Coastal areas have been urbanizing for centuries. The expansion, building and retrofitting of urban waterfronts must confront the urgent challenge of how to adapt to increasing floods, storms and sea level rise. The historic dependence on the sea, for trade and exchange, is no longer a driving force in the shaping of urban waterfronts’ form and infrastructure. In many cases, the relationship to the sea does not solely define a city’s socio-economic milieu. In the age of sea level rise, the sea has become a threat or risk to citizens, a thing to protect and defend against, or retreat from. Waterfront urbanism now carries a heavy burden of damage, loss, and vulnerability.

How are coastal cities responding to these challenges? How can physical and spatial design, and urban planning aid in preparing cities to adapt to these new conditions? Can these dangers also create new opportunities for cities to promote resilience, livability and socio-equitable growth? The studio will combine research and urban design around the theme of ’rising seas in the age of climate change’ for the city of Boston and its surrounding neighborhoods. The first part of the studio is a collective research effort that will analyze selected cities and contemporary projects around the world that address these challenges.

The studio will provide a trip to the Netherlands and England to visit existing design solutions and discover cutting edge precedents. The second part of the studio will engage individual and group design projects for two water edge sites in Boston’s neighborhoods. A series of lectures from experts working in Boston will visit the studio to share the most current data and thinking on the overwhelming challenges facing the city and the larger metropolitan area along the coast over the next fifty years.
Part 1
1. Urban Research

4 exercises during the period of Sept. 7 – Oct. 3.
Final review of all exercises Oct. 3

1. Re-charting the water edge: from line to space:

The studio will divide into pairs (SMArch + DUSP), each pair will document and analyze a different existing coastal city (selected from the list below) through a series of drawings at three urban scales: citywide, borough/township, and neighborhood (scales: 1:50,000, 1:10,000, 1:2000/1:1000 tbc) of the urban edge. We ask to explore the meeting of land and water within the urban territory by questioning the nature of this meeting from its traditional conception as a line to its possible future as a zone or space. The drawings will explore the current and future impact of the sea onto the land. We ask: how was this line initially created? What is it made of and how ‘thick’ is it? what are the urban and infrastructural elements that define it and what are the forces that have and continue to shape it? The drawings will incorporate projected sea level rise and storm surge flooding to reveal a new urban area yet to be impacted by water.

Format: 3 black and white drawings, plan and section, each scale shown on 30” x 30” size sheet printed on a premium heavy bright white matte finish paper.
Timeframe: Sept. 7 – 14 pin up (long lounge)

2. Analysis of selected projects:

Each city in the list of case studies includes 1 -2 selected projects that address the urban waterfront. Student pairs will analyze the projects with an emphasis on how they relate to the urban water-edge analysis done for the city.

Format: 4 11”x17” sheets, of which one is a diagram describing the core elements of the project.
Timeframe: Sept. 14 – 21
3. Inventory of urban elements:

Departing from the scale analysis of exercise 1) each pair will identify urban elements derived from their assigned city, draw and catalogue them according to four major categories. A working table/grid (described below) will be used to organize the elements of each category.

**Categories: Y1 – Y4**

- **Buildings:** the built 'objects' that make up the urban environment: primarily refers to the variety of building types that make up the city, from the small street scape elements to larger monuments.
- **Urban Spaces:** spaces constructed in the city: from streets to squares, spaces of movement and repose.
- **Natural Elements:** vegetation, trees, soil, wind, sun
- **Networks:** transportation, communication, energy. Include the various infrastructure elements that make up the networks that create urban connections.

**Types: X1 → Xn**

Represents the types of elements. For example in regard to buildings– courtyard, slab, low-rise, mid-rise, tower, curved, shell structure, etc. Whether defined by a typological, geometric/formal or scale aspect.

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**Format:** table will be drawn within the dimensions of 30” x 30”. All drawings in black and white printed on a premium heavy bright white matte finish paper.

**Timeframe:** Sept. 21 – 28

4. Policy Analysis

Comparative study of the strategies and policies addressing climate change, sea level rise, flooding, risk management and resiliency in the case study cities.

