A BETTER CITY

EXECUTIVE SUMMARY SUMMER 2016

STATE OF THE BUILT ENVIRONMENT

GREATER BOSTON'S INFRASTRUCTURE


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ACKNOWLEDGMENTS

Any report of this scope and magnitude requires the assistance of many organizations and individuals. We gratefully acknowledge the time and effort put forward by members of our Advisory Committee, by the many who helped supply us with data, and by those who provided us with extraordinary advice. We could not have accomplished this work without their good work and good wishes. To the extent that our report is a useful addition to the dialogue about Greater Boston's infrastructure, we owe much to them. To the extent that segments of our analysis ultimately prove inaccurate or off-base, the responsibility lies entirely with us.

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REPORT TEAM

A Better City is a diverse group of business leaders united around a common goal—to enhance Boston and the region's economic health, competitiveness, vibrancy, sustainability and quality of life. By amplifying the voice of the business community through collaboration and consensus across a broad range of stakeholders, A Better City develops solutions and influences policy in three critical areas central to the Boston region's economic competitiveness and growth: transportation and infrastructure, land use and development, and energy and environment.

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The Kitty and Michael Dukakis Center for Urban and Regional Policy at Northeastern University conducts interdisciplinary research, in collaboration with civic leaders and scholars both within and beyond Northeastern University, to identify and implement real solutions to the critical challenges facing urban areas throughout Greater Boston, the Commonwealth of Massachusetts, and the nation. The Dukakis Center's collaborative research and problem-solving model applies powerful data analysis, a bevy of multidisciplinary research and evaluation techniques, and a policy-driven perspective to addressing a wide range of issues facing cities and towns.

AUTHORS

- Barry Bluestone
- James Huessy
- Catherine Tumber

PREFACE

For nearly fifteen years, the Dukakis Center for Urban and Regional Policy at Northeastern University has been producing an annual *Greater Boston Housing Report Card*. That report series has helped policymakers, citizens, business leaders, and the media keep track of the region's housing needs. It has kept attention trained on a variety of housing issues and, in some cases, has led to action to increase housing supply.

A Better City has provided our research staff the opportunity to extend this type of research to an understanding of Greater Boston's built environment and to project the region's infrastructure needs through 2030. We hope this report will stir dialogue and debate over how to meet our need for transportation, energy, water, sewerage, and open space, and how to render the region more resilient in the face of climate change, sea-level rise, and storm surge.

Scores of individuals in many organizations helped provide the data that form the basis of our analysis in the pages that follow. We cannot thank them enough for their assistance and encouragement.

While we have made every effort to produce a report grounded in strong data and reasonable projection techniques, we recognize that all of our data should be carefully vetted. We look forward to expanding our efforts in next year's report and, in that spirit, welcome ideas for improving upon or adding to these baseline numbers and forecasts.

Barry Bluestone

James Huessy

Catherine Tumber

"WE HOPE TO STIR DIALOGUE AND DEBATE OVER HOW TO MEET OUR NEEDS FOR TRANSPORTATION, ENERGY, WATER, AND OPEN SPACE."

LETTER FROM THE PRESIDENT & CEO

Dear Colleagues:

