other Coastal Communities.

Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

Fishing-dependent towns show consistently higher social vulnerability indices, underscoring that physical exposure is magnified by economic fragility and the limited ability of residents to relocate or retrofit their environments. These studies have shown that these communities experience greater impacts from climate change, including personal disruption, labor force instability, and housing insecurity, all of which have contributed to rising poverty rates and deepened socioeconomic vulnerability along coastal regions.⁷

2.3.4 Business and Infrastructure Exposure

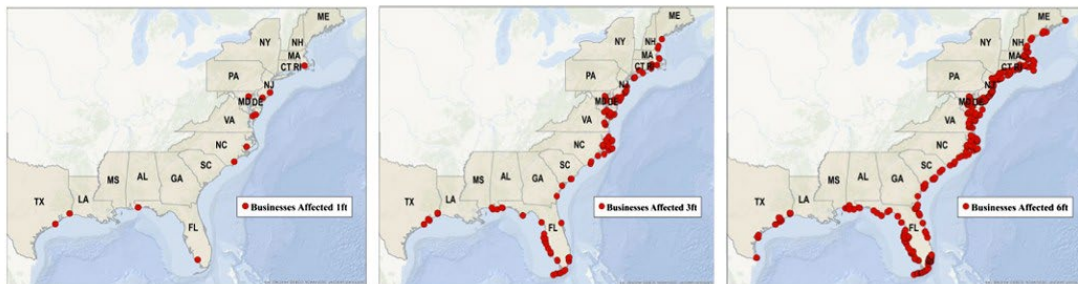


Figure 6: Number of Seafood Commerce Businesses Affected by Sea Level Rise (1–6 ft).

Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

⁷ Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

The distribution of at-risk seafood businesses reveals that regions with lower elevations and concentrated waterfront economies are most susceptible to disruption, making commercial infrastructure a critical dimension of resilience planning.

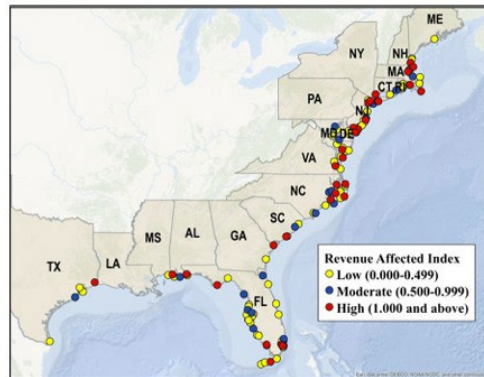


Figure 7: Seafood Commerce Revenue Impact Index Under Sea Level Rise Scenarios.

Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

While the Southeast exhibits more businesses at risk, the steep revenue losses in New England highlight how smaller but more valuable fisheries can suffer disproportionately when key facilities or ports are inundated.⁸

2.3.3 Species Vulnerability and Catch Diversity

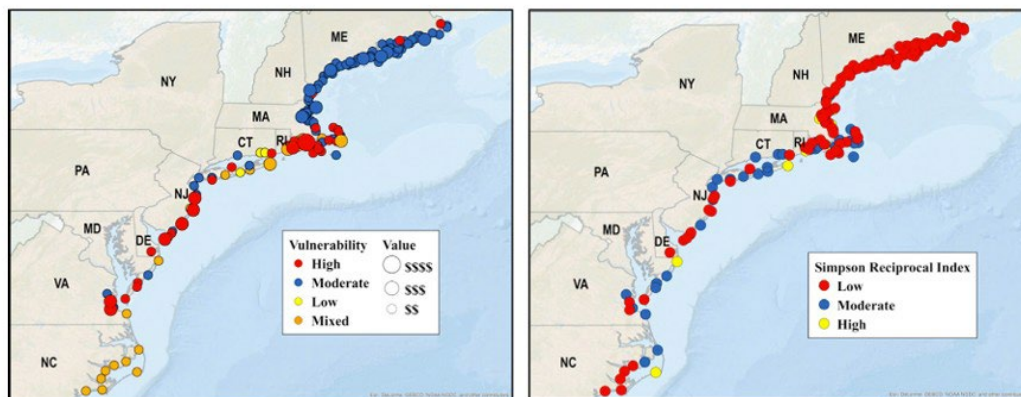


Figure 8: Species Vulnerability and Catch Diversity Among Fishing Communities.

Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

⁸ Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

In figure 8, the analysis shows that communities dependent on a narrow range of species, such as lobster fisheries in Maine, mirror the structural fragility of single-purpose economies and built environments, suggesting the necessity of diversified and adaptive systems at both ecological and urban scales.⁹

2.3.4 Integrated Vulnerability and the Need for Adaptive Design

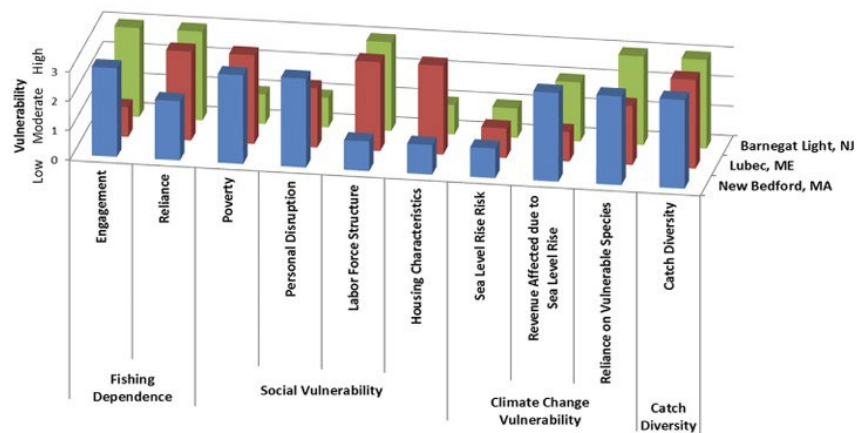


Figure 9: Combined Vulnerability Indices for Select Fishing Communities (Lubec, Barnegat Light, New Bedford). Source: Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

The comparison among these three towns demonstrates that vulnerability is multidimensional shaped not only by geography but by the intersection of economic resilience, social capital, and the historical configuration of each community’s relationship to the sea.¹⁰

Integrating these insights with the tidal projections creates a fuller picture: not only will high-tide flooding increase to 30–60 days annually by 2050, but the capacity to respond will vary dramatically between towns. In this light, adaptive design is not simply about raising ground levels it is about rethinking how communities inhabit uncertainty and continuity along the changing edge of the sea. The convergence of these studies underscores that climate change in coastal America is both environmental and cultural. Rising seas and recurrent flooding reshape

⁹ Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

¹⁰ Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

not only physical landscapes but also the economies, traditions, and collective identities that define fishing communities. The vulnerability of these towns, therefore, cannot be understood solely in technical terms; it is bound to the persistence of heritage and sense of place.¹¹

The following chapter, explores how these same towns have historically forged resilience through culture, craft, and memory and how those legacies might inform future design responses that balance adaptation with continuity.

2.4 Heritage, Identity and the Cultural Value of Fishing Communities

Heritage as a Living Continuum

If climate change exposes the fragility of our coastal environments, it also exposes the fragility of the cultural worlds built along those shores. As rising tides encroach upon ports, homes, and harbors, what is at stake is not only land but the continuity of maritime life itself. The fishing village, as both a spatial and cultural archetype, embodies a unique synthesis of economy, ecology, and identity. These communities developed from the intimate rhythms of the sea; tides, seasons, and migrations, and their spatial organization, materials, and customs reveal a long dialogue between human need and marine ecology.¹²

The previous discussion of climate change and sea-level rise highlighted the physical and economic vulnerabilities facing such towns. These studies have found that fishing-dependent communities along the U.S. Atlantic and Gulf coasts exhibit higher poverty and housing fragility than other coastal populations, a condition that limits their capacity to adapt or relocate. This

¹¹ Mahmoudi et al., “Escalating High Tide Flooding.”

¹² Sahrhage, Dietrich, and Johannes Lundbeck. 1992. “A History of Fishing.” In *A History of Fishing*. Germany: Springer Berlin / Heidelberg.

intersection of poverty, geography, and identity transforms environmental risk into cultural risk: the potential erasure of ways of living and knowing that have evolved over centuries.¹³

Thus, heritage in the context of fishing villages cannot be treated as a static set of preserved artifacts or picturesque landscapes. It is a living continuum, a process of making, dwelling, and adapting that has always defined coastal societies. The preservation of these settlements, then, is not merely a conservationist act but a cultural necessity: a defense of community continuity amid accelerating environmental and economic change.

2.4.1 Fishing as Cultural and Economic Heritage

Fishing is one of humanity's oldest collective practices, predating agriculture as a reliable source of food and exchange. Historians describe how early coastal and riverine communities organized themselves around this shared act of survival. From the simple woven traps of prehistoric settlements to the complex sail and motor fleets of the industrial era, fishing evolved as both technology and tradition, intertwining human ingenuity with the rhythms of nature.

Throughout history, fishing has produced not only sustenance but also distinct social and spatial forms. Villages clustered along estuaries and harbors evolved in dialogue with local marine conditions: tidal ranges dictated wharf design; prevailing winds determined orientation; and materials like timber, stone, or tarred rope expressed a functional regionalism rooted in necessity. The result was a vernacular architecture of resilience, forms capable of repair, adaptation, and community labor.

However, the twentieth century marked a profound rupture. Industrialization and globalization transformed fishing from subsistence and local trade into large-scale extraction. Sahrhage and Lundbeck note that while productivity increased dramatically, the cultural

¹³ Colburn et al., "Indicators of Climate Change and Social Vulnerability,"

cohesion of fishing communities often weakened under the pressure of mechanization and distant markets.¹⁴ This mirrors the situation in many New England towns today, where small-scale fleets compete against industrial trawlers and rising operational costs.¹⁵

Despite this decline, fishing continues to shape the cultural identity of these regions. The working harbor, the fish market, and the community pier remain physical and symbolic anchors of collective memory. Yet these spaces are now increasingly precarious, environmentally from flooding, and economically from disinvestment.¹⁶ Sea level rise projections show that by 2050, high-tide flooding could occur on 30 to 60 days per year in many mid-Atlantic towns.

¹⁷Combined with the findings of socioeconomic fragility, these statistics underscore why preserving fishing villages must include sustaining their economic and cultural lifelines, not merely their historic fabric.

2.4.2 Tradition, Agency, and Living Heritage

Heritage is often misunderstood as a process of freezing the past, but as Nezar AlSayyad argues in his essays “Whose Tradition?” , tradition is not fixed; it is a dynamic discourse of continuity and change. His critical question “Whose tradition?”, reminds us that decisions about what to preserve and how to interpret it are acts of power. In many cases, local communities are excluded from the authorship of their own heritage, while outside institutions define what is “authentic.”

In the context of fishing communities, this is particularly salient. Heritage here is not a collection of monuments but a living practice of making and adaptation, repairing nets, building

¹⁴ Sahrhage and Lundbeck, *A History of Fishing*.

¹⁵ Maltby, Katherine M., Sabrina Kerin, and Katherine E. Mills. 2023. “Barriers and Enablers of Climate Adaptation in Fisheries: Insights from Northeast US Fishing Communities.” *Marine Policy* 147 (January): 105331. <https://doi.org/10.1016/j.marpol.2022.105331>.

¹⁶ Colburn et al., “Indicators of Climate Change and Social Vulnerability,”

¹⁷ Mahmoudi et al., “Escalating High Tide Flooding.”

boats, drying fish, or maintaining waterfront structures. These acts carry both economic and symbolic meaning, linking generations through shared labor and knowledge. When policies of preservation or urban redevelopment displace these functions in favor of tourism or residential gentrification, they risk hollowing out the community's identity, reducing culture to image.

AlSayyad's critique urges an alternative: to treat tradition as an active negotiation between past and present.¹⁸ Rather than replicating historic forms, designers and planners can enable communities to reinterpret traditional practices for contemporary conditions, for example, transforming a disused cannery into a cooperative fish market or community center. Such interventions preserve not the object, but the capacity for production and adaptation that has always defined these places. In this sense, the resilience of fishing villages lies in their ability to evolve without severing their connection to inherited knowledge.

2.4.3 Critical Regionalism and Cultural Resistance

Kenneth Frampton's seminal essay "Towards a Critical Regionalism" (1983) offers a theoretical lens through which to understand fishing villages as architectures of resistance. Frampton warns against the placelessness of universal modernity, arguing that architecture must engage both the universal civilization of technology and the particularity of place, climate, and culture. For him, the regional is not nostalgic but critical, a means to resist homogenization through contextual specificity.¹⁹

Fishing villages exemplify this principle. Their architectures arise from climatic, material, and social constraints: pitched roofs for coastal winds, raised platforms for tides,

¹⁸ Nezar AlSayyad, Mark Gillem, and David Moffat, eds., *Whose Tradition?* (Berkeley: International Association for the Study of Traditional Environments, 2014).

¹⁹ Kenneth Frampton, "Towards a Critical Regionalism: Six Points for an Architecture of Resistance," in *The Anti-Aesthetic: Essays on Postmodern Culture*, ed. Hal Foster (Port Townsend, WA: Bay Press, 1983), 16–30.

clustered forms for community labor. These features are not stylistic but performative, embodying Frampton's notion of tectonic culture, where material expression and construction technique reveal a dialogue between human intention and environmental condition.

Within this framework, preserving fishing villages is not about fixing them in time, but about retaining their regional logic as a guide for future design. Frampton's call for a "bounded domain", a space that mediates between universal and local forces, resonates with the idea of waterfronts as both productive and symbolic boundaries. Contemporary interventions in these contexts can draw from this lineage: reinterpreting vernacular techniques through modern means, using local materials, and maintaining spatial patterns that foster community life.²⁰

In doing so, design becomes a form of cultural resistance, not against progress, but against erasure. The reconstruction or adaptation of waterfronts in places like Gloucester or Stonington could therefore serve as acts of critical regionalism: balancing the universality of climate resilience technologies with the singular cultural depth of coastal identity.

2.4.4 Maritime Culture and Blue Urbanism

While Frampton focuses on the architectural and regional scale, Timothy Beatley's Blue Urbanism literature expands the lens to the ecological and civic. He calls for cultivating an "oceanic consciousness", a recognition that cities and towns are not separate from the sea but fundamentally dependent upon it. Beatley argues that urban design must extend its ethical concern from land to water, acknowledging the ocean as part of the public realm.

For fishing communities, this perspective is both intuitive and urgent. The sea is not a backdrop but a partner in daily life, shaping rhythms of work, leisure, and identity. Beatley's notion of blue urbanism reframes waterfronts as dynamic ecological interfaces rather than

²⁰ Ibid.

economic frontiers. He advocates for urban forms that celebrate marine awareness, public piers, waterfront markets, educational centers as spaces where humans can reconnect with the ocean as a living system.²¹

Applied to fishing towns, this ethos reinforces the argument for adaptive preservation. Instead of isolating working waterfronts or replacing them with privatized development, communities can create hybrid spaces that sustain both cultural heritage and ecological engagement. A fish market that doubles as an educational center or a pier reimaged as a public commons can embody this blue urbanist sensibility. In this sense, Beatley complements Frampton: where Frampton defends the local against the global, Beatley expands the local into a global ethic of stewardship.

Together, these perspectives propose a cultural framework for resilience, one rooted not only in physical adaptation but in a renewed moral relationship with the sea.²²

2.4.5 Identity, Poverty, and the Threat of Cultural Displacement

The synthesis of environmental and cultural theories must confront a stark reality: the erosion of identity through poverty and displacement. As discussed in Subtheme 1, studies documented that fishing-dependent communities often face lower incomes, limited educational attainment, and declining property values compared to other coastal areas. These conditions make them disproportionately vulnerable to the impacts of sea-level rise, coastal storms, and market instability.

Climate uncertainty adds another layer to this picture, projecting a significant increase in high-tide flooding events that will render portions of waterfront infrastructure unusable by mid-

²¹ Timothy Beatley, *Blue Urbanism: Exploring Connections between Cities and Oceans* (Washington, DC: Island Press/Center for Resource Economics, 2014).

²² Beatley, *Blue Urbanism*

century. For small fishing towns, these converging pressures mean that losing a pier, processing plant, or market is not only an economic setback but a blow to collective identity. The waterfront, in these contexts, is a civic anchor; a stage for the rituals of work and community that define belonging.

When redevelopment or displacement occurs, the loss is therefore multidimensional. It entails not only the disappearance of buildings but the fragmentation of social memory and intergenerational knowledge. As heritage scholars increasingly note, cultural continuity depends on keeping the functional life of heritage alive, not merely its form.²³ In fishing villages, this means sustaining the economic and social structures, access to fishing grounds, communal spaces, and affordable housing, that allow maritime culture to persist as a living practice.

Architecture can act as both infrastructure and narrative, enabling continuity by creating spaces where labor, exchange, and memory remain intertwined. Rather than monumentalizing the past, design can curate continuity: maintaining the threads of daily life that keep culture resilient amid environmental uncertainty.²⁴

2.4.6 Toward a Contemporary Ethics of Preservation and Design

Across these readings, a common theme emerges: the challenge of maintaining cultural identity in an era of planetary change. Frampton, AlSayyad, and Beatley converge on the idea that heritage, place, and ecology are not separate concerns but interdependent dimensions of human dwelling.

- Frampton offers an architectural ethics of resistance, the idea that material and spatial form can defend cultural specificity against homogenization.

²³ Frampton, "Towards a Critical Regionalism"

²⁴ Frampton, "Towards a Critical Regionalism"

- AlSayyad contributes a social ethics of agency, the insistence that communities must author their own traditions and futures.
- Beatley introduces an ecological ethics of connection, urging humans to reimagine themselves as participants in a shared oceanic world.

Together, these perspectives propose a model of living heritage that is both adaptive and principled. Fishing villages exemplify this possibility because they have always existed in flux: between land and sea, between independence and interdependence, between past and future.²⁵ To sustain them is to acknowledge that resilience is not merely structural, it is cultural.

In the architectural domain, this means designing not as preservationists but as caretakers of continuity. The goal is not to replicate vernacular forms, but to reinterpret their logic, their understanding of material, climate, and community. Projects that integrate affordable housing with shared working spaces, or that transform derelict industrial piers into civic commons, can embody this living heritage.

As sea levels rise and coastlines change, the value of fishing communities extends beyond their immediate geography. They stand as models of coexistence with dynamic environments, demonstrating how culture itself can be an adaptive mechanism. Preserving and fortifying these places, therefore, is not an act of nostalgia but a strategy for the future: an ethics of place-making that bridges environmental resilience with cultural endurance.²⁶

²⁵ Sahrhage and Lundbeck, *A History of Fishing*.

²⁶ Frampton, "Towards a Critical Regionalism"

2.5 Architecture as a Tool for Adaptation and Continuity

If the previous chapters explored why fishing communities matter environmentally, culturally, and historically, this section addresses the question of *how* they can endure.

Architecture becomes a medium through which adaptation, continuity, and identity intersect. The challenge is not only technical but existential: how can the built environment sustain the culture of communities whose survival depends on living with, rather than against, the sea?

