

LIVING WITH WATER: A CASE STUDY FOR COASTAL MIXED-USE MULTIFAMILY RESIDENTIAL STRUCTURES

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ABSTRACT

This examines *The Eddy*, a new construction mixed-use, multifamily residential project in Boston, MA USA as a model for sustainable and resilient urban waterfront redevelopment that celebrates place – rather than evoking fear – while building a sense of community and continuity along the waterfront. *The Eddy* is situated in the neighbourhood of East Boston on low-lying, reclaimed former-industrial land. Because of its place along the waterfront, this building is one of many projects viewed as a linchpin for a unified front against rising sea level, storm surge, and climate change for the entire neighbourhood. This study explores drivers for resiliency on this project, as well as strategies and tools used by the designers, construction team, and municipality leadership in incentivising and directing sustainability and resiliency efforts in a coordinated fashion on this and adjacent properties. Then, the paper explores the project’s siting, landscape, architecture, interior design, and mechanical considerations and how each impact greater sustainability and resiliency outcomes. Finally, the paper will share the results of these implemented strategies, including operational cost savings, project marketability, and reduced insurance premiums as a result of the resilient and sustainable design approach, proving synergy and return on investment for implementation of each in tandem. The goal is to illustrate that through cooperation between public and private partnerships, cities can grow and densify intelligently while promoting increased resiliency, sustainability, density, identity, and waterfront access – applicable to any waterfront city.

Keywords: resiliency, sustainability, landscape, regenerative design, housing, multifamily, climate change, urban planning, urban design, architecture.

1 INTRODUCTION

The inexorable drive for increased urban density and our innate desire for close proximity to the waterfront drives development; enriches connectivity to history, nature, and recreation; and provides opportunities for memorable open spaces. However, threats to the built environment posed by climate change and natural disasters (Fig. 1) – so recently tragically revealed by Hurricanes Harvey, Irma and Maria – are a major concern as we move into a less predictable and more dynamic future. What lies ahead for real estate in dense coastal cities as they strive for intelligent growth?

2 A SMART APPROACH ON A VULNERABLE WATERFRONT

Among the most vulnerable North American cities to climate change is Boston, currently undergoing its most rapid growth of its 387-year history [1]. Billions of dollars are being invested into new mixed-use developments and neighbourhoods. Boston’s economic vitality, like many growing urban centres, is based on it being a nexus for several industries: finance, education, healthcare, and research. Boston occupies primarily reclaimed land (Fig. 2), linking a collection of former islands and peninsulas, resulting in its current urban morphology. While the city’s aged infrastructure and existing building stock are already vulnerable to the previously mentioned challenges, the majority of new development continues to occur within the most vulnerable, low-lying reclaimed areas closest to the coast. While a wonderful problem to see such strong demand from a real estate perspective, it is a long-term challenge to protect these properties from climate change, namely rising sea level.



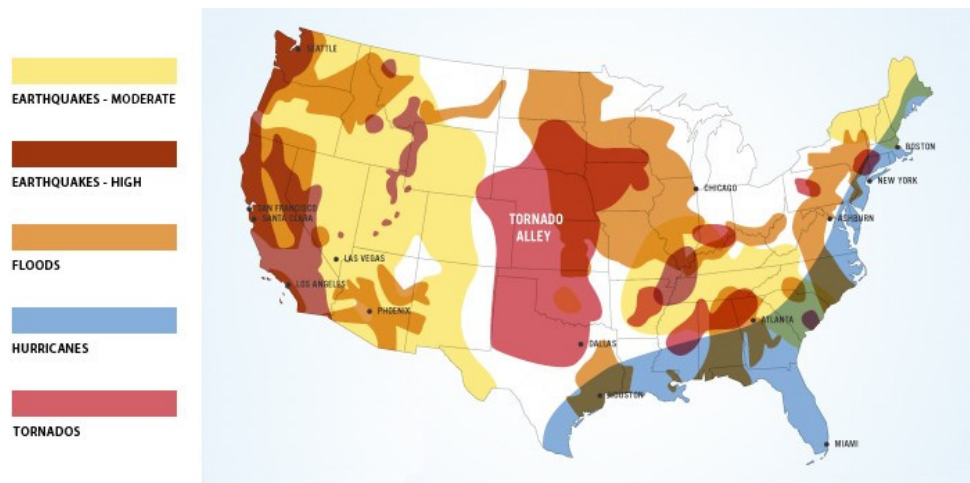


Figure 1: Layering of regional natural disaster risks relative to major North American cities. (Source: www.alertsystemsgroup.com.)



Figure 2: Illustration of Boston's historic expansion through large-scale land reclamation. (Source: www.theshawmutproject.org.)