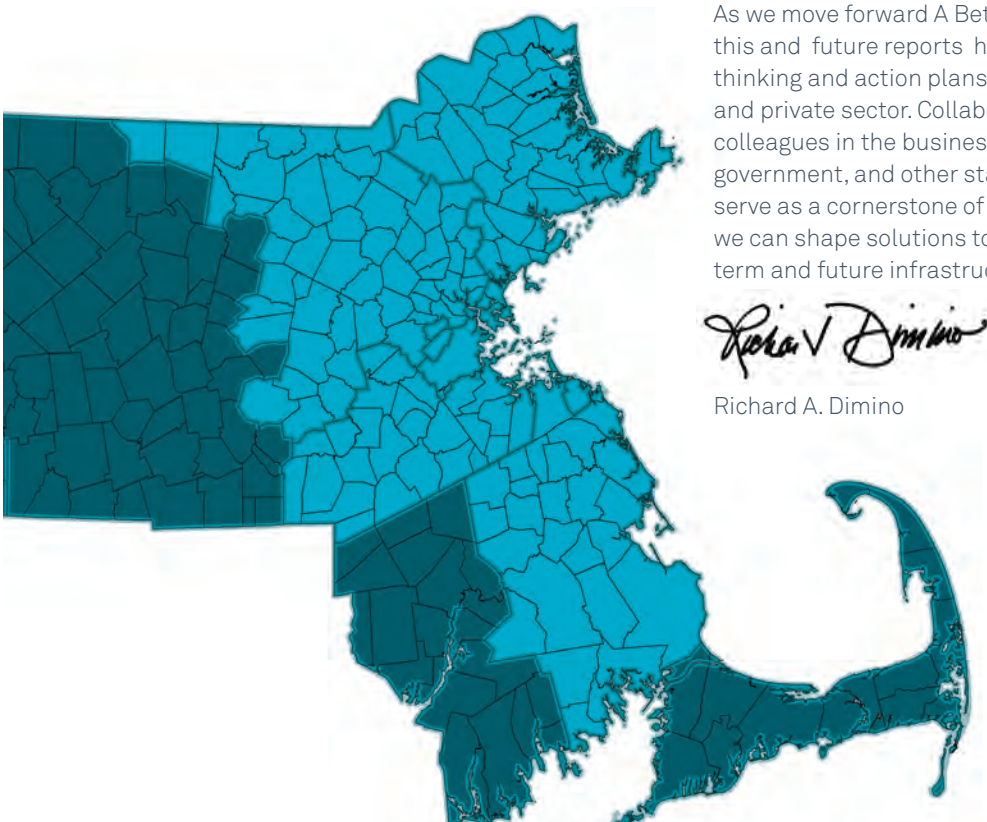
A Better City is at a key point in its organizational development. We are celebrating the start of our next decade by launching a series of new initiatives related to our recently adopted strategic plan. This *State of the Built Environment* report and accompanying conference was identified as a major priority. This report will strengthen the focus in our three core areas: transportation and infrastructure, land use and development, and energy and environment. We are very pleased to have retained and funded Northeastern University's Dukakis Center for Urban and Regional Policy to lead this comprehensive research report and assessment.

A Better City's business and institutional leaders hope that this detailed assessment will help catalyze planning, policies and action to sustain and grow Boston's and the region's economy and global competitiveness. To meet these goals we will need a 21st-century infrastructure system.

We appreciate the significant time and effort devoted to this report by the Dukakis Center team. We also wish to thank a number of state and city agencies together with the Metropolitan Area Planning Council and our advisors for their contributions.

We hope that this report will serve as a valued resource for metro region infrastructure information and data. We intend to share this report and its contents broadly with stakeholders, collaborators and the public.

Finally, A Better City intends to regularly assess the condition of Greater Boston's infrastructure. We have with this report a good start and a preliminary baseline, but also know that we have more work to do. Your comments regarding this report will be greatly appreciated as we seek to make improvements in future efforts.



As we move forward A Better City hopes this and future reports help to inform the thinking and action plans of both the public and private sector. Collaborating with our colleagues in the business community, government, and other stakeholders will serve as a cornerstone of our efforts. Together we can shape solutions to address our near-term and future infrastructure challenges.

Richard A. Dimino

EXECUTIVE SUMMARY

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Since the 1990s, Greater Boston's population and economy have been rebounding at a rapid pace, but such formidable growth places heavy burdens on the region's infrastructure. The region's population alone has jumped more than 13 percent since the 1990 Census, requiring significant improvements in the built environment. In the past, the region has faced such challenges with major infrastructure investments from filling in the Charles River marshes to form the Back Bay to building Route 128, the nation's first circumferential limited-access highway.

Today, we face equally daunting infrastructure challenges. In addition to planning for population and business growth—requiring additions to our transportation system, energy grid, water, sewer, and recycling capacity, and conservation land—we must prepare for the extreme effects of climate change. Not only will the area experience increasingly severe weather, but climate scientists predict that Boston will be among the U.S. cities hardest hit by rising sea-levels and storm surge.

The purpose of this first report, modeled after the Dukakis Center's annual *Greater Boston Housing Report Card*, is to take the measure of current infrastructure throughout the 147 communities in Suffolk, Essex, Middlesex, Norfolk, and Plymouth Counties, and to project the requirements for augmenting the built environment to meet the region's needs in 2030. Our ultimate aim is to assist in appropriate planning for the anticipated growth of the region.