Across the Atlantic coast, small fishing towns face converging pressures: rising tides, aging housing stock, and the decline of working waterfronts. Yet these same places hold immense potential as laboratories for resilient living. Housing, public space, and landscape infrastructure can together redefine what it means to dwell at the water's edge, not by resisting change, but by translating it into design intelligence. This chapter draws from contemporary housing theory, ecological design, and maritime urbanism to articulate architectural pathways that reinforce cultural identity while responding to environmental risk.

2.5.1 The Social and Cultural Dimension of Housing in Coastal Communities

In *The Power of Place: Urban Landscapes as Public History*, Dolores Hayden argues that architecture is a form of public memory. Buildings and urban patterns hold the traces of collective identity, representing the everyday practices of those who built and inhabited them. In this sense, housing is not merely shelter but a record of social life a vessel for the narratives that define a community's relationship to its environment.²⁷

For fishing villages, this perspective is particularly resonant. Their houses, docks, and markets tell intertwined stories of labor, migration, and adaptation. Vernacular housing patterns,

²⁷ Dolores Hayden, *The Power of Place: Urban Landscapes as Public History* (Cambridge, MA: MIT Press, 1995).

narrow gabled homes on stilts, clustered near harbors, reflect centuries of experiential knowledge: responding to wind direction, maximizing daylight for net-mending, and allowing for seasonal flexibility. These spatial logics embody a vernacular intelligence that should inform contemporary design, not as nostalgia but as heritage in action.

Hayden’s framework connects directly to the cultural stakes of climate adaptation. When redevelopment or sea-level rise erases these landscapes, what disappears is not only architectural form but the shared memory embedded in place. Preserving this memory, she insists, requires “making history visible through design” engaging the material and spatial layers of ordinary life.²⁸ Thus, the future of resilient housing in fishing towns lies not in replacing old structures wholesale, but in reinterpreting their spatial DNA within contemporary systems of affordability, sustainability, and ecological response.

2.5.2 Missing Middle Housing and Adaptable Density

The Missing Middle Housing model proposed by Daniel Parolek, offers a critical framework for reimagining housing in small coastal towns. Parolek defines “missing middle” as a spectrum of building types, duplexes, fourplexes, bungalow courts, live-work units, and small courtyard apartments, that bridge the gap between single-family homes and large multifamily blocks. These types can achieve walkable density, social diversity, and affordability without disrupting the human scale of traditional neighborhoods.²⁹

In the context of fishing communities, the missing middle approach holds particular promise. Many of these towns face declining populations of working residents as housing costs

²⁸ Hayden, *The Power of Place*

²⁹ Daniel G. Parolek and Arthur C. Nelson, *Missing Middle Housing: Thinking Big and Building Small to Respond to Today’s Housing Crisis* (Washington, DC: Island Press, 2020).

rise and seasonal tourism expands. Parolek’s model allows for incremental infill that maintains the texture of the existing fabric while accommodating diverse household types, from young fishers and seasonal workers to multigenerational families.

Designing for adaptability is equally vital. Elevated foundations, modular units, and shared community courtyards can respond to both environmental and social needs. By combining affordability with resilience, missing middle housing offers a blueprint for architectural continuity through change: preserving the scale and intimacy of historic fishing villages while integrating flood-adaptive and energy-efficient technologies.

Figure. (Placeholder) Examples of “Missing Middle” Housing Typologies

Source: Parolek and Nelson, Missing Middle Housing,

These typologies, duplexes, courtyard apartments, and live-work units, illustrate how incremental density can strengthen community life in small coastal towns without eroding their human scale. When elevated and clustered around shared courtyards, they provide flexible, flood-resilient housing that aligns with the social rhythms of fishing communities.

2.5.3 Linking Economic Patterns to Architectural Program

While architectural typology defines form, economic context determines function. The NOAA Fisheries of the United States 2022 Report reveals that the U.S. seafood industry remains both economically vital and regionally uneven. In 2022, the country’s commercial fisheries landed 8.4 billion pounds of seafood, valued at \$5.9 billion. The Atlantic coast accounted for approximately 24.5% of national revenue, though only 5.6% of total landings, indicating that smaller-scale, higher-value fisheries such as scallops, lobster, and crab dominate this region.³⁰

³⁰ NOAA - National Oceanic and Atmospheric Administration, Fisheries of the United States Report, 2022 (Silver Spring, MD: U.S. Department of Commerce, 2023).

New Bedford, Massachusetts, has been the nation’s highest-value port for twenty-two consecutive years, producing \$443 million in landings in 2022, largely from sea scallops. Other historic fishing towns, from Gloucester (MA) to Stonington (ME), operate within similar economies of scale: smaller volumes but high cultural and market value. This concentration of economic activity underscores the importance of functional waterfront architecture, spaces that accommodate not just boats and storage but markets, processing, education, and community gathering.³¹

Translating this into architectural terms means designing buildings that reflect the programmatic diversity of fishing economies. Markets can double as educational centers that teach sustainable practices; cooperative processing facilities can serve as public workshops; harborside housing can integrate live-work units for seasonal workers. Architecture, in this sense, becomes an infrastructural narrative, embedding the logistics of livelihood into the spatial fabric of daily life.

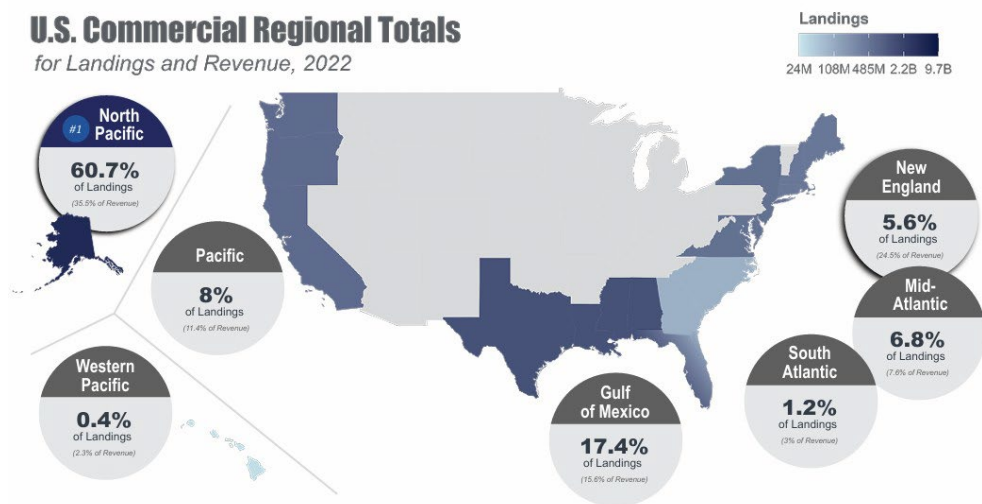


Figure 10: Regional Percentages of U.S. Commercial Fisheries Landings and Revenue (2022).

Source: National Oceanic and Atmospheric Administration (NOAA), *Fisheries of the United States 2022*

³¹ Ibid.

The Atlantic coast's disproportionate share of revenue compared to its landings reveals the unique economic structure of New England fisheries. This high value, low volume model supports the architectural argument for compact, mixed-use harbor districts that combine production, education, and public space rather than industrial sprawl.

2.5.4 Living Shorelines and Landscape Infrastructure

Traditional coastal defense systems, bulkheads, seawalls, and riprap, often protect structures at the cost of destroying the ecological systems that sustain them. The Living Shoreline Approach, represents a paradigm shift: using natural and nature-based features such as oyster reefs, marsh grasses, coir logs, and shallow slopes to stabilize eroding edges. The Ocracoke Island case demonstrates how this strategy can protect both historic structures and cultural landscapes without severing their relationship to the sea.

On Ocracoke, the National Park Service collaborated with ecologists and engineers to replace failing bulkheads with living edges. The project reduced erosion rates, improved habitat quality, and enhanced stormwater absorption. Importantly, it also preserved the visual and tactile continuity of the site, the shoreline remained accessible, porous, and legible as part of the island's identity.³²

For architectural design, the implications are profound. Rather than separating built form from landscape, housing and public structures can integrate amphibious thresholds: decks that extend into vegetated zones, elevated walkways above restored marshlands, and shared piers that act as community ecotones. The living shoreline becomes a model for architecture as landscape

³² Jason C. Doll and Johnny D. Martin, "A Living Shoreline Approach to Protect Historic Structures on Ocracoke Island," in *Ports 2013*, (Reston, VA: American Society of Civil Engineers, 2013), 9–18, <https://doi.org/10.1061/9780784413067.002>.

infrastructure, a resilient interface between ecology, heritage, and habitation.³³



Figure 11: Gray to Green Continuum

Source: Larissa A. Naylor et al., *Greening the Grey: A Framework for Integrated Green Grey Infrastructure (IGGI)* (Glasgow: University of Glasgow, 2017).

The living shoreline replaces hard boundaries with layered ecological buffers that dissipate wave energy, enhance biodiversity, and maintain public access.³⁴ For fishing towns, this strategy reconnects architecture with natural systems, transforming the coastal edge from a line of defense into a shared space of resilience.

2.5.6 Floating, Amphibious and Elevated Architecture - Global Precedents / Case Studies

As sea levels continue to rise, architectural innovation increasingly turns to amphibious and floating typologies. These approaches do not attempt to resist water but to coexist with it, treating buoyancy, flexibility, and reversibility as design principles.

In the Netherlands, the IJburg neighborhood in Amsterdam and the Maasbommel Amphibious Houses exemplify this approach. IJburg consists of floating homes anchored to piers in a protected bay, with modular platforms that allow for incremental growth and community

³³ Ibid.

³⁴ Larissa A. Naylor et al., *Greening the Grey: A Framework for Integrated Green Grey Infrastructure (IGGI)* (Glasgow: University of Glasgow, 2017).

spaces on water. Maasbommel's amphibious houses, by contrast, rest on hollow concrete foundations that float during floods and return to the ground as waters recede, a hybrid between terrestrial and aquatic dwelling.³⁵

In Germany, Hamburg's HafenCity integrates elevated public promenades, floodable plazas, and adaptive buildings that accept periodic inundation as part of urban life. These projects expand the meaning of resilience from protection to coexistence, emphasizing design adaptability over permanence. North America's Amphibious Housing Project in Louisiana, demonstrates that these ideas can translate to local contexts. Its retrofitted shotgun houses use buoyant foundations to lift the structure during floods, preserving the vernacular character while ensuring safety.³⁶ These examples demonstrate that living with water requires not technological novelty alone, but a cultural and ethical shift: recognizing water as a collaborator in the making of place.

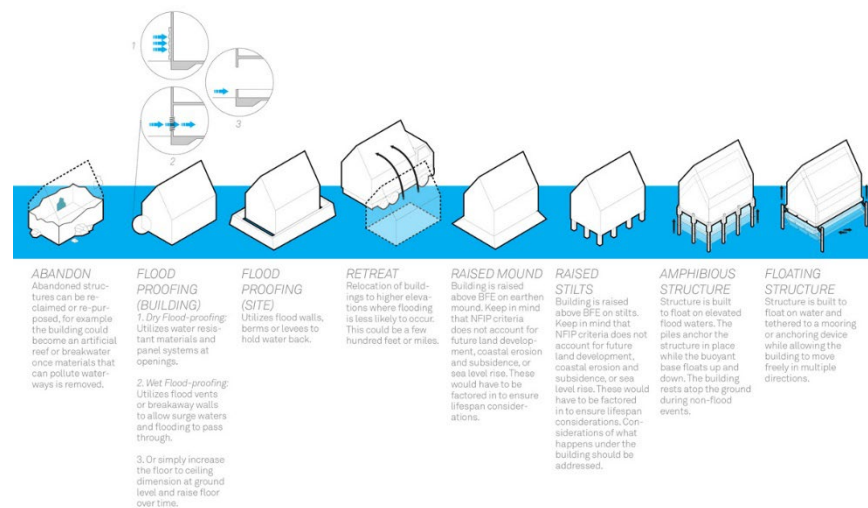


Figure 12: Strategies of Flood Adaptive Waterfront Living.

Source: Jeffrey Huber, *Salty Urbanism: A Design Manual to Address Sea Level Rise and Climate Change for Urban Areas in Coastal Zones* (New York: Routledge, 2019).

³⁵ Lisa Baker, *Built on Water: Floating Architecture + Design*

³⁶ Elizabeth English, Natasha Klink, and Scott Turner, "Thriving with Water: Developments in Amphibious Architecture in North America," ed. M. Lang, F. Klijn, and P. Samuels, *E3S Web of Conferences* 7 (2016): 13009, <https://doi.org/10.1051/e3sconf/20160713009>

The “Salty Urbanism” framework presents a spectrum of flood-adaptive building strategies ranging from floodproofing and raised structures to amphibious and floating typologies, illustrating how architecture can progressively adapt to rising water conditions rather than resist them entirely.³⁷ Using Southeast Florida as a case study, the research emphasizes the integration of ecological infrastructure, resilient urban design, and adaptable building systems within saturated coastal landscapes. This precedent informed the thesis approach of designing with water through elevated and flexible architectural strategies that promote long-term coexistence and adaptability within vulnerable waterfront communities.

2.5.7 Toward an Architecture of Coexistence

Across these diverse approaches, social, economic, and environmental; a coherent framework for resilient coastal architecture emerges. The future of fishing towns depends on reuniting housing, landscape, and livelihood through design strategies that operate simultaneously at multiple scales:

- **At the dwelling scale**, housing must embody adaptability: elevated or amphibious structures that retain traditional proportions and community intimacy.
- **At the neighborhood scale**, missing middle typologies offer a path to incremental density and affordability, sustaining working populations within heritage contexts.
- **At the waterfront scale**, markets, cooperative hubs, and piers can be reprogrammed as mixed-use civic infrastructure, linking cultural continuity with economic vitality.

³⁷ Jeffrey Huber, *Salty Urbanism: A Design Manual to Address Sea Level Rise and Climate Change for Urban Areas in Coastal Zones* (New York: Routledge, 2019).

- **At the territorial scale**, living shorelines and ecological corridors integrate human and nonhuman resilience, reframing protection as participation.

This synthesis suggests that the future of resilient fishing towns lies not in technological fortification but in architectural empathy, the ability of built form to adapt, absorb, and express the identities of those who inhabit it. When design embraces the sea as collaborator, not adversary, resilience becomes a cultural act as much as an environmental one.

2.5.8 From Adaptation to Empowerment

The question of “how” thus extends beyond construction detail to encompass values of continuity, inclusion, and belonging. Architecture in historic fishing towns must operate simultaneously as infrastructure, heritage, and public history, sustaining livelihoods, reinforcing identity, and honoring the oceanic conditions that make these communities possible.

The integration of housing diversity, economic pragmatism, and ecological design offers a pathway toward empowerment. By combining missing middle principles with living shorelines and floating or elevated typologies, designers can generate forms of habitation that evolve with the tides yet remain grounded in place.

This convergence of cultural and ecological resilience defines a new architectural ethic, one that acknowledges impermanence not as loss, but as continuity. In the face of uncertainty, the fishing village stands not as a relic, but as a resilient model of coexistence between humans, architecture, and the living sea.

Chapter 3: Methodologies

Architectural research, as Lucas argues, is most effective when it recognizes that design knowledge emerges from an interplay between observation, analysis, interpretation, and speculation. For a thesis situated at the intersection of climate change, cultural heritage, and coastal economies, methodological clarity becomes essential. The adaptive futures of historic fishing communities cannot be understood through any single disciplinary lens. Instead, they demand an interdisciplinary methodology capable of integrating environmental data, cultural narratives, socio-economic patterns, historical research, and field-based observation. This chapter outlines the methodological framework guiding the project and explains how varied research tools, qualitative and quantitative, subjective and analytical, are being employed to investigate the central question: How might architecture provide affordable, climate-resilient dwellings that fortify both the cultural identity and economic livelihood of historic fishing communities?

The first methodological pillar of this thesis emerges through ethnographic and cultural research. Historic fishing communities are living cultural systems, shaped not only by environmental conditions but by intergenerational knowledge, daily labor rituals, and the spatial logic of working waterfronts. To understand these cultural dimensions, I will conduct fieldwork at the New Bedford Whaling Museum and the New Bedford Fishing Heritage Center. These visits allow access to both archival materials and first-source narratives, making it possible to engage with fishermen, museum docents, historians, and community leaders. This form of

ethnographically informed research, rooted in oral histories, participant observation, and cultural analysis, helps reveal patterns of living, working, and inhabitation that are often invisible in plan drawings or policy documents. Lucas underscores the importance of research that “learns from people,” and in the context of fishing towns, these voices are essential for identifying the lived challenges of rising seas, housing precarity, and economic change. Speaking with the Fishing Heritage Center’s archivist and president will provide insight into the socioeconomic pressures fishermen face today, how climate change alters their practice, and how cultural identity is maintained or put at risk in the process.

Complementing this qualitative research is a second methodological layer grounded in environmental and quantitative analysis. Climate change is fundamentally a scientific and spatial problem; therefore, the thesis relies on authoritative datasets, including FEMA Flood Insurance Rate Maps, NOAA high-tide flooding projections, and IPCC sea-level rise scenarios, to understand the magnitude and spatial distribution of coastal risk. These resources allow me to model inundation patterns, compare moderate- versus severe-rise scenarios, and assess which areas of the waterfront are likely to experience chronic flooding by 2050. Lucas emphasizes that architectural research must synthesize information across disciplines; here, environmental science becomes a necessary partner in shaping architectural direction. These analyses clarify where elevated, amphibious, or floating housing might be viable, and they guide the identification of safe, adaptive locations for new affordable housing interventions.

Field studies form the third methodological component, building on Lucas's emphasis on direct engagement with place. My site visits to New Bedford, its industrial waterfront, residential edges, and historic harbor district, provide firsthand knowledge of existing spatial conditions, circulation patterns, material textures, and vulnerabilities. Walking the piers, documenting housing conditions, and observing the rhythms of the working waterfront offer insights that are unattainable through maps alone. These observations will inform the site analysis by revealing how economic, cultural, and environmental forces collide at the water's edge. They also help in understanding how affordable housing might be realistically integrated into the waterfront without displacing existing workers or weakening fishing activity.

In parallel, this thesis incorporates socioeconomic and blue-economy research, which adds a critical quantitative dimension. NOAA data demonstrates that the Northeast U.S. fisheries generate disproportionately high revenue despite lower total landings, meaning that climate disruptions reverberate economically in unique ways. When floods shut down ports or disrupt scallop harvesting, the losses are not only infrastructural but deeply tied to community livelihood. Exploring the blue economy literature expands this investigation by considering how coastal economies might evolve through sustainable, reciprocal relationships with the ocean. This research strengthens the argument that housing and economic resilience must be designed in tandem, reinforcing Lucas's notion that architecture must understand the systems it intervenes in.

One of the most significant methodological components involves precedent studies, examined through both literature and direct field research. Because this thesis

seeks architectural strategies for living with water, I will travel to Amsterdam to study some of the world's most advanced floating and amphibious communities, including IJburg and Maasbommel. Observing these neighborhoods firsthand will allow me to analyze buoyant foundations, modular construction techniques, neighborhood morphology, and how daily life adapts to water-based conditions. This experiential analysis deepens the methodological rigor of precedent research, moving beyond image-based understanding toward embodied knowledge of how water and architecture coexist. Similarly, traveling to Copenhagen, a global leader in sustainable fisheries and harborfront design, will provide opportunities to study contemporary fish markets, cooperative fisheries, and waterfront housing integrated with maritime economies. Scandinavia's dual leadership in sustainable coastal living and fisheries management positions these visits as essential methodological tools for understanding how architecture might simultaneously support livelihood, culture, and ecological stewardship.