**Format:** ppt

**Timeframe:** Sept. 28 – Oct. 3
Part 1
1. Urban Analysis: The City Case Studies

1. San Francisco Bay Area
Micro Polders / Kristina Hill (UC Berkeley)
India Basin / Bionic

2. Miami
Miami Beach / Isaac Stein

3. NYC
Meadowband / CAU+ZUS
Rising Currents Competition / Matthew Baird et al

4. Rotterdam/Amsterdam
Afsluitdijk / West 8
The Sand Engine (Zandmotor) / Netherlands

5. Malmo
Dania Park / Thorbjörn Andersson
Anchor Park / SLA
Bo01 District /

6. Hamburg
Hafencity /

7. Copenhagen
Long-term Climate Change Adaptation Plan / Citywide Cloudburst Masterplan

8. Singapore
Modular CALTROPe Mangrove Structures / Szövetség’39
Forest City / Sasaki
*Resource: Singapore Underwater / The Straits Times

9. Sidney
*Policy: Mapping and Responding to Coastal Inundation
Subtropical Sydney / OPSYS - Pierre Bélanger, Miho Mazereeuw, Christina Milos, Andrew tenBrink, Erik Prince, Sarah Thomas
Embassy of Drowned Nations: Floating City for Rising Tide Victims / OCULUS

10. Newcastle
Newcastle University Urban Water Research Facility / Urban Observatory /
1. Analysis and mapping: impact of sea level rise and storm surges on Boston (done in groups) (2 weeks)

Establishing base predictions and ranges of impact and mapping current and future scenarios based on the following ‘layers’:

**Environmental:** flooding from sea level rise and storms (will act as the underlying base for the other layers of analysis)

**Economic:** commercial value of areas impacted, ‘cost of loss’ if nothing is done, insurance, etc.

**Social:** social vulnerability (there are measures currently being used to evaluate this, but can be questioned), demographics, race, considering projected population growth, migration, etc

**Infrastructure:** Existing to be impacted,

2. Strategies and visions: Studio divides into 2-3 groups each works on developing a strategy, based on concepts/directions provided: (1 week)

This phase will begin to shape urban design ideas through strategies and visions about the future transformation of Boston’s relationship with its water edges. Strategies will examine multiple scales and potential scenarios, and act as a point of departure for the projects to come.

**Format:** 1. PPT and printed drawings/maps  
**Timeframe:** Oct. 17-26

**Format:** 1. PPT  
**Timeframe:** Oct. 17-26
Part 2
Boston: The Strategies

Resilient Districts

Why the urban district scale? Resiliency at the district scale is a growing trend for adaptation planning in cities. Our resilient district concept is a performance-based set of design and planning strategies that capture agglomeration benefits, mitigate systemic risks, and address socioeconomic concerns of long-term climate adaptation in coastal cities. Having strategies available allows cities to conceive of the resilience dividend over time while beginning to answer the difficult question of what projects should be conducted at the urban scale to combat climate-induced risk of sea level rise and climate change.

These strategies will focus on physically designing resilient districts for Boston. However it is important for design and planning students to know that resilient districts are not just a spatial solution, but also depend upon carefully matching socio-political engagement and economic tools at the appropriate spatial scale. Traditional public policy suggests that the district should be as large as possible to incorporate externalities. Thus, as cost-effective adaptation strategies might require action in another jurisdiction, the decision-making unit (DMU) must have a legal framework, enforcement structure, and validation mechanism to meet process and outcome concerns.

Residents and business operators could have different mechanisms for effecting adaptation measures over time. For example, logistic spaces linked to rail lines and/or port facilities along the water’s edge typically cluster in areas that are vulnerable to long-term sea level rise. The benefit-cost calculus of increased resilience for these critical infrastructural or other high value areas (such as waterfront retail) has already yielded risk mitigation funding mechanisms such as public agencies or Business Improvement Districts. As the size of the DMU increases, the climate-related risks they face, their policy concerns, and their socioeconomic characteristics will become more heterogeneous, and implying that agreement on adaptation strategies will prove less feasible. Thus, there is a trade-off between the incorporation of externalities and the increasing potential for conflict and disagreement. Designers and planners can help balance the perception of these issues, making their scale malleable and manipulable.

With these issues in mind, the Norman B. Leventhal Center for Advanced Urbanism at MIT (LCAU) developed a concept framework for resilient districts which will be applied in Boston through your efforts.

1. The identification and protection of Critical Infrastructure
Geospatial analysis will reveal transportation, energy generation, transmission, and food storage networks that are highly vulnerable to flooding throughout coastal areas. They are also interdependent, implying that severe damage to one will impair others, and thus multiply the scale of devastation. The district strategy emphasizes affordable and adaptable armaments such as breakwaters, floodwalls, levees, and dikes around critical infrastructures.