While this poses stark challenges, developers are learning from previous storms like Hurricanes Sandy and Katrina to formulate cost-effective strategies, which protect built developments and enhance waterfront access, while promoting initial and operational cost savings. A good example of smart development in Boston that is replicable in other coastal cities is *The Eddy*, a 267,500 sf (24,850 m²), \$104 (£79) million residential mixed-use

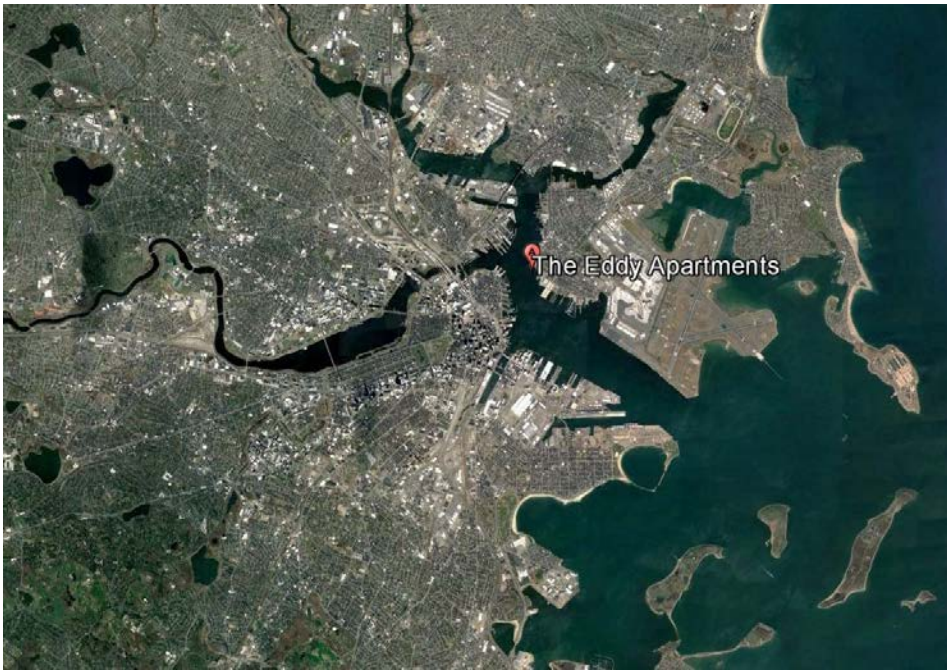


Figure 3: Modern-day Boston illustrating the location of The Eddy within the East Boston neighbourhood, adjacent to the airport. (Source: www.googleearth.com.)

development on 4 acres of previously underdeveloped waterfront property in East Boston, one of the lowest-lying, most vulnerable neighbourhoods in the city (Fig. 3). Designed by Stantec, it features 259 apartments, 5,000 sf (465 m²) of commercial space, parking, and public waterfront parks.

3 MUNICIPAL GUIDANCE

While much credit can be given to an informed client and a capable design and construction team, policy, and municipal planning support, with incentives to guide the development towards doing what was right for its parcel and respective neighbourhood, was crucial. Boston is ahead of other major US cities, having required since 2007 that large developments (> 50,000 sf/4,650 m²) demonstrate resiliency and sustainability features in order to obtain a building permit. The Boston Planning & Development Agency (BPDA) requires these projects demonstrate LEED Silver compliance and comply to a resiliency checklist, focused on identifying floodplains, water body proximity, site porosity, materials, systems, and their ability to adapt over time to climate change, including increased heat, sea level rise, and precipitation. To aid teams, the BPDA developed the Climate Ready Boston Map Explorer tool (Fig. 4), an online GIS map that visualises these impacts over all individual parcels within the city. Using this free online tool, teams can make informed decisions to guide permit approval and better design outcomes.

In 2017, Boston launched *Imagine Boston 2030*, its first comprehensive masterplan in over 50 years [2] to offer a vision for the future growth and prosperity of the city. Both sustainability and resiliency were key drivers in the masterplan. Anticipating its evolution