Finally, the methodology incorporates diagramming, mapping, and analytical drawings, which Lucas identifies as essential tools for architectural synthesis. These graphic methods enable the translation of complex cultural, environmental, and economic data into spatial insights that guide the design process. Diagrams will be used to map relationships between flooding patterns and housing conditions, between fishing infrastructure and community life, and between waterfront identity and adaptive housing typologies. This visual research transforms raw data and lived observations into architectural understanding, creating a conceptual basis for the design strategies that follow.

Together, these methodologies, ethnographic research, environmental modeling, site studies, socioeconomic analysis, precedent investigation, and diagrammatic synthesis, form an integrated framework tailored to the layered challenges faced by historic fishing communities. Lucas argues that architectural research attains its deepest value when it acts as a bridge between worlds: between objective data and cultural meaning, between present realities and future possibilities. The methods employed in this thesis embody that ambition. By weaving together stories, measurements, histories, and projections, the research framework ensures that the architectural proposals emerging from this work are both imaginative and grounded, capable of sustaining the cultural identity, economic livelihood, and environmental resilience of communities co-existing with the ocean.

Chapter 4: Precedent Analysis

Introduction

The study of precedents is essential to my thesis because the challenges faced by contemporary fishing communities, coastal vulnerability, cultural resilience, and the relationship between architecture and water, do not exist in isolation. They are part of a long lineage of human adaptation to maritime landscapes. By examining projects that operate at different scales, climates, and cultural contexts, I have been able to see how architecture negotiates the edge between land and sea, how it supports livelihoods tied to water, and how it expresses identity in the face of environmental change.

The five precedents selected for this chapter, Venice's historic urban fabric and infrastructure, the Tofino Fishing Pier adaptive reuse project in British Columbia, Renzo Piano's Jean-Marie Tjibaou Cultural Center in New Caledonia, the Amphibious House by BACA Architects in London, and the Angsila Scaffolding Pavilion in Thailand, represent a spectrum of strategies, from vernacular resilience to advanced technology, from monumental cultural centers to small-scale working infrastructures. Each precedent contributes a different dimension to the questions at the core of my thesis:

How can architecture support the cultural identity of fishing communities while addressing climatic vulnerability?

What can we learn from sites where water is treated as partner rather than threat?

How can design intervene without eroding the social fabric that defines these communities?

These projects together offer lessons that extend beyond form or program, they help illuminate how architectural thinking can become culturally grounded, environmentally responsive, and socially meaningful.

4.1 Venice: Urbanism on Water as a Model of Cultural Resilience

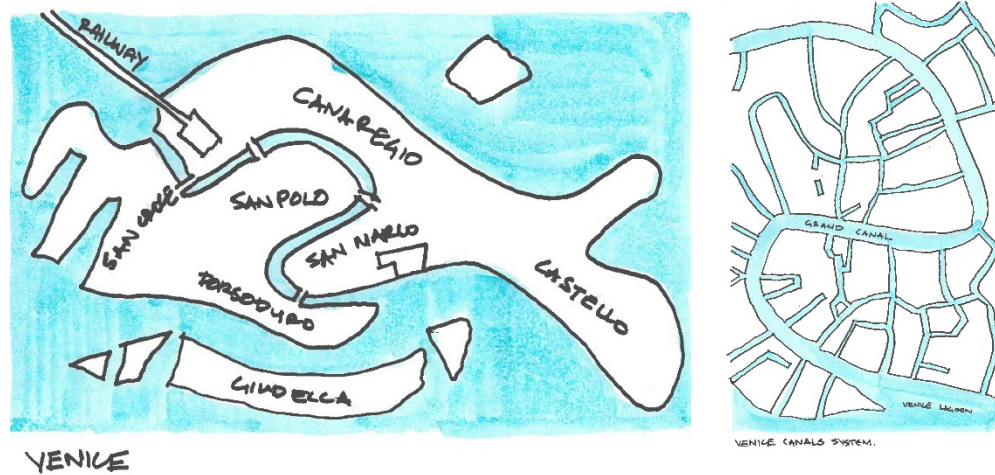


Figure 13: Venice Map and Canals System – Diagram by Author

Venice is not a singular building but an entire urban ecosystem arguably the world's most sophisticated precedent for architecture built with, rather than against, water. Its layers of foundations, canals, edges, and protective systems reflect centuries of experimentation.³⁸ My analysis began with the small-scale techniques: timber piles driven deep into the lagoon floor, compacted stone strata, and amphibious building logics that emerged from an acceptance of water's unpredictability. The incremental adjustments, raised entrances, stepped thresholds, canal-facing service spaces,

³⁸ Savoy, Daniel. 2012. *Venice from the Water : Architecture and Myth in an Early Modern City*. Yale University Press.

demonstrate a lived, generational understanding of climate dynamics long before climate change became formalized in policy.

At the larger scale, the city's infrastructure includes monumental interventions such as the MOSE barrier system, a contemporary reimagining of how Venice negotiates extreme flooding events. Although MOSE is technologically ambitious, it still originates from the same foundational ethos: resilience is achieved not through isolation but through calibration with natural forces.³⁹ Venice makes visible the relationship between cultural identity and urban form, its architecture evolved from adaptive necessity, but became symbolic of community continuity.

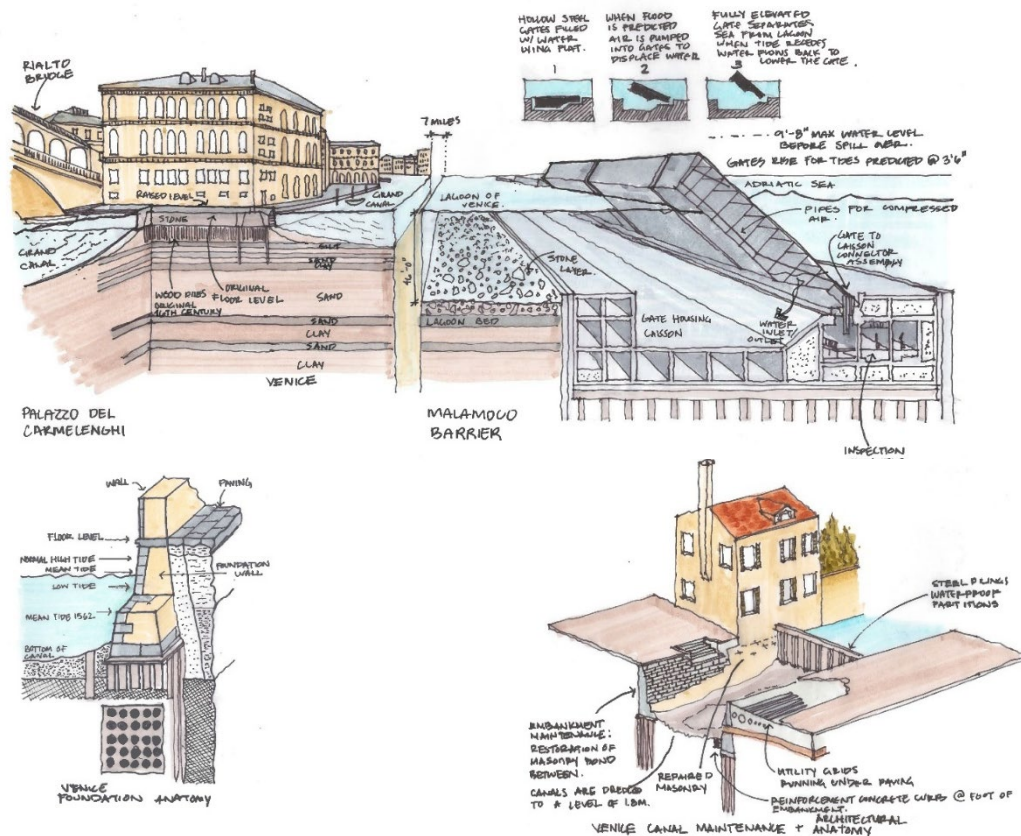


Figure 14: MOSE Barrier Section & Foundations system – Diagrams by Author

³⁹ Paolo Sammarco et al., “Prototype Data Analysis of the Dynamics of the Venice Gate-Barriers during an Extreme Storm Event,” *Coastal Engineering* 196 (2024): 104623, <https://doi.org/10.1016/j.coastaleng.2024.104623>.

For this thesis, Venice serves as a reminder that resilience is not an aesthetic, it is a cultural practice. The city demonstrates that working waterfronts can coexist with dense housing, civic spaces, and ritualized movement across water. It provides a rich precedent for understanding how fishing communities historically coexist with environmental constraints, and how contemporary interventions can respect inherited relationships while planning for future climate realities. The lesson here is that architecture situated at the water's edge must embrace complexity, seasonal rhythms, and the possibility of change.

4.2 Tofino Fishing Pier (Leckie Studio): Adaptive Reuse as Cultural Continuity



Figure 15: Old Ice plant built in 1962 vs Adaptive Reuse Tofino Fishing Pier – Source: Leckie Studio

The Tofino Fishing Pier project offers a contrasting but equally valuable lens: instead of a historic city shaped by centuries, it is a contemporary adaptive reuse intervention anchored in a First Nations fishing community. Originally built in 1962 as an industrial ice plant supporting commercial fishing, the structure is now being

transformed into a mixed-use pier, public space, and community hub. Its new life does not abandon its past, instead, it reframes that past for contemporary needs.⁴⁰

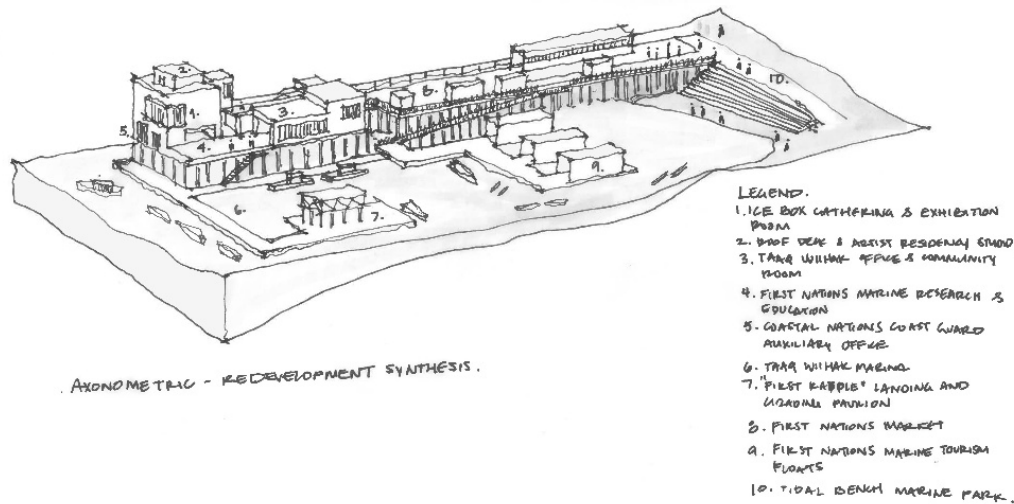


Figure 16: Axonometric Redevelopment Synthesis – Source: Diagram by Author

Through this analysis, an aspect that stands out is how the design balances working waterfront functions with community engagement. Rather than sanitizing or romanticizing the fishing industry, the project brings people closer to it. It provides spaces where fishermen, residents, and visitors intersect, not to commodify cultural identity but to reinforce it. The adaptive reuse approach acknowledges that fishing is not purely an economic activity, but a social backbone for the Tla-o-qui-aht First Nation people.

This precedent guides the thesis by demonstrating how architecture can reactivate industrial sites without erasing working identities. The pier supports the fishing industry while offering gathering spaces, educational opportunities, and cultural representation. It exemplifies a hybrid typology worth exploring:

⁴⁰ Leckie Studio Architecture + Design, “Tofino Fish Pier,” *Canadian Architect*, accessed Oct 23, 2025, <https://www.canadianarchitect.com/tofino-fish-pier/>

infrastructure that performs economically while sustaining community life. For fishing towns, this raises essential questions about how architecture can repair the disconnect between working waterfronts and the towns they support.

4.3 Jean-Marie Tjibaou Cultural Center (Renzo Piano): Vernacular Reinterpreted as Identity

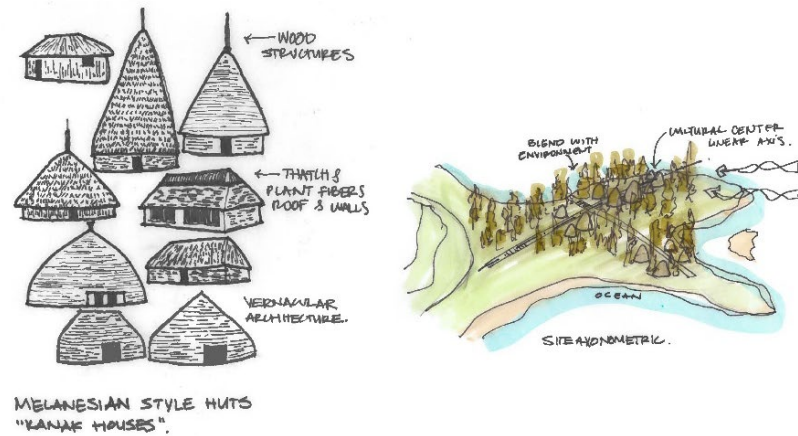


Figure 17: Vernacular Melanesian Style Huts and Cultural Center Site – Source: Diagram by Author

Renzo Piano’s Jean-Marie Tjibaou Cultural Center is not a maritime structure in a literal sense, but it is fundamentally a project about cultural preservation at the intersection of tradition, climate, and contemporary design. Inspired by the Kanak people's vernacular huts, light, woven cylindrical forms made of local materials, the project reinterprets these archetypes through a contemporary architectural vocabulary. The resulting structures breathe with the climate; they filter wind, diffuse light, and mediate the harsh coastal environment of New Caledonia through passive strategies deeply rooted in indigenous knowledge.⁴¹

⁴¹ Renzo Piano Building Workshop, “Jean-Marie Tjibaou Cultural Center,” accessed Oct 12, 2025, <https://www.rpbw.com/project/jean-marie-tjibaou-cultural-center>.

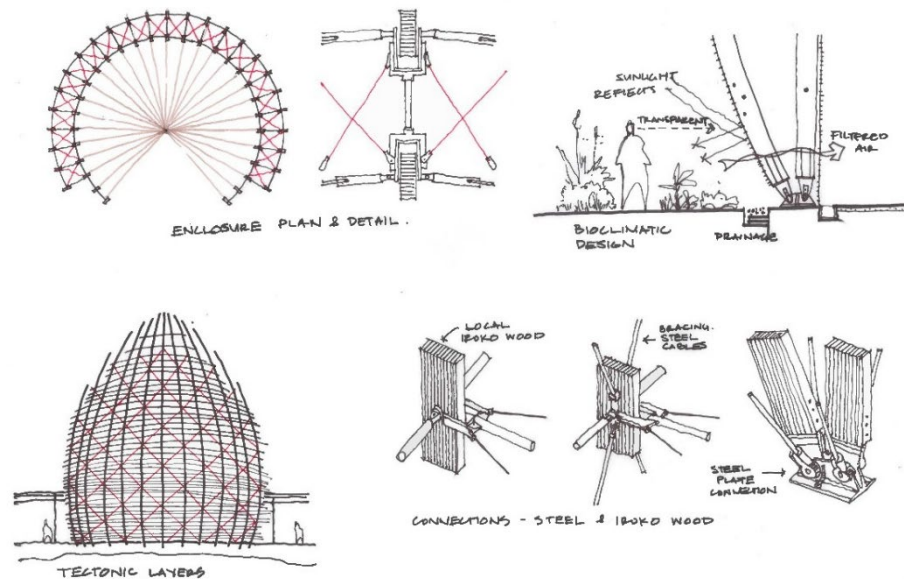


Figure 18: Renzo Piano Vernacular Tectonics – Source: Diagram by Author

An important aspect to abstract from the project’s philosophical stance: architecture becomes a vessel for cultural memory and identity. It demonstrates how built form can simultaneously respect historical craft and embrace technological innovation. The project is not a replica, it is a translation. That distinction matters for fishing communities whose identities risk erasure under pressure from climate adaptation demands, tourism economies, and industrial escalation.

The Tjibaou Cultural Center therefore provides a precedent for how I might approach form, materiality, and narrative in my own thesis. It suggests that a successful project does not simply “represent” a community; it collaborates with it. It listens to the spatial logic of traditional crafts, rituals, and ways of inhabiting land and water. This precedent reinforces the idea of resilience being social as much as environmental, and that architecture can act as an active participant in sustaining identity.