Between 2010 and 2030, we project that the population in the five counties of Greater Boston will have grown by nearly 430,000, or 10.5 percent. Where will they live? How will they get to and from work, school, and other essential destinations? Will their communities be outfitted with appropriate levels and types of transportation, energy, water and sewage capacity, recycling and waste facilities, and open and conservation land to suit their environmental and economic needs, ensuring a growing and prosperous economy? Through careful longitudinal tracking of multiple systems and demographic shifts across many jurisdictions, we hope to provide resources essential to the sort of state-of-the-art performance-based planning that will be imperative in the years ahead. **Based on our projections, the conclusion is pretty straightforward. As a region we must find ways to expand our infrastructure, enhance the efficiency with which we use it, and find ways to conserve energy, water, and open space in order to accommodate the population growth and expanded economic output we project through 2030. The complexity lies in determining which course to take and ultimately how to pay for it.**

METHODOLOGY AND RESOURCES

With this initial report, a template for future studies, we have identified dozens of data sets that track demand and performance in four principal types of infrastructure: transportation; energy; water and sanitation; and environment, open space, and resilience. A large number of public sector agencies and private sector companies provided data to make this project possible. For our projections we relied heavily on population and labor force forecasting through 2030 by the Metropolitan Area Planning Council (MAPC). We have harvested data from innumerable siloed sources to prepare one report for easier assimilation by policymakers, business leaders, and citizens. Using the MAPC projections, we have been able to develop estimates for household use and business consumption of infrastructure resources so that we can estimate how much and what kinds of service delivery will likely be needed to accommodate a growing and demographically varied population while advancing a strong economy. In the future, these numbers will undoubtedly shift as new and more recent data become available and, particularly in the energy and waste sectors, systems achieve efficiencies. For now, however, we are convinced that the figures included in this inaugural report represent a strong baseline for current use and anticipated future demand.

Our 2030 projections are based on several **behavioral assumptions**, which fall under the rubric of "business as usual." That is, we assume no change in age-specific labor force participation, no change in transportation modes in use today, and no efficiency or conservation improvements in energy and water consumption. In future reports, we will work from this baseline to provide counterfactuals —"what-ifs"—projecting scenarios that could result from behavioral change. Our current modeling assumptions are as follows:

- The Greater Boston region will enjoy economic growth more or less in line with the 1.2 percent annual increase in productivity the U.S. enjoyed between 2006 and 2015, and small annual increases in the size of the labor force as the number of younger workers grows somewhat faster than the number of retiring Baby Boomers.
- The number of commuters will increase with the size of the labor force and, in this baseline projection, will continue to use the same age-specific and region-specific transit modes they use today.
- The use of energy, water, and sewage per household and per business enterprise will remain the same as today.
- Demand for air travel and seaport cargo will grow at the same annual rate as they have over the past decade.
- Sea-level rise and storm surge will match the best forecasts of regional climatologists.

CURRENT INFRASTRUCTURE DEFICITS

Even today, *before* we experience additional population growth and economic expansion, much of Greater Boston's infrastructure is inadequate, deteriorating, and out of date.

- According to MassDOT, 37 percent of state-owned roads are currently in "poor" or only "fair" condition. At the present rate of maintenance, 79 percent of the state's roadways could be in poor to fair condition by 2025. In addition, Greater Boston's 2,115 bridges could be improved. Eleven percent are either closed to traffic or functionally deficient, and nearly 20 percent are restricted from use by heavy commercial vehicles.
- Highway congestion has become so bad that typical AM and PM commuting speeds within Greater Boston on the Mass Pike, I-93, Routes 3 and 24, and I-495 are below 25 mph and on many segments below 20 mph.
- MBTA vehicles are in desperate need of maintenance and modernization. More than a third of operating Red Line cars were acquired more than 40 years ago, and 44 percent of Green Line trolley rolling stock dates back to 1989. To reach a "state of good repair," the T calculates the system needs over $7 billion in improvements. The transit system also faces a number of capacity constraints.
- While Logan Airport has been able to keep up with demand for passenger and freight service through the use of larger aircraft and higher load factors, the Conley container port terminal has neither the water depth nor crane capacity to handle any of the new larger container vessels.
- While Massachusetts and Boston have made great strides in reducing Greenhouse Gas Emissions, to meet national goals by 2030 will require steady improvement in energy efficiency and conservation.
- Greater Boston is blessed with nearly 900 miles of hiking trails, but the Department of Conservation and Recreation reports that less than half are considered in good repair.

- While strides have been made in recycling, as of 2010 less than a third of all waste is being recycled.
- Sea-level rise and storm surge are inevitable, but much of the built environment near the Boston waterfront is not currently resilient.