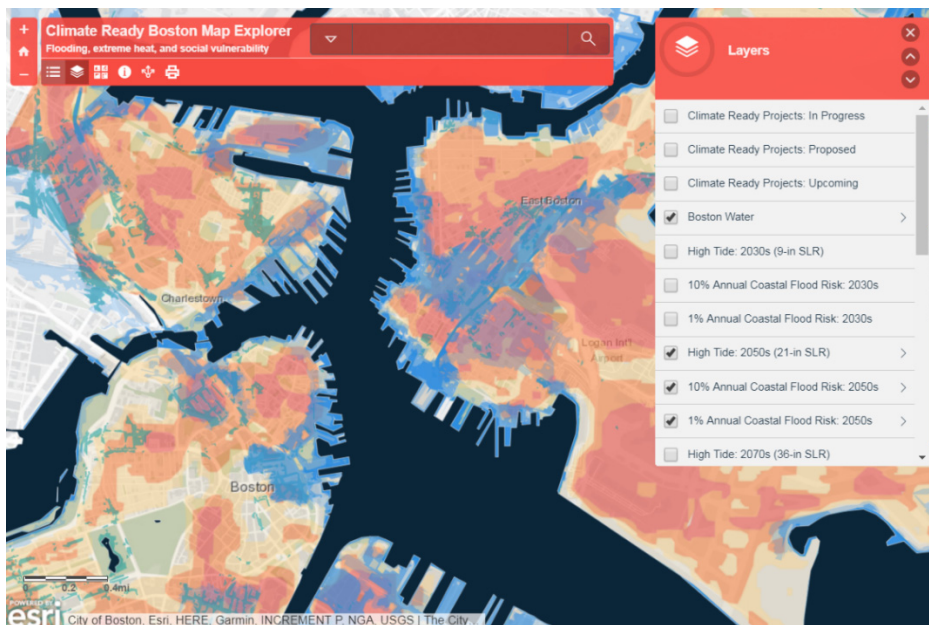


Figure 4: This screenshot illustrates various GIS mapping tools the municipality provides for developers and designers to use to visualise climate change impacts for city parcels. (Source: www.boston.gov.)

over time, as private partnerships come onboard, the city is able to apply a long-range view in working with private entities to help them understand how their projects fit into this framework, resulting, over time, in a more resilient city (Figs 5 and 6). *The Eddy's* site manipulation strategies protect the building and the neighbourhood, while the green spaces surrounding it were developed to connect to local standards already in place, linking existing masterplan elements to encourage continuity and resilience. While the city gained ground implementing its plan, and the neighbourhood gained open, green space and waterfront access, the developer was allowed greater density; thus, the negotiations for sustainability and resiliency resulted in long-term benefits for all parties.

4 FINDING SAVINGS THROUGH RESILIENT DESIGN

Anticipating sea level rise, increased precipitation and heating days, and potential damage due to storm surge, the developer, Gerding Edlen, wanted to build a development that did more than just meet code. Their vision was a property that could rebound within three days after disruption. Article 37 compliance – an ordinance requiring new developments be designed to meet LEED Silver certification – helped bundle what might have been perceived as cost premiums for resiliency into the costs for required LEED compliance. For example, the newly enhanced open, green space helps the project earn LEED points while increasing resilience. Native coastal plantings that thrive in saltwater (even when inundated) are featured, and three-dimensional landscaping serves as a passive barrier to break apart storm surge and funnel water away from the building, protecting it during disruption and beautifying the site during normal operations (Fig. 7). These features, among others, helped the project eventually earn LEED Gold certification.



Figure 5: Sea level rise without intervention for a 100-year storm event in 2030 (9"/23 cm) and 2070 (36"/66 cm). (Source: www.boston.gov.)



Figure 6: Implementation of the Imagine Boston 2030 masterplan shows a unified waterfront through a combination of architecture (*The Eddy* in center), infrastructure, and open space. (Source: www.boston.gov.)

Additional savings came from clever site manipulation and space planning. It is common, even in Boston, to place electrical equipment and emergency back-up generators below-grade, despite the high-water table. While saving space, this practice increases expenses because of high waterproofing costs. *The Eddy* features roof-mounted generators (along with



Figure 7: The enhanced Harbor walk serves to protect the development via enhanced seawall and absorptive green spaces flanking the structure, which channel runoff and reduce storm surge force impacts. (*Source: Stantec Buildings Group.*)

most mechanical equipment, including a cogeneration plant, which saves \$150,000 (£113,000) in annual energy costs) with sufficient fuel for four days of power. All electrical equipment is also placed in a protected space at grade elevated above the 500-year floodplain (Fig. 8). Additionally, using onsite fill to elevate grade reduced trucking costs, saving front-end construction costs. Furthermore, to protect from storm surge, the old sea wall was reconstructed to a higher datum point to avoid flooding, which was commonplace before redevelopment. Entrances are reduced along the waterfront side, with the main entry safely faces away from the coast onto an accessible public way. Wet floodproofing techniques allow the ground level to quickly resume normal operations after an event, which also reduces daily maintenance costs through squeegeeing and air-drying [3].