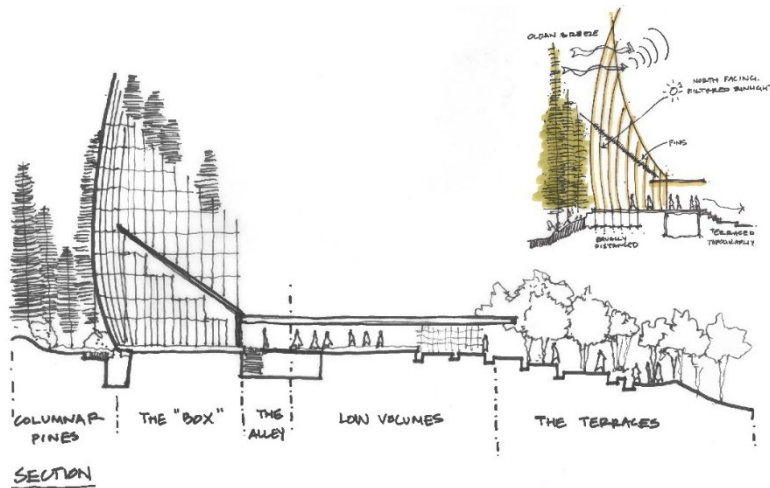


Figure 19: Program and Bioclimatic Sections – Diagram by Author

4.5 Amphibious House (BACA Architects): Living with Flooding Rather Than Fighting It

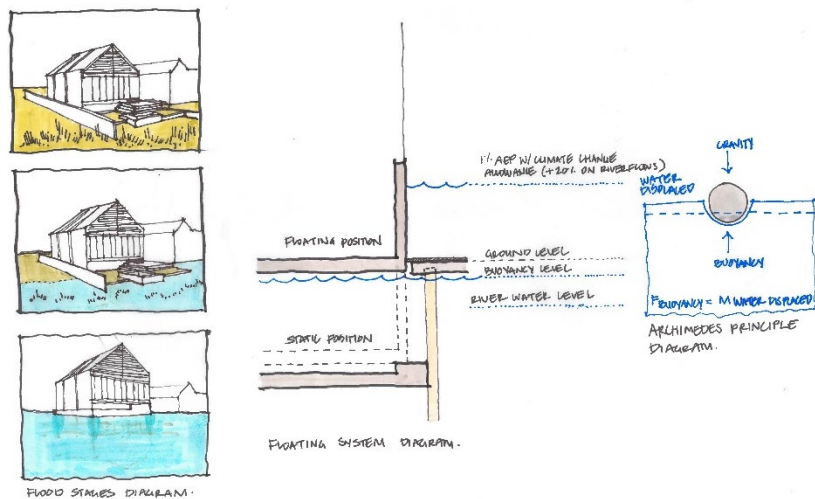


Figure 20: Flooding Scenarios & Archimedes' Buoyancy Principle – Diagram by Author

Located on the River Thames in London, the Amphibious House introduces an entirely different dimension of precedent, the technological and engineering strategies that allow structures to adapt to fluctuating water levels. Based on Archimedes's principle of buoyancy, the building sits within a dry dock that allows it

to rise during flood events and settle back into place when waters recede. It neither resists nor escapes water; it temporarily becomes part of it.⁴²

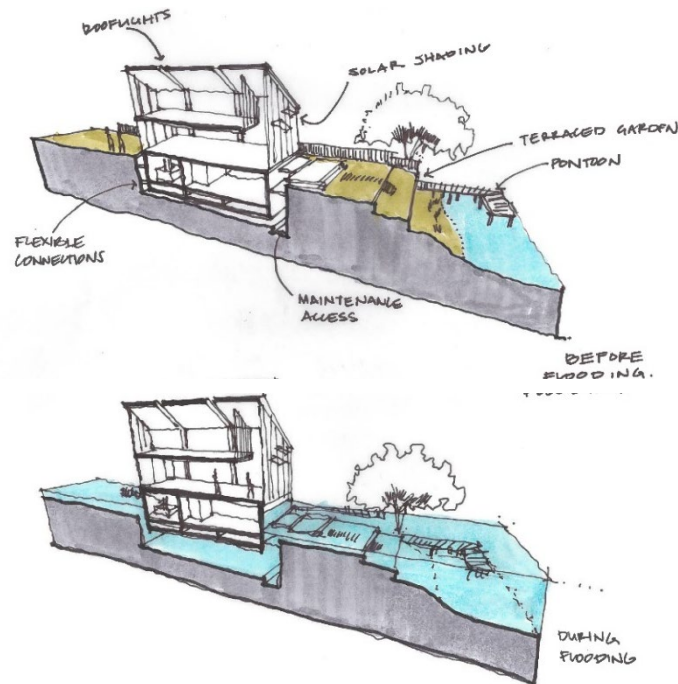


Figure 21: Axonometric Section: Flooding Scenario – Diagram by Author

This project represents a crucial conceptual shift: amphibious architecture as a mode of cohabitation with climate change. Fishing communities in New England face increasing tidal fluctuations, storm surges, and rising seas. While not all sites require full amphibious systems, the logic behind them, anticipatory design, flexibility, elevational responsiveness, opens the door to new typological thinking. Could housing, community spaces, or working waterfront facilities incorporate buoyant foundations? Could flexibility become a cultural asset rather than an emergency measure?

⁴² Baca Architects, “Amphibious House,” Oct 14, 2025, <https://www.baca.uk.com/projects/amphibious-house>.

The Amphibious House thus expands the thesis methodology by offering a precedent at the intersection of engineering, climate science, and domestic life. It becomes a challenge to consider what a future working waterfront might look like if designed not for static resilience but dynamic adaptation.

4.6 Angsila Scaffolding Pavilion (Thailand): Small-Scale Structures as Social Infrastructure

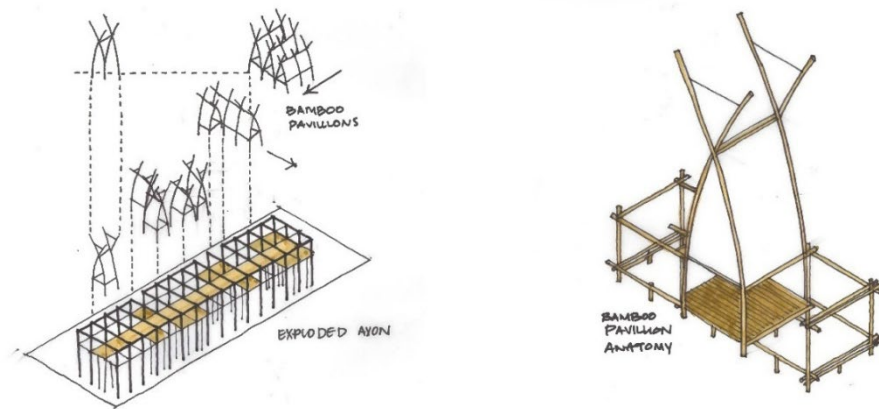


Figure 22: Axonometric: Modular Bamboo Structure – Diagram by Author

The Angsila Scaffolding Pavilion exists at a smaller scale than the other precedents, yet its contribution is equally important. Built for a native fishing community in Thailand, the pavilion is a lightweight, hand-built structure that extends directly into the water. Constructed from bamboo and local materials, it supports fishing activities while creating a communal platform for gathering, repairing nets, and participating in daily rituals tied to the sea.⁴³

⁴³ Golden Pin Design Award. “Tofino Fishing Pier.” Accessed May 23, 2026. <https://goldenpin.org.tw/goldenpin/en/winners/1283>.

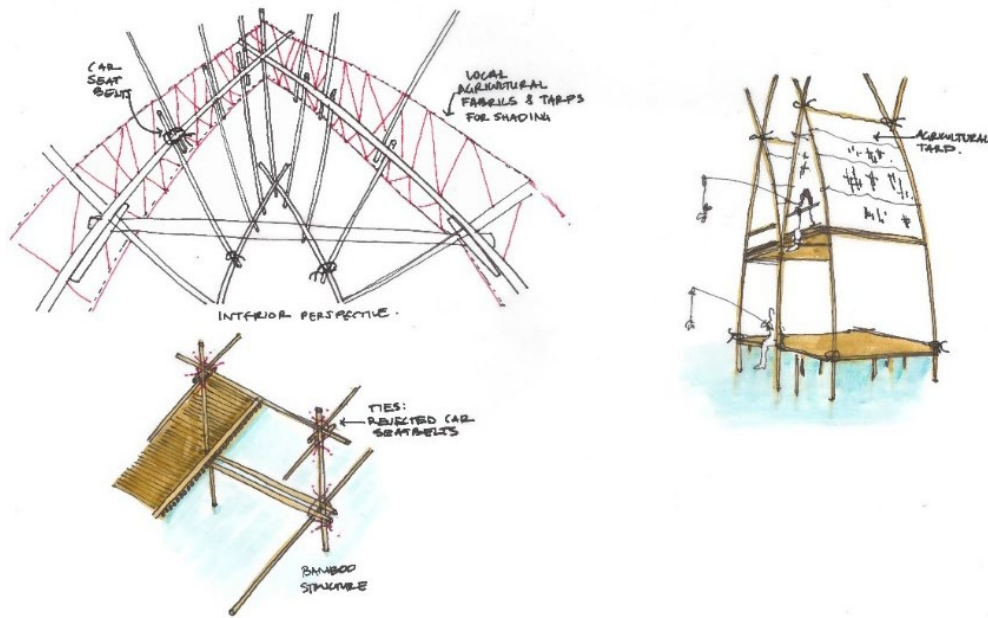


Figure 23: Vernacular Craft – Diagram by Author

What stands out is the project’s humility and cultural embeddedness. It does not attempt to monumentalize fishing culture; instead, it amplifies the everyday practices that sustain it. The pavilions are both infrastructure and social spaces, two functions that fishing towns often segregate. It recognizes that community happens not only in designated civic buildings, but in the liminal moments of shared labor.

The project demonstrates the importance of design at the scale of the hand, the community, and the daily ritual. While this thesis is looking at larger urban issues in New England, the Angsila pavilion serves as a reminder that successful interventions must still respect the micro-scale rhythms of work, maintenance, and gathering; not all architectural impact needs to be monumental; in many cases, meaningful improvement begins with small, precise interventions.

Chapter 5: The Program

Program Abstract

The thesis research journey was taken across three historic fishing communities: New Bedford, Gloucester, and Rockport revealed a shared cultural and economic reality shaped by the daily rhythms of fishermen, the fragility of working waterfronts, and the deep emotional ties between maritime labor and place. Although these towns differ in scale and atmosphere, their challenges are strikingly parallel: displacement of fishing families, loss of industrial space to commercial development, insufficient support for physical and mental health, and a gradual erosion of cultural identity. Speaking with the president of the New Bedford Fishing Heritage Center sharpened my understanding of these concerns, particularly fishermen's fear of losing access to essential working space and their struggle with injuries, exhaustion, and substance-use pressures. Gloucester, with its dynamic working waterfront along the Scenic Walkway, ultimately emerged as the most compelling site for architectural intervention. Yet the lessons learned from all three towns inform the program developed in this chapter.

The program prioritizes precision over breadth. The site visit clarified the necessity of focusing on fewer, more intentional programmatic zones, each one grounded in the lived realities of fishing communities and the specific spatial conditions observed in Gloucester. The following sections outline the four interdependent zones of the project: Working Waterfront Support, Living &

Dwelling, Healing & Well-Being, and Cultural Heritage & Community Interface.

Together, they aim to create a holistic architectural framework that protects economic livelihood, sustains cultural identity, and enhances resilience along a vulnerable coastline.

5.1 ZONE 1 - Working Waterfront Support: Maritime Atelier

This essential programmatic zone responds directly to fishermen's concerns about losing working space, a concern voiced repeatedly during site visits and conversations in the sites. Fishing communities cannot survive without secure waterfront access, efficient circulation routes, and reliable on-shore infrastructure. On the Gloucester site, where underutilized parking lots and deteriorating sheds sit adjacent to active piers, the opportunity emerges to redesign working spaces that strengthen rather than disrupt daily operations.

This zone focuses on enhancing critical activities such as gear repair, net drying, tool storage, cold-storage access, and boat to land transitions. The architectural response here must be grounded, robust, and materially expressive of Gloucester's industrial identity. Drawing from the region's natural granite stone, brick facades, wooden piers and dense forests, the design can employ stereotomic and tectonic forms that withstand harsh weather, accommodate heavy loads, and maintain durability over decades.

The intention is not to reimagine fishing work through an idealized lens but to support its realities, its messiness, repetition, urgency, and physical demands. By improving safety, efficiency, and accessibility without removing or romanticizing the

industrial character of the site, this zone safeguards the economic engine that anchors Gloucester's cultural identity.

5.2 ZONE 2 - Living & Dwelling Spaces: Anchorage Row

Across New Bedford, Rockport, and Gloucester, one issue surfaced repeatedly: the instability of housing for fishing families and workers. Rising coastal real-estate values, seasonal tourism, and displacement pressures have pushed many fishermen to live farther from the water, undermining the proximity and visibility that historically shaped the social patterns of maritime communities. Visiting these towns made clear how deeply housing and livelihood are intertwined. When fishermen live near their boats, they maintain generational continuity, communal support systems, and a sense of rootedness essential to their identity.

The Living & Dwelling zone addresses this by proposing small-scale, affordable, missing-middle housing near the working waterfront. These dwellings draw from Gloucester's existing architectural language, steep gables, granite bases, brick and timber façades, allowing new forms to blend with the historic fabric rather than overshadow it. Rather than envisioning large residential developments, this zone introduces a modest cluster of units: a balance of permanent housing for active fishermen and transitional or seasonal units for crew members between voyages. Such housing not only restores proximity but creates a dignified living environment that supports physical rest, mental well-being, and long-term economic participation. By rooting families and workers back into the waterfront, the zone reinforces the cultural continuity that defines Gloucester's identity.

5.3 ZONE 3 - Healing & Well-Being Center: Safe Harbor Clinic

One of the most eye-opening aspects of the site visits was learning about the invisible injuries and emotional burdens carried by fishermen, issues emphasized during the conversation with the New Bedford Fishing Heritage Center. Fishing remains one of the most dangerous occupations in the country, marked by chronic back injuries, repetitive strain, acute accidents, and exposure to unpredictable weather and hazardous conditions. Yet physical injuries tell only part of the story; many fishermen endure mental-health challenges connected to exhaustion, financial instability, trauma, and substance use. Despite this, most waterfronts lack even the smallest spaces for immediate care or restorative healing.

The Healing & Well-Being zone responds directly to this gap. Instead of proposing a large medical facility, the design introduces small, accessible spaces integrated into the daily path of fishermen: a first-aid micro-clinic for immediate treatment of minor injuries and primary care, and a contemporary healing room that provides a quiet, reflective environment for decompression. This second space can draw from sensory and environmental design strategies, warm materials, controlled natural light, acoustically softened surfaces, to create a soothing counterpoint to the demands of maritime labor. Rather than treating healing as an institutional process, this zone positions it as a culturally sensitive, approachable part of the fishermen's ecosystem. It acknowledges that resilience is not only infrastructural but human.

5.4 ZONE 4 - Cultural Heritage & Community Interface: Fleet's Forum

While working, living, and healing spaces address functional and physical needs, fishing communities also rely on intangible forms of continuity, storytelling, intergenerational knowledge, and public understanding of their craft. In all three towns visited, I encountered both pride and fragility: a strong sense of identity accompanied by an awareness that traditions are slipping into obscurity as fleets shrink and coastal development accelerates. Architecture has the power to reinforce this cultural continuity by giving fishermen platforms to share their experiences and teaching the public to appreciate the complexities of contemporary maritime work.

The Cultural Heritage & Community Interface zone includes meaningful components: an oral-history and storytelling pavilion, and a waterfront community center. The pavilion offers a setting where fishermen can narrate their lived experiences, host educational visits, record oral history, and celebrate maritime knowledge. Adjacent to it, the community hall supports gatherings such as meetings, potlucks, seasonal fish events, small exhibitions, and cross-generational workshops. These are not tourist attractions; they are civic tools designed to strengthen community cohesion and ensure that fishing heritage remains visible in the cultural life of Gloucester. By integrating these spaces along the Scenic Walkway, the project helps bridge the gap between public perception and the everyday realities of the working waterfront.



Figure 24: Design and programmatic drivers shaping the thesis proposal and architectural response. Diagram by author.

5.5 Conclusion

These four programmatic zones, working waterfront support, dwelling spaces, healing environments, and cultural heritage forums, operate together as an interconnected architectural ecosystem shaped by research, fieldwork, and community insight. The program is focused and intentional in responding directly to issues experienced across New Bedford, Gloucester, and Rockport while grounding itself firmly in Gloucester’s spatial and material conditions. Working spaces protect economic livelihood, living spaces preserve proximity and continuity, healing spaces support physical and emotional well-being, and heritage spaces sustain cultural memory and community cohesion. Together, they produce an architectural framework that is not only practical and resilient but deeply humane. By designing for coexistence rather than replacement, the project respects the complexity of fishing communities and offers a path toward sustaining their identities in the face of economic pressures and climate change. Ultimately, this program reinforces the thesis’s central goal: to design resilient, culturally grounded spaces that honor the dignity, heritage, and future of historic fishing towns “living on the edge”.

Chapter 6: Site Analysis

Introduction: Site as a Critical Agent

This chapter examines the selected site in Gloucester, Massachusetts, not simply as the physical location of the proposal, but as a critical agent shaping the architectural response. The site's environmental conditions, historic urban fabric, working waterfront identity, and socio-economic realities directly informed the development of the thesis, influencing decisions of program, spatial organization, resiliency strategies, and community engagement.

Building upon the theoretical framework, literature review, and programmatic research established in previous chapters, the site selection emerged through an investigation of vulnerable historic fishing communities facing increasing pressures from climate change, economic instability, and cultural displacement. Gloucester was ultimately identified as a site where these forces converge most visibly, offering an opportunity to explore how architecture can support continuity, adaptability, and long-term resilience within a working waterfront community.

Rather than treating the site as a passive backdrop for intervention, this analysis positions it as an active determinant of form, experience, and social performance.

Through an examination of its environmental vulnerabilities, historical evolution, urban relationships, and cultural significance, the chapter establishes the foundational conditions that guided the design proposal and its broader thesis intentions.

6.1 Site Positioning and Selection Criteria

The selection of the thesis site was guided by a series of environmental, cultural, urban, and economic criteria directly aligned with the core objectives of the research. The intent was to identify a historic fishing community where the impacts of climate vulnerability, economic pressures, and cultural displacement were visibly present, while also offering opportunities for architectural intervention at both the community and waterfront scale.

Key criteria included:

- Presence of an active and historically significant commercial fishing industry
- Vulnerability to sea level rise, storm surge, and coastal flooding
- Strong relationship between the historic urban fabric and the working waterfront
- Opportunities for public engagement and community-oriented intervention
- Walkability and human-scale urban conditions
- Availability of underutilized or transitional waterfront sites
- Existing tensions between preservation, tourism, economic survival, and climate adaptation

These criteria established the framework for the comparative site investigations conducted across several coastal communities in Massachusetts, ultimately leading to the selection of Gloucester as the most suitable context for the thesis proposal.

6.2 Comparative Site Analysis and Field Research

To better understand the spatial, cultural, and economic conditions of New England fishing communities, a comparative field study was conducted through site visits, observational mapping, ethnographic studies, and informal conversations with local residents and community members. The investigation focused primarily on Gloucester, New Bedford, and Rockport, Massachusetts, each representing distinct relationships between community identity, waterfront activity, and urban form.

6.2.1 New Bedford

New Bedford revealed one of the largest and most economically powerful fishing industries in the United States. The scale of its industrial waterfront, shipping infrastructure, and processing facilities demonstrated the immense operational capacity of the contemporary fishing economy. However, the city's urban condition presented significant physical separation between the historic core and the working waterfront. Large industrial zones and major transportation infrastructure, particularly the interstate corridor, create barriers between the public realm and the waterfront edge.

While New Bedford offered important lessons regarding industrial fishing economies and infrastructural resilience, the scale and complexity of the city suggested that meaningful intervention would require a broader urban strategy operating beyond the architectural scale explored within this thesis.

6.2.2 *Rockport*

In contrast, Rockport presented a smaller and more intimate coastal environment with a strong historic identity and walkable waterfront character. However, field observations and local interactions revealed that the town's contemporary identity is increasingly shaped by tourism, galleries, and artistic culture rather than an active working fishing industry.

Although fishing remains part of Rockport's historical narrative, the waterfront no longer operates at the scale necessary to support the central research questions of this thesis concerning vulnerable working fishing communities and their economic livelihood.

6.2.3 *Gloucester*

Gloucester ultimately emerged as the most appropriate site for the thesis due to its unique balance of scale, identity, and active waterfront conditions. The city maintains one of the oldest and most historically significant fishing industries in the United States while still preserving a direct relationship between the working waterfront and the surrounding urban fabric.

Site visits, ethnographic observations, and conversations with local community members reinforced Gloucester's strong cultural attachment to the fishing industry despite increasing pressures from climate change, tourism, economic shifts, and waterfront redevelopment. Unlike New Bedford, Gloucester operates at a more approachable and human scale, allowing architectural intervention to engage both community life and waterfront infrastructure simultaneously. Unlike Rockport, the fishing industry remains visibly active and culturally embedded within everyday urban life.

Additionally, Gloucester presented significant opportunities for waterfront intervention through transitional edge conditions, underutilized sites, flood-vulnerable zones, and direct public access to the harbor. These conditions aligned closely with the thesis objectives of exploring continuity, adaptability, and coexistence between architecture, community, and water.