2. Creating a Thick and Redundant soft / hard Infrastructure
The second strategy is to create a thick line of defense that combines hard and soft infrastructure, leveraging opportunities with existing linear features such as highways and rail corridors. Coupled with hard structures (walls, dams, dikes, and stairs), protective earthworks (terraces, mounds, and berms) must be built parallel the coastline.

3. Up-zoning High Grounds
Located on the landward side of the thick line, up-zones follow high ground around the urban complex where it is safe from sea level rise and flooding potential. These areas would receive density-based transfer development rights from down-zones via discretionary and incentive mechanisms typical of downtown districts. This strategy complements long-standing environmental planning goals such as density clustering and Transit Oriented Development.

4. Down-zoning Low Lying Areas through “flux codes”
On the sea-facing side of the thick line of defense, a rating system for newly designated down-zones would evaluate existing and proposed structures for their ability to withstand storm surge inundation, saline conditions, and wave action. It will also include areas that are designed and zoned to receive variable inundation levels at various times of the year and in the future.
Chelsea Creek

Chelsea “Creek” is one of four major rivers that flow into Boston Harbor. Separating the communities of Chelsea from the cities of Boston and Revere, the river’s tidal ecosystem was radically transformed during the 19th and 20th centuries as surrounding marshes were reshaped and hardened with concrete and timber-decked piers, riprap slopes, and steel sheet bulkheads to accommodate heavy industry. Today, the area around Chelsea Creek is managed as a Designated Port Area (DPA) by the Office of Coastal Zone Management (CZM), and is governed through a complex overlay of federal, state, and local regulatory agencies.

Most of the area’s major land use patterns have been influenced by its context. As a result of its proximity to Boston, Chelsea has become the site of critical distribution centers such as the New England Produce Market. Additionally, the waterfront area around Chelsea Creek is marked by large clusters of petroleum storage facilities, airport-related commercial and industrial activity, as well as massive stockpiles of sand and salt used by the Department of Transportation for state-wide roadway maintenance.

Long-term industrial uses of the waterfront here have resulted in high levels of contamination from heavy metals and other hazardous materials - a major limiting factor for potential future redevelopment. Additionally, several of the area’s Combined Sewer Overflows (CSO’s) discharge untreated wastewater into the Chelsea Creek during periods of heavy rain.

According to the 2010 Census, 25 percent of the residents in this area identify as being minority and/or having low-income. Most of the residential areas along Chelsea Creek abut or are within an Area of Critical Environmental Concern (ACEC). These areas are less than 10 feet above sea level and are very likely to be flooded during a major storm event.
South Boston is a peninsula located southeast of Downtown Boston, bounded by Fort Point Channel and Dorchester Bay. Most of South Boston’s land mass was formed during the first half of the 20th century as the result of several major land reclamation projects. In recent years, the area, which was originally developed to house regional rail infrastructure, has experienced rapid transformation as the result of a development boom and significant private investment.

From 2010–2013, the South Boston Waterfront was the fastest growing urban area in the commonwealth, adding approximately ten million square feet of commercial and residential buildings. The waterfront has become a hub for recreation and culture, with the expansion or opening of numerous attractions, including the Boston Convention and Exhibition Center (opened 2004), Institute of Contemporary Art (opened 2006), and Boston Children’s Museum (renovated 2007), among others. The South Boston Waterfront is expected to increasingly become a mixed-use neighborhood with a large residential population.

With fifty percent of its land area at or below 21 inches of sea level, the South Boston Waterfront consistently faces the greatest regional exposure and potential losses to coastal flooding across all sea level rise conditions and flood events. In the near term, a significant portion of the South Boston Waterfront is exposed to high-probability coastal storms (10 percent annual chance events). South Boston’s exposure will increase significantly over the course of the century, with a substantial portion of the South Boston Waterfront exposed to both chronic high-tide flooding and more severe flooding during coastal storms. Over the century, flooding from Fort Point Channel and Dorchester Bay will increase, exposing several residential areas as well as critical transportation and energy infrastructure.
## Schedule

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<td><strong>September</strong></td>
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<td><strong>Guest Jury</strong></td>
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History / Theory:


14. Short, John R; Liquid City: Megalopolis and the contemporary Northeast; Washington DC, 2007


Policy Based Research:


**Boston:**