DEMOGRAPHIC AND ECONOMIC OUTPUT PROJECTIONS

Such is the current state of Greater Boston's infrastructure. But based on our behavioral assumptions and projection methodology, we expect to see the following changes by 2030—all of which will tax the region's infrastructure further:

- The population of the five counties of Greater Boston (Essex, Norfolk, Middlesex, Plymouth, and Suffolk) will increase from a little less than 4.1 million in 2010 to 4.5 million in 2030: + 428,000. This amounts to an increase of 6.6 percent between 2010 and 2020 and another 3.6 percent between 2020 and 2030.
- While the region's young population (age 0–24) is projected to decline by nearly 100,000 between 2010 and 2030, along with a loss of 57,000 45 to 64 year olds, the number of 25 to 44 year olds is expected to increase by nearly 140,000. The number of older residents—aging baby boomers—will skyrocket by more than 380,000.
- The population will not expand uniformly throughout Greater Boston. In the Inner Core, including Boston and the cities close by, we project the population to grow by 17.5 percent by 2030. In the Regional Urban Centers such as Lawrence, Lowell, Lynn, and Quincy, the population is expected to increase by 12 percent. Meanwhile, in the Suburbs surrounding the Inner Core and Regional Urban Centers, the population is expected to increase by just 4.3 percent—as fewer young people choose to live there and a significant number of Baby Boomers move away or pass on.
- Overall, as a result of an increase in 25-44 year olds offset by the large increase in older residents who retire from the labor force, Greater Boston's labor force will grow much more slowly than its population. We project a total labor force increase of 6.4 percent between 2010 and 2030 and less than 2 percent between 2020 and 2030.

"TO REACH A 'STATE OF GOOD REPAIR,' THE T CALCULATES THE SYSTEM NEEDS OVER $7 BILLION IN IMPROVEMENTS."

- Economic output by existing firms and new ones will expand by 13.1 percent between 2010 and 2020 and by another 12.9 percent between 2020 and 2030. As such, over the full 2010–2030 period, we project a near 28 percent increase in economic activity in Greater Boston.

KEY FINDINGS: PROJECTED FUTURE INFRASTRUCTURE DEMAND

Based on these behavioral assumptions and projections, we have identified the following increases in infrastructure demand:

TRANSPORTATION

- **Commuting**: Across all of Greater Boston, we project that there will be an additional 117,000 commuters between 2010 and 2030—5.2 percent more than the 2.25 million in the labor force in 2010.
    - ***Highway Use***: According to our projections, we expect to see at least 80,000 more autos, trucks, and tractor trailers on Greater Boston's roads and highways by 2030, an increase of nearly 5 percent.
    - ***Public Transit:*** The region can expect to have to accommodate more than 14,000 additional subway commuters, more than 11,000 additional bus and trolley commuters, and more than another 1,000 daily commuter rail customers. This represents a 6.8 percent increase in subway and bus/trolley use by commuters and nearly a 3 percent increase in commuter rail. Constrained roads and highways, and significant growth in transit oriented development may lead to even greater increases in transit demand.
- **Air Travel**: If passenger air travel continues to grow at the same pace as it did over the 2005–2015 period, Logan Airport will have to find a way to handle 63 percent more passengers on domestic and international flights annually.
- **Seaport**: If the Conley Terminal is going to keep up with demand for seaport cargo, it will need to find a way to increase its container ship capacity by 93 percent—increasing its ability to handle TEU containers from its current 181,000 per year to 350,000 a year by 2030.

ENERGY

- **Electricity**: In terms of electricity demand in the five-county region, we project the need for adding 1.25 million megawatt hours of service to accommodate a 10.2 increase in residential service, and a 27.7 percent increase in commercial and industrial use. This amounts to adding overall 17.4 percent more electric power to the Greater Boston grid.
- **Natural Gas**: In terms of natural gas for residents and businesses, we project increased demand of 14.3 percent between 2010 and 2030.

WATER AND SANITATION

- **Water/Sewage**: We project increased water demand by residents, businesses, municipal governments and large nonprofit institutions of nearly 13.5 percent. Total sewage use will rise by only 5 percent since we project no increase in average daily rain and snow runoff between 2010 and 2030.

ENVIRONMENT, OPEN SPACE, AND RESILIENCE

- **Trash/Recycling:** Overall, we will need trash disposal and recycling facilities to process an additional 130,000 tons of waste per year—7.9 percent more in 2030 than in 2010.
- **Sea-Level Rise:** We need to focus on making large parts of Greater Boston near Boston Harbor and along the seacoast more resilient to expected sea-level rise and storm surge that could inundate large swaths of the region. The need will be most imperative in Boston proper, due to the density of its commercial infrastructure and housing.

A host of ideas—old, new, and unforeseen—must be evaluated in terms of their cost-effectiveness and the relative benefits they provide to meeting our future infrastructure needs. First, though, we must recognize the full extent to which we will have to add to Greater Boston's built environment. Only then can we balance investments in new infrastructure with conservation, new technology, and efficiency measures in ways that meet the needs of a growing population and an expanding economy.


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