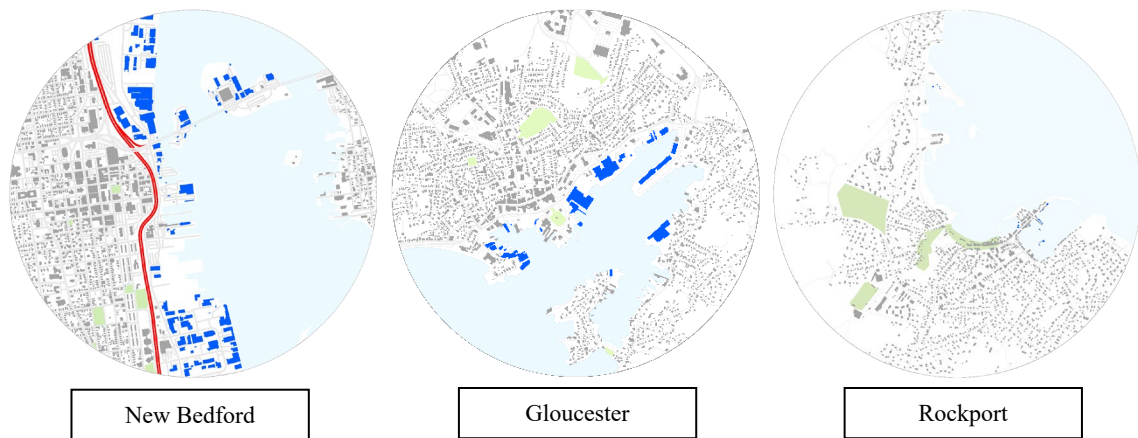


Figure 25: Comparative figure-ground analysis highlighting fishing industry-related buildings in blue within a one-mile radius in New Bedford, Gloucester, and Rockport. All maps are presented at the same scale to compare the relationship between urban fabric, waterfront access, and the concentration of fishing infrastructure.

– Diagram by Author

The comparative figure-ground studies presented in this chapter further illustrate these distinctions by mapping the relationship between each town's urban fabric and fishing industry infrastructure, highlighting Gloucester as the condition where community scale, active industry, and waterfront accessibility most successfully intersect.

6.3 Gloucester, Massachusetts: Historical Context and Site Conditions

Located on Cape Ann along the northeastern coast of Massachusetts, Gloucester is one of the oldest continuously active fishing communities in the United States. Since its establishment in 1623, the city has developed a strong cultural, economic, and spatial identity deeply tied to the Atlantic Ocean and the commercial fishing industry. The harbor, waterfront infrastructure, and surrounding urban fabric evolved together over time, creating a unique relationship between community life and maritime labor that continues to define Gloucester today.⁴⁴

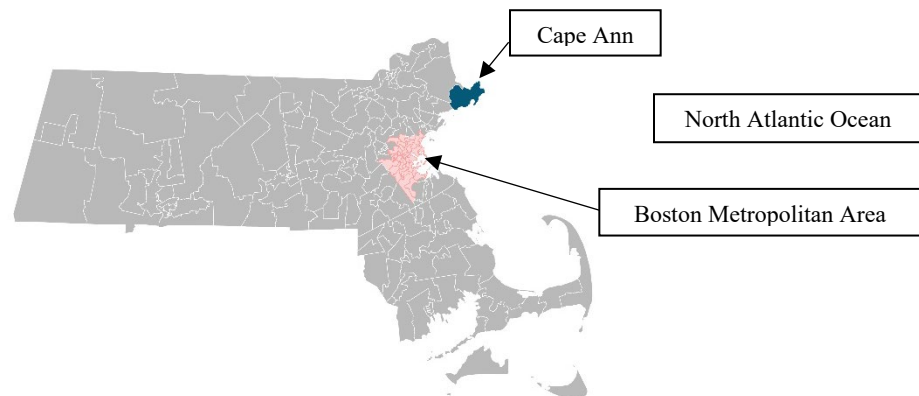


Figure 26: Regional context map locating Cape Ann within the greater Boston metropolitan area along the North Atlantic coast, illustrating Gloucester’s geographic relationship to the broader regional and coastal context. – Diagram by Author

Historically, Gloucester emerged as a major center for cod fishing, shipbuilding, and maritime trade, shaping both the physical development of the city and the livelihoods of its residents. Over centuries, the working waterfront became embedded within the everyday urban experience, where industrial activity, housing,

⁴⁴ Cape Ann Museum, “History of Cape Ann,” accessed May 23, 2026, <https://www.capeannmuseum.org/about/history-of-the-museum/history-of-cape-ann/>.

civic life, and public space coexist in close proximity. This interdependence between city and water remains one of Gloucester's defining characteristics and a central condition informing this thesis.

Today, Gloucester continues to support an active commercial fishing industry despite increasing pressures from climate change, tourism, rising property values, and changing economic conditions. Large portions of the waterfront remain vulnerable to tidal flooding, storm surge, and sea level rise, particularly within low-lying edge conditions surrounding the harbor. Simultaneously, the city faces ongoing challenges related to the preservation of cultural identity, affordable housing, and the long-term sustainability of fishing-dependent livelihoods. These conditions position Gloucester as a critical site for investigating how architecture can mediate between environmental resilience, economic continuity, and cultural preservation. Rather than proposing retreat from the waterfront, this thesis explores how adaptive architectural strategies can reinforce the relationship between community and water while supporting the continuation of Gloucester's working harbor identity.



Figure 27: Historical timeline of Gloucester showing major cultural, economic, and waterfront transformations relevant to the thesis. Selected reference imagery. - Diagram by author.

The timeline and site analysis examine the historical evolution of Gloucester's waterfront, its shifting urban edge conditions, and the environmental and socio-economic forces that continue to shape the city today.

6.4 Land Use

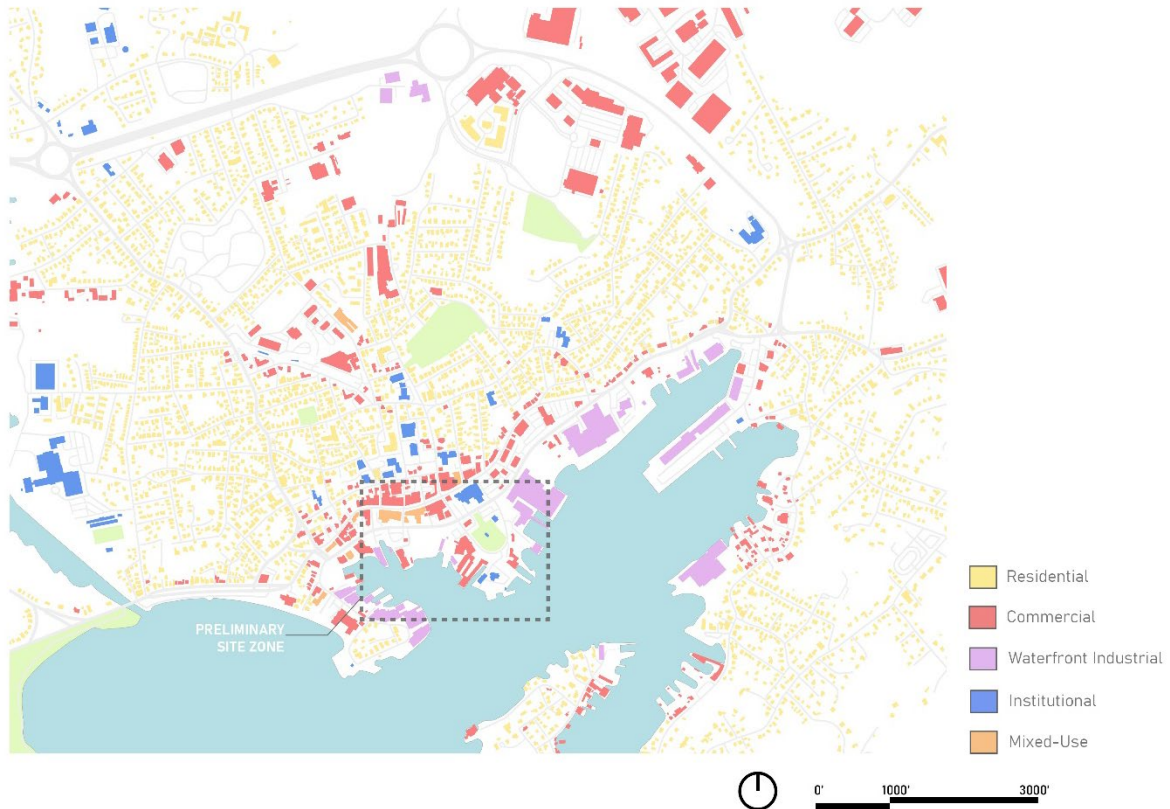


Figure28: Land use and urban morphology analysis of the central waterfront district in Gloucester illustrating the spatial relationship between residential neighborhoods, commercial corridors, institutional buildings, and waterfront industrial infrastructure surrounding the preliminary site zone. - Diagram by author.

The land use analysis reveals a clear spatial hierarchy between Gloucester's working waterfront and its surrounding urban fabric. Waterfront industrial uses associated with the fishing industry dominate the harbor edge, occupying the majority of the direct waterfront access and reinforcing the city's continued dependence on maritime activity and commercial fishing infrastructure. Processing facilities, storage

buildings, docks, and industrial waterfront structures form a continuous working edge along the harbor, establishing a strong industrial presence within the city center. In contrast, residential neighborhoods shift further inland and occupy the higher portions of the urban fabric away from the immediate waterfront edge. This separation reflects both historical patterns of waterfront occupation and the environmental vulnerabilities associated with low-lying coastal conditions. Between these zones, commercial and mixed-use corridors create transitional layers connecting the historic downtown to the harbor, maintaining active relationships between civic life and maritime industry.

The analysis also identifies several underutilized edge conditions and fragmented public waterfront connections surrounding the preliminary site zone. These areas present opportunities to strengthen the relationship between the city and the harbor while introducing resilient forms of occupation capable of adapting to future environmental pressures. Together, these existing urban conditions position the selected site as a critical point of intersection between industrial activity, community life, and coastal vulnerability.

6.5 Historical Evolution of the Waterfront Edge

The following historical overlays reveal that Gloucester's waterfront has never existed as a fixed boundary between land and water, but rather as a constantly evolving edge shaped by industry, infrastructure, and environmental adaptation. Over time, the harbor edge expanded through infill, pier construction, seawall reinforcement, and industrial occupation associated with the growth of the fishing economy. These transformations demonstrate how the city historically adapted its

waterfront to support changing economic and maritime needs while continuously negotiating its relationship with the Atlantic Ocean.

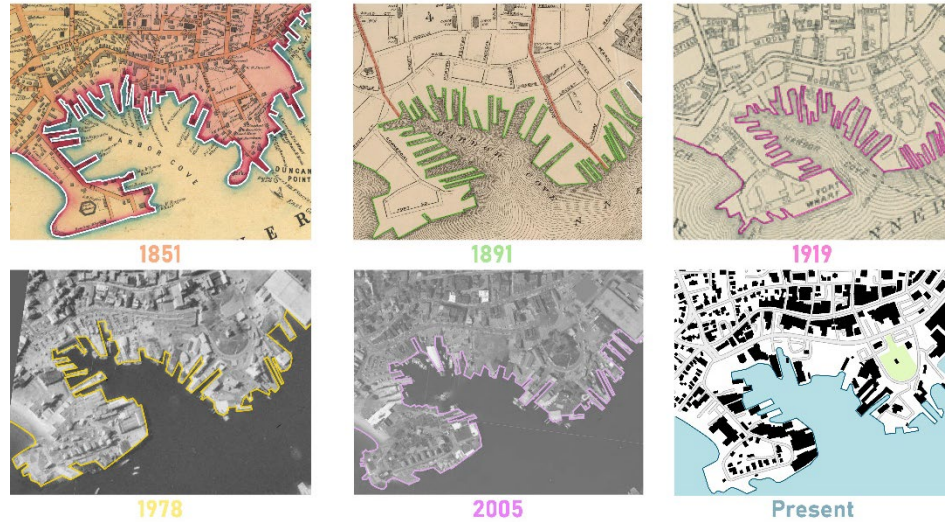


Figure 29: Historical waterfront map of Gloucester illustrating the extent and configuration of the harbor edge during the corresponding historical period. Present(2026) - Diagram adapted and annotated by author.

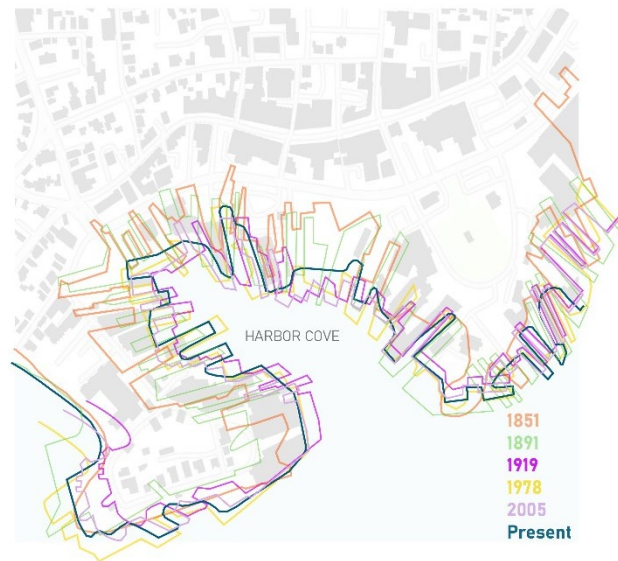


Figure 30: Overlay of historical waterfront edge conditions in Gloucester revealing the gradual transformation, expansion, and reconfiguration of the harbor edge over time. Present (2026) - Diagram by author.

At the same time, the overlays expose the increasing hardening and artificial stabilization of the coastal edge, conditions that now contribute to environmental vulnerability under rising sea levels and intensified coastal flooding. Understanding the waterfront as an evolving and constructed condition rather than a permanent fixed line becomes critical to the thesis, reinforcing the need for adaptive strategies capable of accommodating future environmental change while maintaining continuity with Gloucester's historic working harbor identity.

6.6 Existing Landmarks and Urban Anchors

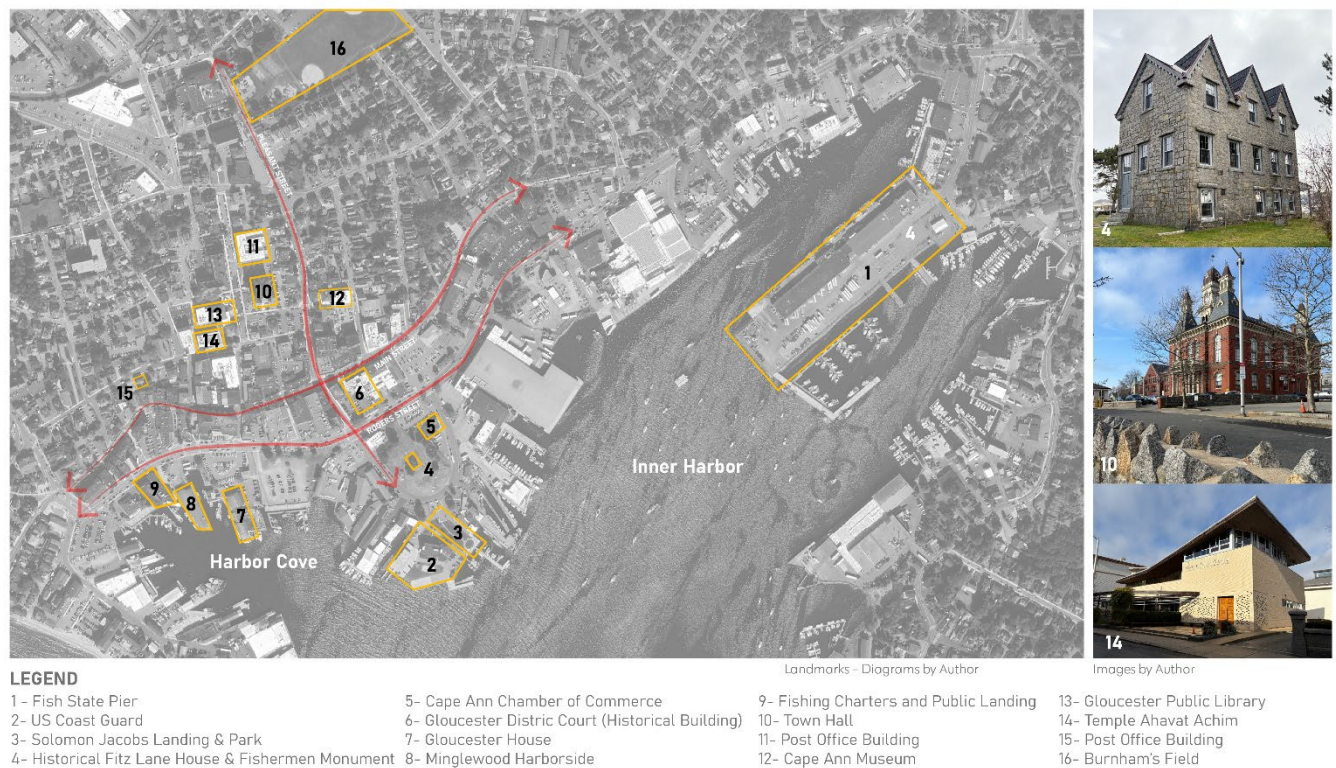


Figure 31: Existing landmarks and civic anchors surrounding the selected site in Gloucester, illustrating the spatial relationship between historic institutions, waterfront infrastructure, public spaces, and the working harbor. -Diagram and photographs by author.

The landmark analysis reveals the concentration of civic, cultural, historical, and maritime institutions surrounding the selected site within Gloucester's waterfront district. These urban anchors contribute significantly to the identity, orientation, and collective memory of the city while reinforcing the strong relationship between the historic downtown and the working harbor. The coexistence of public institutions, maritime infrastructure, historic architecture, and waterfront activity establishes a layered urban condition where civic life and industrial activity remain closely interconnected.

Several landmarks surrounding the site directly reflect Gloucester's maritime heritage and historical dependence on the fishing industry, including Fish State Pier, Solomon Jacobs Landing, the Fishermen's Monument, and the public waterfront landings along Harbor Cove and the Inner Harbor. Simultaneously, civic and institutional buildings such as the Gloucester District Court, Gloucester Public Library, Cape Ann Museum, and Town Hall reinforce the role of the area as both a functional and symbolic center of community life.

The analysis also highlights the strategic location of the selected site at the intersection of multiple urban paths, public destinations, and waterfront corridors. Existing pedestrian and vehicular movement patterns converge near Rogers Street, Main Street, and the harbor edge, positioning the site as a transitional threshold between the historic downtown, residential neighborhoods, and the industrial waterfront. Additionally, the proximity to Henry Fitz Lane House and surrounding public spaces strengthens the cultural significance of the area while providing

opportunities to reconnect the community with the waterfront through new civic and resilient public interventions.

Together, these landmarks establish a strong contextual framework for the thesis proposal, reinforcing the importance of continuity, public engagement, and cultural preservation within Gloucester's evolving coastal edge.