5 RESILIENCY AS A CELEBRATION OF PLACE

These strategies are not a radical departure from code compliant construction; yet, they promote place-based design that discourages fear of waterfront locations. The resulting design creates a harmonious celebration and respect of the historic relationship of human development to waterfront sites through a marriage of “soft” and “hard” infrastructure – landscaping and buildings designed to coexist during normal operations and disruption. Here, a new water taxi connects the neighbourhood to downtown Boston, new fishing stations, and a new signature restaurant along the enhanced Harbor walk, a 43-mile (69km) linear park



Figure 8: The ground floor elevation was elevated above the 500-year floodplain. At the new high point onsite, the design team located external transformers to save cost and space, provided fire pump access, and provided a secondary means of egress. (Source: Stantec Buildings Group.)

along Boston's shoreline, all are for the joy and socialisation of residents and non-residents alike. These strategies illustrate synergies between sustainability and resiliency for long-term operational and maintenance savings, which ultimately also become a branding opportunity (Fig. 9). The developer sees resilient developments achieving top-of-market pricing (2–18% higher for studios and 2-bed apartments), faster leasing, higher renewal, and higher occupancy rates [4]. Additionally, *The Eddy's* entitlement process was expedited due to its compelling resiliency/sustainability narrative. Notably, insurance premiums were also reduced from \$10 million to \$1 million by the underwriter, Affiliated FM, because of the body of proof of protection from multiple risks, including flooding, wind, and storm surge [5]. This is all a win-win for the developer, the community, and the environment.

6 CONCLUSION

This project provides insight into the process and potentiality for waterfront development anywhere, serving to demonstrate that common sense approaches, collaboration, tools, and incentives can utilise development to champion resiliency, sustainability, and narrate a positive future for waterfront cities. Until cities move the conversation around resiliency beyond fear of loss (the purview of insurance agencies) cities will continue to struggle with balancing growth with uncertainty in an unknown future in respect to climate change impacts. The 2017 hurricane season should have served as a wakeup call for the need for greater urban



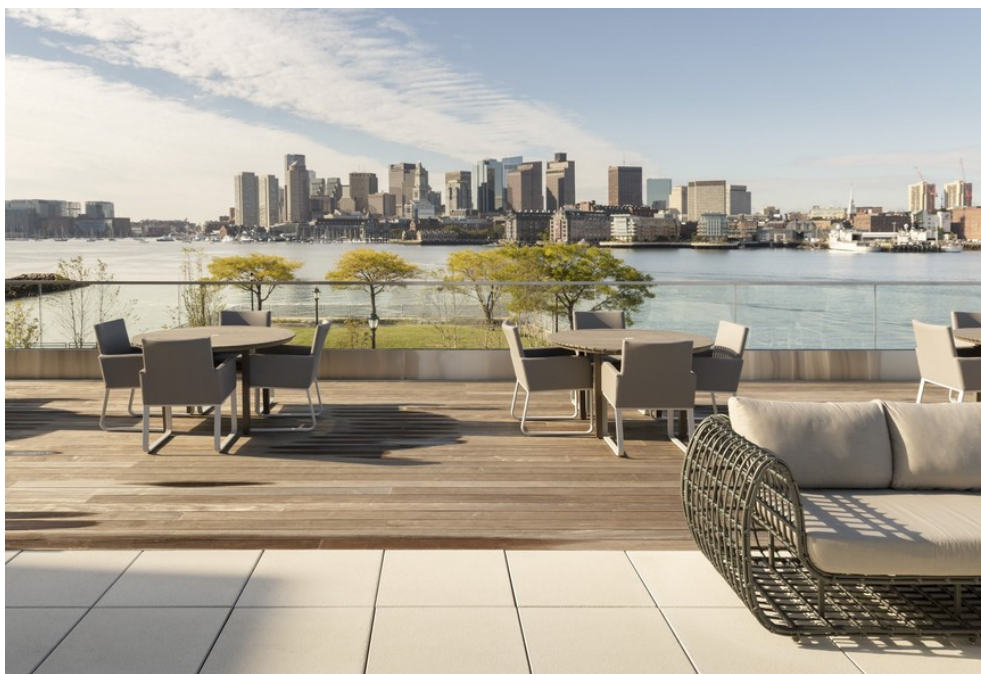


Figure 9: Level 1 view onto the harbour/skyline. (Source: Stantec Buildings Group.)

resilience. Developments, like *The Eddy*, create pathways towards a future where climate uncertainty won't be detrimental to the hope of urban vitality within cities. Particularly for our coastal cities, this relationship serves as a major attraction fueling their unprecedented growth, which shows no signs of slowing down.

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REFERENCES

- [1] Catherine, T., In demand cities: Boston, Architectural Record. Online. www.architecturalrecord.com/articles/5892-boston?v=preview. Assessed on: 15 May 2018.
- [2] Rebekah, E., *Imagine Boston 2030 – A Plan for the Future of Boston*, City Hall: Boston.
- [3] Gray, J. & Pursley, Z., Personal communication, 17 October 2017, Principal and Associate at Stantec – Boston, Boston, MA.
- [4] Matt, E., Personal communication, 17 October 2017, Director of East Coast & Midwest Acquisitions for Gerdin Edlen, Boston, MA.
- [5] Marshall, S. & McCormick, K., *Urban Land Institute: Returns on Resilience: The Business Case*. ULI Center for Sustainability, The Urban Land Institute: Washington, DC, pp. 18–20, 2015.