6.7 Architectural and Built Environment Analysis

GLoucester: BUILT ENVIRONMENT - Waterfront

Alvaro Munoz - JEA/OTY Cardiac Spring 2026 | 15



GLoucester: BUILT ENVIRONMENT - Community

Alvaro Munoz - JEA/OTY Cardiac Spring 2026 | 16



GLoucester: BUILT ENVIRONMENT - Historic/Institutional

Alvaro Munoz - JEA/OTY Cardiac Spring 2026 | 13



Figure 32: Built environment analysis of Gloucester illustrating the architectural character and material qualities of residential/community, institutional/historic, and waterfront industrial conditions surrounding the study area. Collage and analysis by author using site photography and selected reference imagery.

The built environment analysis reveals three distinct architectural conditions that collectively shape the identity of Gloucester: the residential and community fabric, the institutional and historic civic core, and the industrial waterfront edge.

Together, these conditions reflect the layered relationship between everyday community life, historical continuity, and the working fishing economy that continues to define Gloucester's urban character.

The residential and community fabric is characterized by compact urban blocks, narrow streets, and vernacular coastal architecture closely integrated within the historic topography of the city. Wood siding, cedar shingles, granite stone foundations, and pitched roof forms dominate the material palette, reinforcing the coastal New England identity of the surrounding neighborhoods. Architectural styles rooted in Colonial and Victorian traditions remain visible throughout the district, contributing to a strong sense of continuity and human scale. Porches, bay windows, small setbacks, and articulated facades create active relationships between buildings and the public realm, fostering a walkable and community-oriented urban environment.

In contrast, the institutional and historic civic buildings establish a more monumental architectural presence within the urban fabric. Structures such as churches, civic buildings, libraries, and historic landmarks often utilize brick masonry, granite stone, and more formal architectural compositions that emphasize permanence, stability, and civic identity. These buildings act as important visual and social anchors throughout Gloucester, reinforcing the historical significance of the waterfront district while contributing to the collective memory of the city.

The waterfront industrial condition presents a dramatically different architectural language shaped primarily by functionality, infrastructure, and labor. Fish processing facilities, storage structures, working piers, and industrial buildings occupy much of

the harbor edge and are characterized by enclosed facades, limited openings, utilitarian construction, exposed infrastructure, and hardened material conditions. Corrugated metal, concrete, weathered wood, steel elements, and heavy industrial surfaces dominate the waterfront environment, creating spaces that prioritize operational efficiency over public engagement or human comfort. In many areas, the relationship between people and the waterfront becomes physically and psychologically distant, with industrial barriers, large-scale infrastructure, and inaccessible edges limiting public interaction with the harbor.

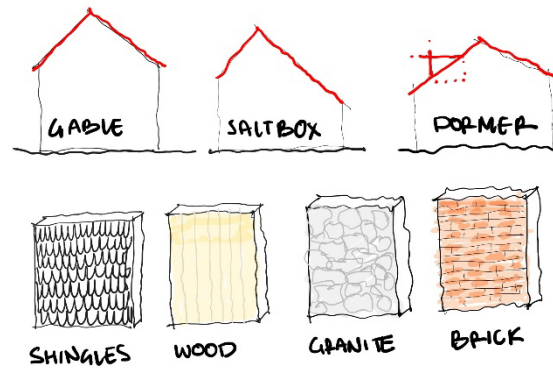


Figure 33: Vernacular architectural roof forms and material palette observed throughout Gloucester, illustrating recurring typologies and material conditions including gable and saltbox roof forms, dormers, wood siding, cedar shingles, granite stone, and brick masonry. - Diagram by author.

These observations became fundamental to the development of the thesis proposal. Rather than removing or replacing the working waterfront, the project seeks to mediate between the human-scaled qualities of Gloucester's historic urban fabric and the necessary industrial realities of the fishing economy. The analysis suggests the opportunity for a more accessible, resilient, and community-oriented waterfront condition capable of maintaining the authenticity of the working harbor while

reintroducing public engagement, spatial warmth, and human experience along the coastal edge.

Additionally, the recurring vernacular roof forms, material palette, and architectural proportions observed throughout Gloucester informed the formal and tectonic development of the proposal. Elements such as gable and saltbox roof profiles, dormers, cedar shingles, wood siding, granite stone, and brick masonry became important references in developing an architectural language rooted in place rather than imposed upon it. Rather than replicating historic architecture directly, the thesis interprets these vernacular characteristics through a contemporary lens, using them to reinforce continuity, identity, and a stronger connection between the architecture, the waterfront, and the cultural memory of Gloucester.

6.8 Physical and Environmental Site Analysis



Figure 34: Existing figure-ground and topographic analysis of the selected waterfront site in Gloucester illustrating the FEMA 100-year floodplain elevation (14 ft), existing urban fabric, waterfront infrastructure, and vulnerable low-lying coastal edge conditions surrounding Harbor Cove. Diagram by author.

The environmental analysis reveals the direct relationship between Gloucester's urban fabric and the vulnerable coastal edge conditions surrounding Harbor Cove. Large portions of the selected site and adjacent waterfront infrastructure exist within the FEMA 100-year floodplain at elevation 14 feet, exposing the area to increased risks associated with tidal flooding, storm surge, and future sea level rise. The analysis demonstrates how the lowest portions of the site occupy the immediate harbor edge, while the urban fabric gradually rises inland following the natural topography of the city.

The floodplain overlay further highlights the tension between environmental vulnerability and the continued dependence on waterfront occupation within Gloucester's working harbor. Rather than existing as isolated infrastructure, the vulnerable edge conditions intersect directly with public streets, industrial facilities, civic spaces, and pedestrian movement throughout the district. These relationships reinforce the need for adaptive and resilient waterfront strategies capable of accommodating periodic flooding while maintaining public access, community continuity, and the operational realities of the fishing industry.

Understanding the floodplain not as a condition to retreat from, but as an active environmental force shaping the future of the waterfront, became fundamental to the development of the thesis proposal and its approach toward coexistence with water.

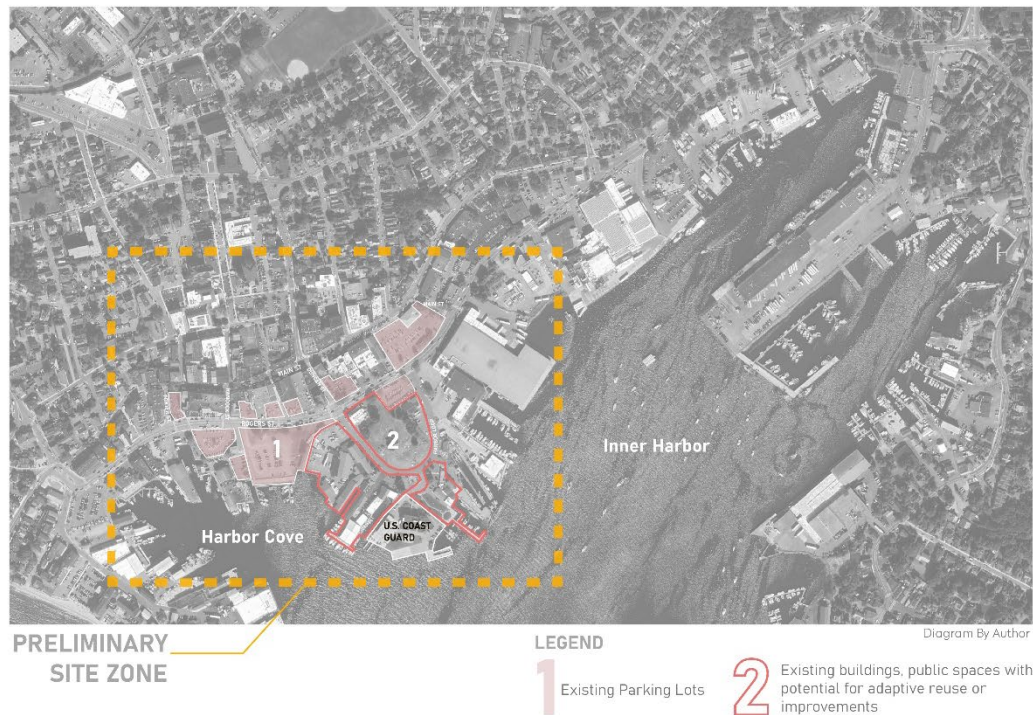


Figure 35: Preliminary site opportunity analysis identifying underutilized waterfront parcels, existing parking lots, and structures with potential for adaptive reuse or removal within the selected study area in Gloucester. Diagram by author.

The preliminary site analysis identifies a series of underutilized and fragmented waterfront conditions surrounding Harbor Cove and Rogers Street that present opportunities for architectural and urban intervention. Existing parking lots occupy significant portions of the waterfront edge and interrupt the continuity between the public realm and the harbor, prioritizing vehicular storage over public engagement, ecological performance, and community access to the water.

Additionally, several existing structures within the study area, many constructed during the mid-twentieth century, exhibit deteriorating physical conditions and limited contribution to the surrounding urban fabric. These buildings create visual and physical barriers along the waterfront while reducing permeability and restricting public interaction with the harbor edge. The analysis suggests

opportunities for selective removal, adaptive reuse, or reconfiguration capable of strengthening connections between the city and the waterfront.

The diagram also reveals the predominance of hardened impervious surfaces throughout the site, contributing to increased runoff, limited ecological performance, and reduced environmental resilience within an already vulnerable floodplain condition. These observations reinforced the potential for introducing more permeable landscapes, flood-adaptive public spaces, and resilient waterfront strategies that can better mediate between urban occupation and the coastal environment while improving public access and continuity along the harbor edge.

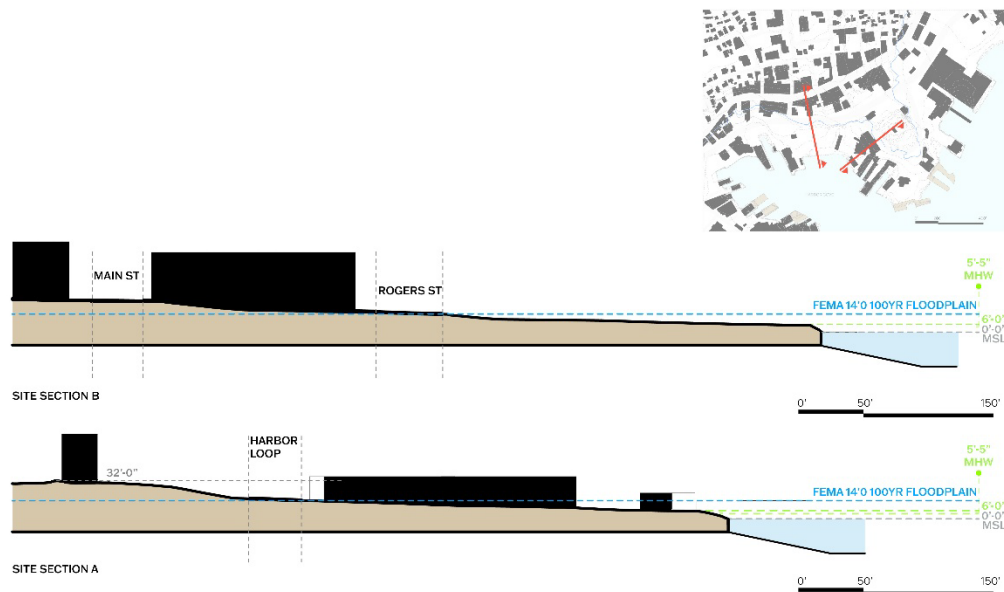


Figure 36: Conceptual site sections illustrating the relationship between existing topography, urban streets, Mean Sea Level (MSL), Mean High Water (MHW), and the FEMA 100-year floodplain elevation (14 ft) across the selected waterfront site in Gloucester. Diagram by author.

The site sections reveal the gradual transition between Gloucester's elevated urban fabric and the low-lying waterfront edge surrounding Harbor Cove. As the topography slopes toward the harbor, large portions of the site intersect directly with the FEMA 100-year floodplain elevation, exposing existing streets, infrastructure, and waterfront structures to tidal flooding and future sea level rise conditions. The analysis further demonstrates how many existing occupied spaces currently engage the floodplain with limited vertical separation from the water.

These sectional relationships became fundamental in informing the vertical organization and resiliency strategies of the thesis proposal. FEMA floodplain requirements establish that occupied residential floors within Special Flood Hazard Areas must be elevated to or above the Base Flood Elevation (BFE), while additional freeboard is commonly recommended to improve long-term flood resilience.⁴⁵ The analysis therefore informed an architectural approach where habitable spaces are elevated above vulnerable flood conditions while lower levels remain more adaptable, permeable, and capable of accommodating periodic inundation and waterfront activity.

Rather than treating elevation solely as a defensive strategy, the sections reinforce the thesis position that architecture along vulnerable coastal edges must negotiate coexistence with water through sectional adaptability, resilient occupation, and flexible relationships between ground, infrastructure, and public space.

⁴⁵ Federal Emergency Management Agency (FEMA), *Lowest Floor*, last modified July 8, 2020, <https://www.fema.gov/about/glossary/lowest-floor>; Federal Emergency Management Agency (FEMA), *Freeboard*, last modified July 8, 2020, <https://www.fema.gov/about/glossary/freeboard>



Figure 37: Existing seawall conditions and documented flooding during the 2018 storm surge event within the selected waterfront district in Gloucester, illustrating vulnerable edge conditions, storm surge impacts, and deterioration of waterfront infrastructure. Image source: City of Gloucester, 2025 Gloucester Municipal Harbor Plan and Designated Port Area Master Plan (2025).

The existing seawall conditions surrounding Harbor Cove reveal the increasing vulnerability of Gloucester’s waterfront infrastructure under rising sea levels, storm surge events, and intensified coastal weather conditions. Portions of the existing edge are composed of historic granite seawalls constructed from locally sourced Cape Ann granite, reflecting the city’s long-standing maritime and quarrying heritage. These historic stone edges demonstrate durability and continuity with Gloucester’s working waterfront identity while reinforcing the material relationship between the city and its coastal landscape.⁴⁶

⁴⁶ City of Gloucester, 2025 Gloucester Municipal Harbor Plan and Designated Port Area Master Plan (Gloucester, MA: City of Gloucester, 2025), 35.

In contrast, more recent concrete seawall interventions exhibit visible signs of deterioration, erosion, and structural stress resulting from repeated coastal flooding and wave action. The documented 2018 storm surge event further illustrates how existing waterfront infrastructure, pedestrian access points, and harbor edges are regularly exposed to inundation during extreme weather conditions and high tide events. These hardened edge conditions often prioritize protection and containment while limiting ecological adaptability and public interaction with the waterfront.

The analysis reinforces the thesis argument that future waterfront interventions in Gloucester must move beyond purely defensive coastal infrastructure toward more adaptive and resilient edge strategies. Rather than treating the seawall as a rigid boundary between land and water, the proposal explores opportunities for layered edge conditions capable of accommodating periodic flooding, improving public engagement, and strengthening the long-term coexistence between the city, the working waterfront, and the coastal environment.

6.9 Site Analysis Conclusion

The site analysis reveals Gloucester's waterfront as a dynamic intersection of environmental vulnerability, industrial activity, cultural identity, and community life. Rather than serving as a passive backdrop, the site actively informs the thesis agenda through its evolving coastal edge, working harbor infrastructure, historic urban fabric, and exposure to future climate pressures.

The comparative studies, urban investigations, and environmental analyses collectively reinforce the need for an architectural response rooted in resilience,

continuity, and adaptability. Simultaneously, the analysis establishes a direct relationship between the proposed program and the physical, social, and economic realities of the site, positioning the project as both a civic and environmental intervention within Gloucester's working waterfront.

These findings establish the foundation for the following design chapters, where the architectural proposal emerges directly from the opportunities, constraints, and spatial conditions identified throughout the site analysis process.

Chapter 7: **Discovery Phase: Conceptual Testing of the Thesis**

Introduction: Iterative Process, Massing, and Parti Explorations

The development of the thesis proposal emerged through a series of iterative design studies exploring how the program could engage Gloucester's waterfront while responding to the environmental, urban, and cultural conditions identified in the previous chapter. Rather than beginning from a fixed architectural form, the process evolved through continuous testing of program distribution, circulation strategies, massing relationships, and public waterfront connections across the site.



Figure 38: Early programmatic iterations exploring spatial organization, circulation, waterfront access, and relationships between community, housing, market, and public open space within the selected site.

Diagrams by author.

Early iterations investigated multiple organizational approaches for locating the community, housing, health and wellbeing, and market programs within the waterfront edge. These studies examined how each component could respond differently to conditions of flooding, public accessibility, views, industrial activity, and connections to the historic urban fabric of Gloucester. Through this process, the

project gradually developed as a layered sequence of public, semi-public, and residential conditions extending from the city toward the harbor.

The iterative studies also explored varying degrees of openness and permeability across the site, seeking to reconnect the public realm with the waterfront while maintaining the operational realities of the working harbor. Particular attention was given to preserving visual and physical connections toward Gloucester Harbor, creating moments of gathering, public access, and interaction with the water throughout the proposal. These explorations informed the placement of civic and community-oriented programs closer to major urban corridors and public arrival points, while more private residential zones were positioned to balance waterfront access, environmental resilience, and neighborhood scale.

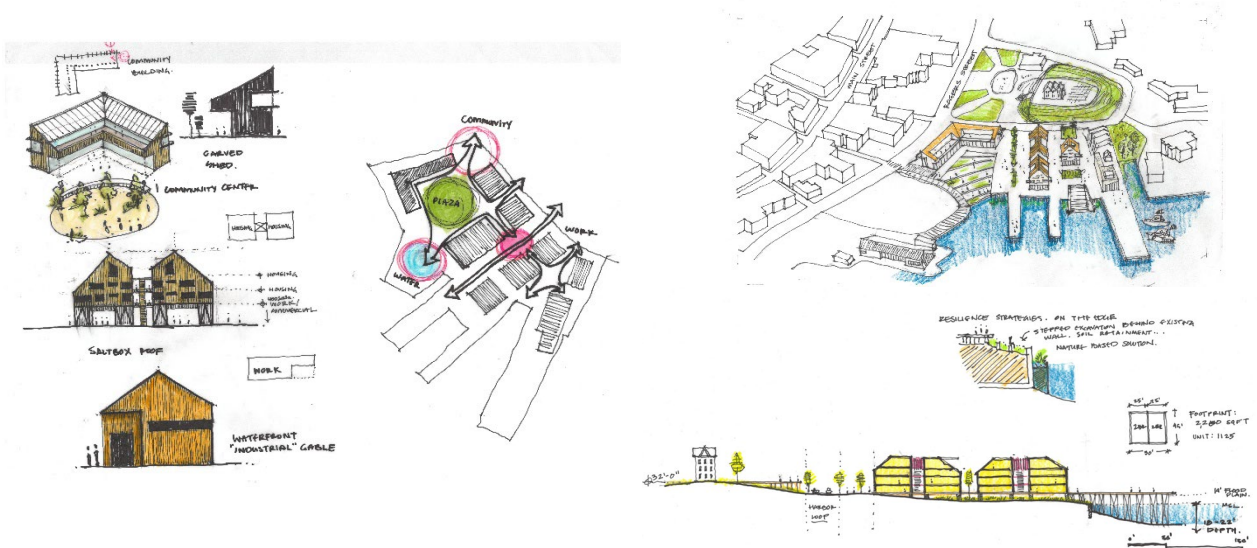


Figure 39: Programmatic and massing iterations exploring spatial organization, circulation, waterfront access, and relationships between community, housing, market, and public open space within the selected site.

Diagrams by author.

Additionally, the design process investigated how the architectural intervention could mediate between Gloucester's industrial waterfront conditions and the human-scaled qualities of its historic urban fabric. Through repeated testing of massing, circulation, and open space relationships, the proposal evolved toward a more interconnected and adaptable waterfront framework capable of supporting community life, economic activity, and resilient occupation along the coastal edge.

Together, these iterative explorations established the conceptual and spatial foundation for the final design proposal presented in the following sections.

7.1 Design Proposal: Parti and Spatial Framework

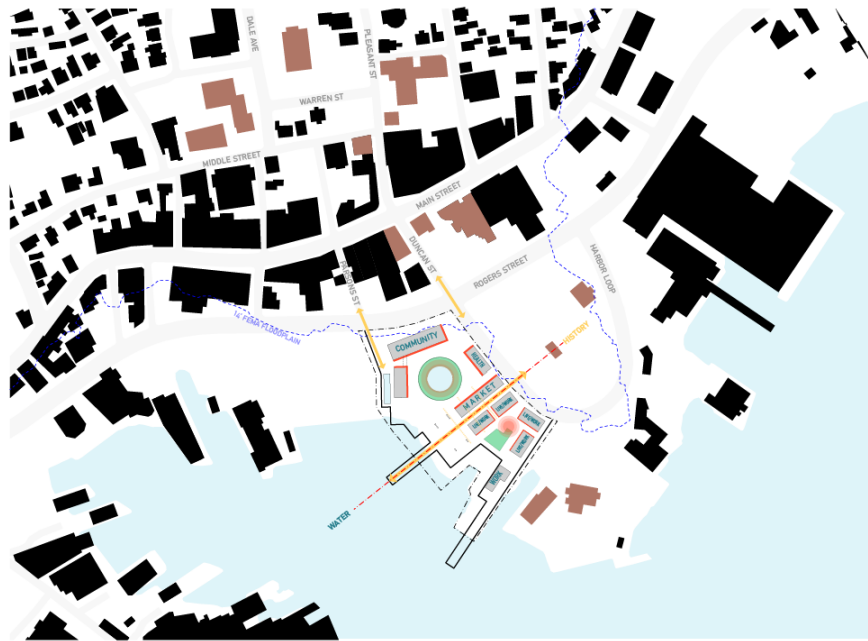


Figure 40: Site parti diagram illustrating the spatial and conceptual framework of the proposal, establishing connections between community, history, the working waterfront, and the harbor edge. - Diagram by author.

The site parti emerges from the intention to reconnect Gloucester's community with its waterfront while preserving and reinforcing the cultural and

economic realities of the working fishing harbor. Rather than separating public life from industrial activity, the proposal seeks to create a layered waterfront condition where community, labor, history, and water coexist through a continuous spatial sequence extending from the historic downtown toward the harbor edge.

The parti is organized around an existing urban condition within Gloucester's historic core: a sequence of institutional and civic buildings extending through Duncan Street toward the intersection at Rogers Street. This urban convergence becomes the critical threshold of the proposal, transforming the corner condition into a new civic opening toward the waterfront. Community-oriented programs are positioned at this edge to continue the institutional presence of the historic downtown while framing a central public plaza that acts as both an arrival space and a transition between city and harbor.

From this civic core, the proposal gradually shifts toward the market and waterfront activities through a series of increasingly porous and open spatial conditions connected by a primary community pier extending into the harbor. Positioned on axis with the historic Henry Fitz Lane House, the pier establishes both a visual and symbolic relationship between the city's cultural memory and the water that shaped its identity. This alignment reinforces the thesis intention of linking history and waterfront occupation through architecture, public space, and movement.

Beyond the civic and market spaces, the parti transitions toward the fishermen's housing, maritime atelier, and working pier, creating a gradient between public occupation and the operational realities of the harbor. Rather than functioning as isolated objects, the buildings and open spaces operate collectively as an

interconnected waterfront framework shaped by continuity, permeability, and coexistence with water.

The resulting spatial organization establishes moments of openness, gathering, work, and reflection throughout the site while preserving visual access to the harbor and strengthening connections between Gloucester's historic urban fabric, its fishing community, and the coastal environment. Through this layered approach, the proposal seeks to redefine the waterfront not as a hardened boundary between land and water, but as a resilient and living civic landscape rooted in the identity of Gloucester.

7.2 Proposed Site Plan and Spatial Organization

The site plan develops the conceptual framework established through the parti into an interconnected waterfront proposal shaped by public access, environmental resilience, and the continuity of Gloucester's working harbor identity. Organized as a gradual transition from the historic urban fabric toward the water, the proposal establishes a layered sequence of civic, commercial, residential, and maritime spaces connected through open public circulation and waterfront access.

Community-oriented programs anchor the western edge of the site adjacent to Rogers Street and Duncan Street, reinforcing the civic threshold between the city and the harbor while framing a central public plaza and gathering space. From this civic core, the proposal transitions toward the seafood market and public waterfront edge before extending outward through the community pier toward Gloucester Harbor. Residential clusters for fishermen and the maritime atelier occupy the eastern portion

of the site, creating a gradient between public occupation and the operational realities of the working waterfront.



Figure 41: Site plan of the proposed waterfront intervention illustrating the spatial organization of community, market, housing, health and wellbeing, and maritime programs within the harbor edge. Drawing by author.

The site organization further prioritizes permeability, visual openness, and coexistence with the coastal landscape through interconnected public spaces, adaptive waterfront edges, and preserved relationships to the harbor and surrounding topography.

7.3 Aerial Axonometric and Waterfront Relationships



Figure 42: Aerial axonometric illustrating the relationship between the proposal, Gloucester Harbor, the Henry Fitz Lane House and Park, and the surrounding urban waterfront context. Drawing by author.

The aerial axonometric reveals the proposal as a cohesive waterfront framework embedded within Gloucester’s historic coastal landscape rather than as a singular isolated object. The massing strategy responds directly to the surrounding urban grain, gradually transitioning between civic buildings, public waterfront spaces, residential clusters, and maritime infrastructure while maintaining visual openness toward the harbor.

The relationship between the proposal and the Henry Fitz Lane House and Park becomes particularly significant within the overall composition. Positioned along the elevated landscape overlooking the harbor, the historic site establishes a

visual and symbolic connection between Gloucester's cultural memory and the waterfront below. The primary community pier extends along this axis, reinforcing the conceptual relationship between history, public space, and the water that shaped Gloucester's identity.

The axonometric further illustrates how the project operates through a series of interconnected open spaces and spatial moments rather than through continuous built mass. Courtyards, waterfront plazas, permeable circulation paths, stepped landscape conditions, and public gathering areas create opportunities for interaction between residents, fishermen, visitors, and the harbor itself. Simultaneously, the proposal maintains the human scale and material language observed throughout Gloucester's historic urban fabric while introducing resilient waterfront conditions capable of adapting to future environmental change.

7.4 Sectional Relationships and Waterfront Resilience



Figure 43: Longitudinal site section perspective illustrating the spatial relationships between community programs, public open space, seafood market, fishermen's housing, and the working waterfront within the proposed harbor framework. Drawing by author.

The site section perspective reveals the proposal as a layered waterfront environment shaped by openness, permeability, and coexistence with the coastal

landscape. By cutting simultaneously through exterior public spaces and interior programmatic conditions, the drawing illustrates how the project operates as an interconnected civic framework rather than as a collection of isolated buildings. The section emphasizes the gradual transition between community-oriented spaces, market activity, residential occupation, and the harbor edge while maintaining continuous visual and spatial relationships to the water.

The drawing further highlights the role of exterior public space as a central organizing element within the proposal. The civic plaza, waterfront terraces, permeable circulation paths, and fishermen's courtyard create a sequence of gathering spaces that mediate between architecture, landscape, and the harbor. These open conditions allow movement, visibility, and interaction between residents, visitors, and fishermen while reinforcing the project's intention of reconnecting the community with the waterfront.

The sectional perspective also demonstrates how variations in form, roof profiles, and building scale respond to Gloucester's vernacular architectural language while creating a diverse waterfront skyline rooted in the identity of the historic harbor. Gabled volumes, elevated residential spaces, and articulated public edges establish moments of compression and openness throughout the site while reinforcing human scale along the coastal edge.

Simultaneously, the section reveals the project's environmental and resiliency strategies through elevated habitable spaces, adaptable lower levels, and flood-responsive landscape conditions integrated within the waterfront edge. Rather than resisting the presence of water through rigid separation, the proposal embraces a more

adaptive sectional relationship between architecture, public space, and the harbor, reinforcing the thesis agenda of continuity, resilience, and coexistence with the coastal environment.



Figure 44: Site sections illustrating the relationship between topography, floodplain conditions, public waterfront space, elevated habitable programs, and resilient coastal edge strategies within the proposal. Drawings by author.

The orthographic site sections further examine the proposal through the relationship between architecture, topography, flooding conditions, and the harbor edge. Extending from the elevated landscape surrounding the Henry Fitz Lane House toward the working pier and Gloucester Harbor, the sections reveal the gradual transition between public space, residential occupation, industrial activity, and water.

The drawings illustrate how the proposal responds to the FEMA floodplain through elevated habitable spaces, adaptable lower levels, permeable waterfront landscapes, and resilient edge conditions capable of accommodating periodic inundation. Rather than establishing a rigid separation between land and water, the

project operates through layered sectional relationships that allow the waterfront to remain active, accessible, and environmentally responsive over time.

The sections additionally reveal the structural and spatial framework of the proposal, including elevated housing typologies, community-oriented public spaces, the seafood market, waterfront circulation, and the working pier infrastructure. These sectional relationships reinforce the thesis intention of creating a resilient coastal framework rooted in continuity, adaptability, and coexistence with Gloucester's evolving harbor environment.

7.5 Spatial Experience and Architectural Relationships

The following section presents the final architectural proposal through a series of experiential renderings, plans, and spatial relationships illustrating how the waterfront framework is inhabited across multiple scales. Moving beyond the broader urban and environmental strategies established in previous sections, the proposal focuses on the lived experience of the waterfront and the interaction between community, labor, housing, and public space within Gloucester's evolving harbor environment. Through variations in scale, materiality, openness, and circulation, the proposal establishes a sequence of interconnected civic, residential, and maritime spaces intended to reinforce continuity between the city, the working waterfront, and the coastal landscape. Together, these spaces seek to create a resilient and human-centered waterfront environment rooted in cultural identity, collective wellbeing, and coexistence with water.

7.5.1 Community Spaces



Figure 45: Conceptual spatial parti diagram illustrating the organizational and circulation framework of the community-oriented waterfront spaces. Diagram by author



CORNER INTERSECTION



COMMUNITY CENTER



PLAZA / CIVIC CORE



COMMUNITY PIER / RETAIL & WORK SPACES

Figure 46: Community-centered waterfront spaces illustrating the architectural atmosphere, public gathering conditions, and experiential qualities of the proposal. Renderings by author.

The community spaces of the proposal are conceived as the primary civic threshold between Gloucester's historic urban fabric and the harbor edge. Organized around a central public plaza and interconnected waterfront circulation paths, these spaces seek to reintroduce openness, gathering, and human occupation to a waterfront historically dominated by industrial and infrastructural conditions. Rather than functioning as singular architectural objects, the buildings collectively define a porous civic landscape where architecture, public space, and water remain continuously interconnected.

At the urban scale, the corner condition at Rogers Street establishes the arrival point into the waterfront intervention. The community center anchors this threshold through a contemporary reinterpretation of Gloucester's vernacular architectural language, utilizing pitched roof forms, wood siding, granite elements, and articulated openings to create a building that feels rooted within the coastal identity of the city. Positioned prominently at the intersection, the building reinforces continuity with the surrounding civic and institutional fabric while opening visually and spatially toward the harbor.

Internally, the community center is organized as a flexible and open gathering environment shaped by natural light, exposed timber structure, and visual connections to the surrounding waterfront landscape. The large communal hall functions as a multi-purpose civic space capable of accommodating community gatherings, cultural events, educational programs, and seasonal waterfront activities. The spatial qualities prioritize warmth, openness, and visibility, reinforcing the thesis intention of creating

architecture that supports collective identity and community continuity within Gloucester's working harbor.

The civic plaza further operates as the social heart of the proposal, creating an open public landscape framed by the surrounding buildings while maintaining uninterrupted relationships to the water. Changes in materiality, topography, planting, and circulation create a sequence of spaces that encourage gathering, pause, and movement throughout the site. The circular water element becomes both a spatial anchor and symbolic reference to the harbor itself, reinforcing the visual and experiential relationship between the community and the waterfront.

Extending toward the community pier and retail/work spaces, the proposal transitions into a more porous and active waterfront condition where public circulation, maritime activity, and everyday occupation intersect. Ground-level workspaces, retail conditions, and sheltered pedestrian paths create a human-scaled waterfront edge that remains active throughout the year while strengthening connections between residents, fishermen, visitors, and Gloucester Harbor. These spaces establish a layered civic waterfront environment rooted in continuity, adaptability, and coexistence with the coastal landscape.

7.5.2 Work/Live Housing & Maritime Atelier



Figure 47: Conceptual spatial parti diagram illustrating the relationship between live/work housing, the fishermen's courtyard, resilient waterfront edges, and the link with the community pier. Diagram by Author.

The live/work housing parti is organized around the intention of maintaining a continuous relationship between community life, maritime labor, and the waterfront edge through a cohesive public circulation framework anchored by the main community pier. Extending from the civic core and marketplace toward the harbor, the pier operates as the primary spatial connector of the proposal, binding together the community spaces, residential clusters, workspaces, and waterfront infrastructure into a unified coastal environment.

The housing clusters are arranged to create a central communal landscape referred to as the fishermen's courtyard, establishing a semi-public gathering space that supports everyday interaction, rest, work, and collective identity among residents and the surrounding community. Rather than functioning as isolated residential objects, the buildings frame the courtyard as a protected yet open environment

connected visually and physically to the harbor, the community pier, and the surrounding waterfront activity.

The parti further integrates resilience and coexistence with water through the use of stepped tidal landscapes shaped by the existing topography of the site. These tidal steps are intentionally designed to accommodate periodic flooding and future sea level rise conditions, allowing water to temporarily inhabit portions of the courtyard while preserving the safety of elevated residential and work spaces above. Instead of resisting water through rigid separation, the proposal embraces flooding as a dynamic environmental condition capable of shaping meaningful public and ecological experiences along the waterfront.

Through this layered organization, the fishermen's courtyard becomes both a resilient landscape and a communal social space where living, working, gathering, and interaction with the harbor remain continuously intertwined. The resulting environment seeks to support not only the operational realities of Gloucester's fishing community, but also the overall wellbeing, identity, and long-term continuity of the community itself.



Figure 48: Work/live housing, fishermen's courtyard, and maritime atelier illustrating the relationship between housing, labor, public waterfront space, and resilient coastal occupation. Renderings by author.

The work/live housing and maritime atelier establish the most intimate relationship between everyday occupation and Gloucester's working waterfront. Positioned along the eastern edge of the proposal adjacent to the working pier infrastructure, these spaces are organized as a layered residential and maritime environment where housing, labor, and waterfront life remain closely interconnected.

Rather than separating living from working conditions, the proposal embraces the realities of the fishing community by creating spaces that support both domestic life and maritime occupation within the same coastal framework.

The housing clusters are organized around shared circulation paths, courtyards, and waterfront gathering spaces that reinforce community interaction and collective identity among residents. Elevated residential units create protected habitable spaces above vulnerable flood conditions while allowing the ground level to

remain more permeable, adaptable, and connected to the public realm. Ground-floor workshops, storage areas, retail spaces, and flexible maritime workspaces activate the waterfront edge while maintaining visual and physical continuity throughout the site. Architecturally, the housing and atelier reinterpret Gloucester's vernacular waterfront typologies through contemporary forms rooted in the material and spatial language of the harbor. Gabled roof profiles, wood siding, elevated timber structures, articulated balconies, and durable coastal materials reinforce continuity with the surrounding built environment while responding to the harsh environmental realities of the waterfront. Architecture intentionally balances warmth and ruggedness, acknowledging both the domestic qualities of housing and the industrial character of maritime labor.

The fishermen's courtyard functions as a central communal landscape mediating between the residential clusters, the seafood market, and the harbor edge. Designed as a resilient public space capable of accommodating periodic flooding, the courtyard incorporates tidal pool conditions, permeable surfaces, native planting, and adaptable waterfront edges that allow water to enter and recede naturally throughout changing tidal and storm conditions. Rather than resisting the presence of water through rigid separation, these spaces embrace coexistence with the coastal environment while creating moments of reflection, gathering, and interaction with the harbor.

The spatial organization additionally reinforces visual relationships between the waterfront and Gloucester's historic landscape. The main community pier aligns directly with the Henry Fitz Lane House positioned on the hill above Harbor Loop,

establishing a continuous visual axis between the harbor, the proposal, and one of Gloucester's most significant cultural landmarks. This relationship strengthens the conceptual connection between history, community, and water while reinforcing the thesis intention of preserving cultural continuity through architecture and public space.

Together, the work/live housing and maritime atelier create a resilient waterfront environment where domestic life, labor, ecology, and public occupation remain interconnected through a layered architectural and landscape framework rooted in Gloucester's evolving coastal identity.



Figure 49: Live/work housing floor plans illustrating the spatial organization, residential typologies, and mixed-use framework supporting Gloucester's fishing community. Drawings by author.

The live/work housing proposal adopts a missing middle housing approach organized through compact multi-unit residential clusters designed to reinforce

affordability, social interaction, and community continuity along the waterfront.

Utilizing a single-stair circulation strategy, the housing typology allows for increased permeability, natural light, cross ventilation, and more intimate residential relationships while maintaining a human-scaled architectural presence rooted within Gloucester's historic urban fabric.

The ground level is conceived as a flexible and adaptable working layer directly connected to the waterfront and fishermen's courtyard. Rather than functioning solely as residential access, this level accommodates conditioned lobbies, resident storage, mail facilities, and flexible workspaces intended for fishermen and their families or partners. These spaces support maritime labor, small-scale commercial activity, gear storage, repair work, and evolving economic needs while maintaining an active and publicly engaged waterfront edge.

The second residential level contains a combination of two-bedroom and one-bedroom units intended to support varying household structures within the fishing community. The larger two-bedroom units primarily accommodate fishermen with children and family households, while the one-bedroom apartments support smaller households, couples, or individual residents connected to the waterfront economy. The organization of the units around shared circulation spaces and communal outdoor areas reinforces opportunities for neighbor interaction, collective identity, and informal community relationships.

The third level continues the residential organization while introducing a one-bedroom plus loft typology intended to support transitional or semi-collective living conditions. In this arrangement, the primary one-bedroom unit functions as a

permanent residence, while the loft level provides temporary accommodation for fishermen returning from sea, workers between landings, or individuals requiring short-term housing connected to the harbor economy. This housing strategy acknowledges the fluctuating and seasonal realities of maritime labor while reinforcing the thesis intention of creating architecture that supports both stability and adaptability within Gloucester's fishing community.

Together, the housing proposal seeks to move beyond conventional waterfront residential development by creating a resilient live/work environment rooted in cultural continuity, collective wellbeing, and the preservation of Gloucester's maritime identity. Through shared spaces, adaptable housing typologies, and direct relationships between living, labor, and the waterfront, the proposal reinforces a stronger sense of belonging and community interconnectedness along the harbor edge.

7.6 Tectonic and Landscape Resiliency Strategies

The tectonic strategy of the proposal supports the broader thesis agenda of adaptability, minimal site disturbance, and coexistence with water. Helical piers are used as a lightweight foundation system that allows the buildings to be elevated above the FEMA floodplain while reducing excavation, site disruption, and dependence on large concrete foundations. Because helical piles are screwed into the ground rather than cast through extensive excavation, they can limit soil disturbance, reduce spoil removal, install quickly, and provide immediate load capacity after

installation.⁴⁷ This makes them particularly appropriate for sensitive waterfront sites where future adaptation, repair, and potential modification are central to the design intent.

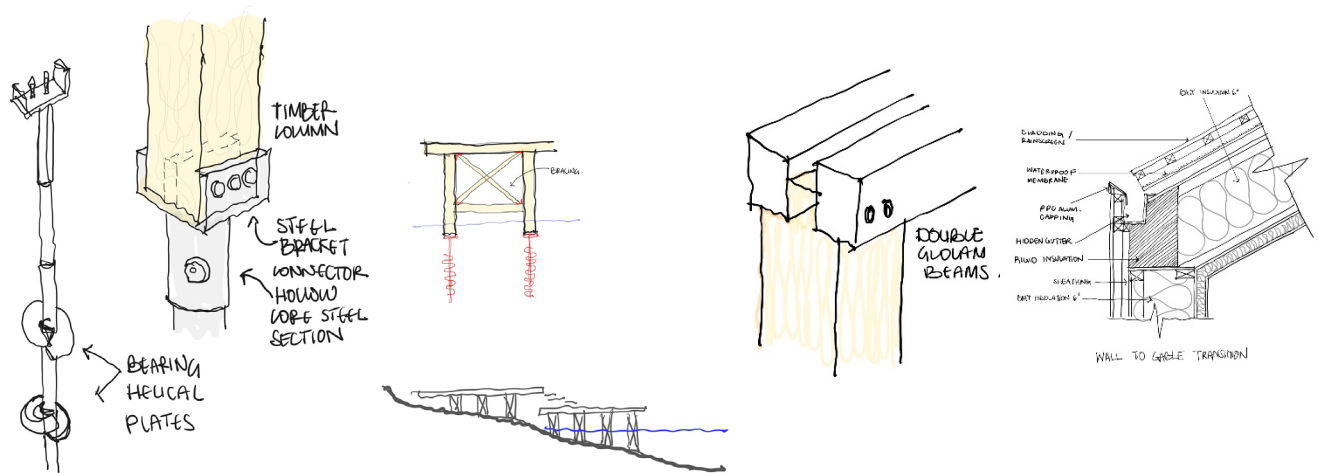


Figure 50: Tectonic and resilient construction diagrams illustrating helical pier foundations, timber-to-steel structural connections, glulam beam assemblies, and coastal envelope strategies. Diagrams by author.

Within the proposal, timber columns connect to steel U-brackets anchored to the helical pier system, creating a raised structural framework that protects habitable spaces while allowing lower levels and landscape conditions to remain more flexible. This tectonic approach reinforces the project’s intention to elevate where necessary, touch the ground lightly, and preserve the possibility for future adjustment as coastal conditions change.

The landscape resiliency strategy works in parallel with the structural system. Rather than relying exclusively on hard coastal defense, the proposal combines

⁴⁷ Hammad Ur Rehman et al., “Helical Pile: An Innovative and Sustainable Foundation Technique,” *Proceedings of the 3rd International Conference on Construction, Structures and Civil Engineering* (2022), https://csce.cust.edu.pk/archive/CSCE_22_conference_proceedings/Paper%20ID.22-603.pdf

reinforced historic granite seawall fragments, salvaged edge conditions, stepped planting zones, tidal landscapes, and living shoreline strategies. NOAA defines living shorelines as approaches that maintain the natural land-water interface, reduce erosion, provide habitat value, and enhance coastal resilience, often through vegetation and natural materials combined with harder elements where needed.⁴⁸

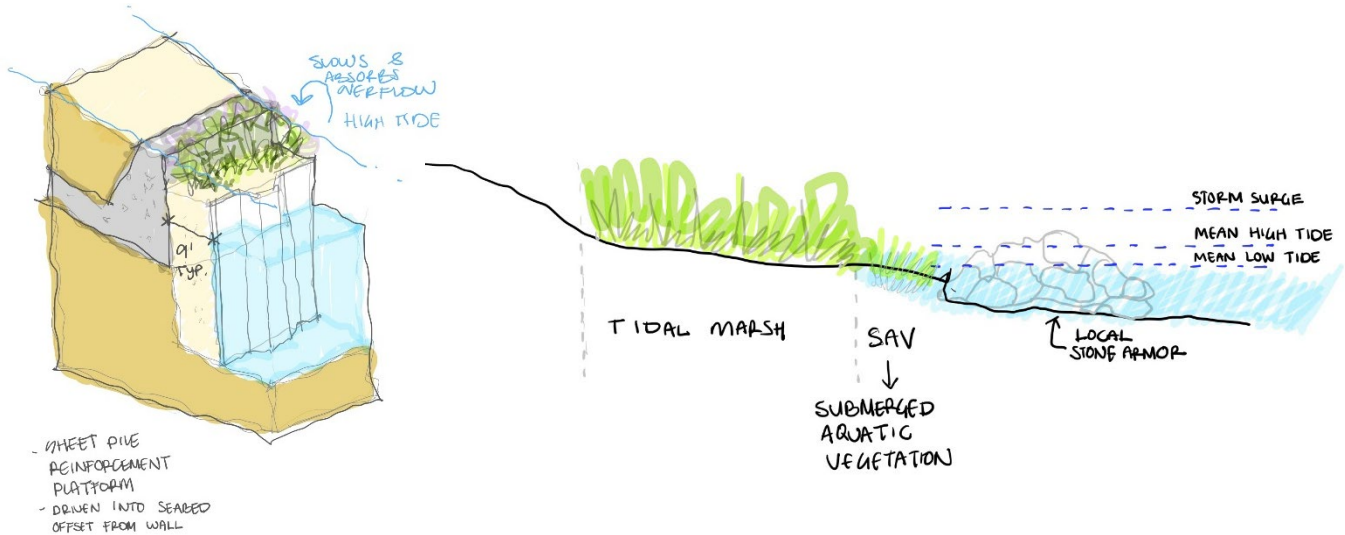


Figure 51: Living shoreline and reinforced seawall strategies combining salvaged granite edge conditions, tidal marshes, submerged aquatic vegetation, stepped planting systems, and localized stone armoring to create a layered gray-green coastal resilience framework. Diagrams by author.

Together, the helical pier system and living shoreline approach create a layered resilience strategy: buildings are protected through elevation and adaptable foundations, while the ground plane is allowed to absorb, filter, flood, and recover. In this way, the proposal treats resilience not as a single defensive line, but as a

⁴⁸ National Oceanic and Atmospheric Administration, *Guidance for Considering the Use of Living Shorelines* (Washington, DC: NOAA, 2015), https://www.habitatblueprint.noaa.gov/wp-content/uploads/2018/01/NOAA-Guidance-for-Considering-the-Use-of-Living-Shorelines_2015.pdf.

sequence of architectural and landscape systems capable of supporting both environmental performance and human experience along Gloucester's waterfront.

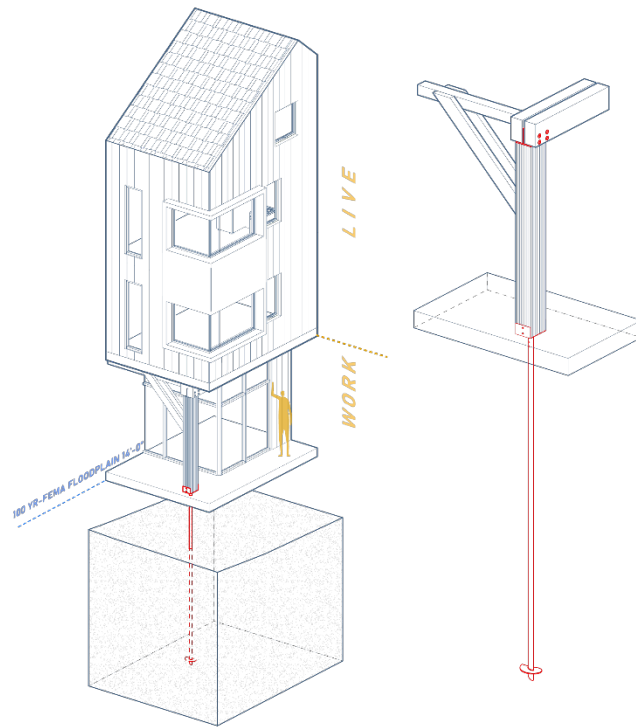


Figure 52: Exploded tectonic diagram illustrating elevated live/work housing supported by helical pier foundations, timber structural framing, and adaptable coastal construction strategies above the FEMA floodplain. Diagram by author.

The elevated live/work housing system utilizes helical pier foundations as a lightweight and minimally invasive tectonic strategy appropriate for Gloucester's vulnerable coastal edge. By concentrating structural loads into a series of slender deep foundations rather than large continuous concrete footings, the proposal significantly reduces site disturbance, excavation, and impact on the existing landscape and hydrological conditions. The elevated timber framework allows habitable spaces to remain protected above projected flood conditions while maintaining adaptable and flexible ground-level workspaces below. Through the integration of timber construction, steel connection assemblies, and helical foundation

systems, the proposal reinforces a resilient architectural approach that prioritizes long-term adaptability, environmental responsiveness, and coexistence with the waterfront landscape.

7.7 Conclusion

The thesis design proposal envisions Gloucester's waterfront not as a fixed boundary resisting environmental change, but as a resilient and adaptive coastal framework capable of strengthening the relationship between community, labor, heritage, wellbeing, and water. Through the integration of civic space, live/work housing, health and wellness facilities, maritime infrastructure, and layered ecological strategies, the project seeks to preserve the cultural identity, historical continuity, mental wellbeing, and economic livelihood of Gloucester's fishing community while responding to the realities of climate change and rising seas.

Rather than separating architecture from the forces of the landscape, the proposal embraces coexistence, flexibility, and collective occupation as fundamental design principles. Public gathering spaces, resilient waterfront edges, therapeutic landscapes, communal courtyards, and adaptable work/live environments are designed to support not only the operational realities of maritime labor, but also the physical and psychological wellbeing of the individuals and families connected to Gloucester's harbor economy. Materiality, form, spatial organization, and landscape interventions draw from Gloucester's vernacular heritage while reinterpreting it through a contemporary resilient framework rooted in place, memory, and community.

In doing so, the proposal positions architecture not as a tool to freeze the past, but as a framework capable of fortifying heritage, continuity, and collective identity through adaptation. The waterfront becomes more than an infrastructural edge; it becomes a shared civic environment where resilience, ecology, labor, and everyday life remain continuously interconnected through architecture that seeks to strengthen both the future and cultural legacy of Gloucester's historic fishing community.

Appendices



Figure 53: School of Architecture and Business School buildings overlaid onto the site for comparative scale analysis. Diagram by author

FISHING AS CULTURAL IDENTITY

Alvaro Nunez - M.Arch Candidate Spring 2026 | 4

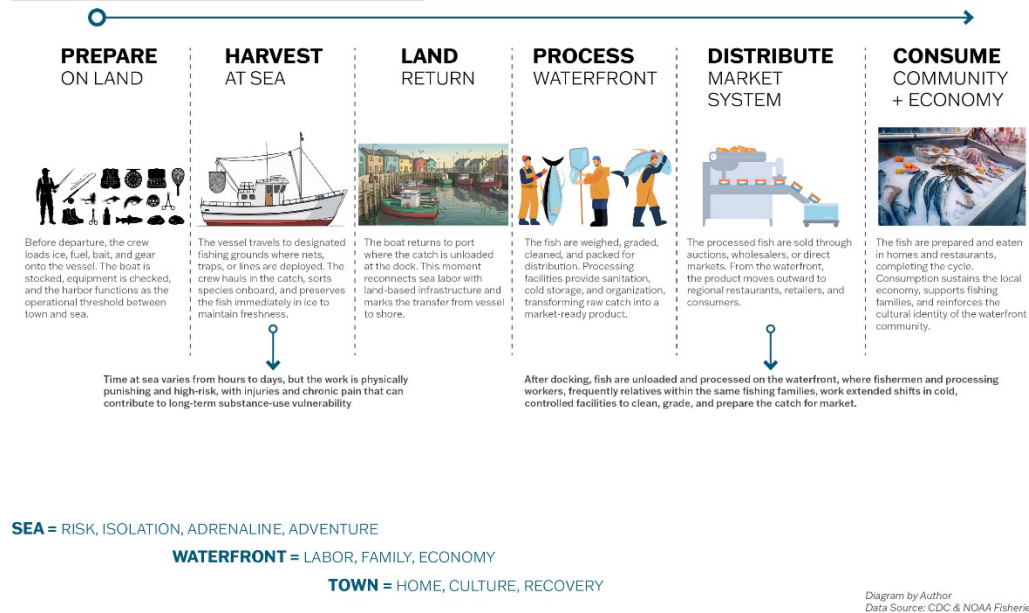


Figure 54: Fishing as Cultural Identity.- Diagram by author

Bibliography

- AlSayyad, Nezar, Mark Gillem, and David Moffat, eds. *Whose Tradition?* Berkeley: International Association for the Study of Traditional Environments, 2014.
- Baker, Lisa. *Built on Water: Floating Architecture + Design*. Braun Publishing, 2014.
- Baca Architects. “Amphibious House.” Accessed Dec 10, 2025.
<https://www.baca.uk.com/projects/amphibious-house/>.
- Beatley, Timothy. *Blue Urbanism: Exploring Connections between Cities and Oceans*. Washington, DC: Island Press, 2014.
- Cape Ann Museum. “History of Cape Ann.” Accessed Dec 26, 2025.
<https://www.capeannmuseum.org/about/history-of-the-museum/history-of-cape-ann/>.
- City of Gloucester. *2025 Gloucester Municipal Harbor Plan and Designated Port Area Master Plan*. Gloucester, MA, March 2025.
- Colburn, Lisa L., Michael Jepson, Lisa Wengrenovich, Timothy M. Seara, and John T. Silva. “Indicators of Climate Change and Social Vulnerability in Fishing Dependent Communities along the Eastern and Gulf Coasts of the United States.” *Marine Policy* 74 (2016): 323–333.
<https://doi.org/10.1016/j.marpol.2016.04.030>.
- Doll, Jason C., and Johnny D. Martin. “A Living Shoreline Approach to Protect Historic Structures on Ocracoke Island.” In *Ports 2013*, 9–18. Reston, VA: American Society of Civil Engineers, 2013.
<https://doi.org/10.1061/9780784413067.002>.
- English, Elizabeth, Natasha Klink, and Scott Turner. “Thriving with Water: Developments in Amphibious Architecture in North America.” Edited by M. Lang, F. Klijn, and P. Samuels. *E3S Web of Conferences* 7 (2016): 13009.
<https://doi.org/10.1051/e3sconf/20160713009>.
- Frampton, Kenneth. “Towards a Critical Regionalism: Six Points for an Architecture of Resistance.” In *The Anti-Aesthetic: Essays on Postmodern Culture*, edited by Hal Foster, 16–30. Port Townsend, WA: Bay Press, 1983.
- Hayden, Dolores. *The Power of Place: Urban Landscapes as Public History*. Cambridge, MA: MIT Press, 1995.

- Huber, Jeffrey. *Salty Urbanism: A Design Manual to Address Sea Level Rise and Climate Change for Urban Areas in Coastal Zones*. New York: Routledge, 2019.
- Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press, 2021.
- Leckie Studio. “Tofino Fishing Pier.” Accessed May 23, 2026.
<https://leckiestudio.com/project/tofino-fishing-pier/>.
- Mahmoudi, S., H. Moftakhari, D. F. Muñoz, S. Radfar, W. Sweet, and H. Moradkhani. “Escalating High Tide Flooding along the Atlantic and Gulf Coast of the United States due to Sea Level Rise.” *Earth’s Future* 13 (2025): e2024EF005328. <https://doi.org/10.1029/2024EF005328>.
- Maltby, Katherine M., Sabrina Kerin, and Katherine E. Mills. “Barriers and Enablers of Climate Adaptation in Fisheries: Insights from Northeast US Fishing Communities.” *Marine Policy* 147 (2023): 105331.
<https://doi.org/10.1016/j.marpol.2022.105331>.
- Massachusetts Office of Coastal Zone Management. *Designated Port Area (DPA) Fact Sheet: Overview and Contact Information*. Boston: Executive Office of Energy and Environmental Affairs, updated February 2024.
- Metropolitan Area Planning Council. *City of Gloucester Hazard Mitigation Plan*. Prepared for the City of Gloucester, Massachusetts Emergency Management Agency, and Department of Conservation and Recreation. Boston: MAPC, 2011.
- National Oceanic and Atmospheric Administration (NOAA). *Fisheries of the United States 2022*. Silver Spring, MD: U.S. Department of Commerce, 2023.
- Naylor, Larissa A., Hugh Kippen, Martin A. Coombes, Bruce Horton, Mairi MacArthur, and others. *Greening the Grey: A Framework for Integrated Green Grey Infrastructure (IGGI)*. Glasgow: University of Glasgow, 2017.
- Parolek, Daniel G., and Arthur C. Nelson. *Missing Middle Housing: Thinking Big and Building Small to Respond to Today’s Housing Crisis*. Washington, DC: Island Press, 2020.

Price, Lisa L., and Nemer E. Narchi, eds. *Coastal Heritage and Cultural Resilience*. Ethnobiology Series. Cham, Switzerland: Springer Nature, 2018.
<https://doi.org/10.1007/978-3-319-99025-5>.

Renzo Piano Building Workshop. "Jean-Marie Tjibaou Cultural Center." Accessed May 12, 2026. <https://www.rpbw.com/project/jean-marie-tjibaou-cultural-center/>.

Sahrhage, Dietrich, and Johannes Lundbeck. *A History of Fishing*. Berlin: Springer, 1992.

Sammarco, Paolo, Piera Fischione, Alessandro Romano, Giorgio Bellotti, and Sergio Dalla Villa. "Prototype Data Analysis of the Dynamics of the Venice Gate-
Barriers during an Extreme Storm Event." *Coastal Engineering* 196 (2024):
104623. <https://doi.org/10.1016/j.coastaleng.2024.104623>.

Savoy, Daniel. *Venice from the Water: Architecture and Myth in an Early Modern City*. New Haven, CT: Yale University Press, 2012.