

2017

Transportation Planning in an Era of Inequality and Climate Change

Christopher Jones

Follow this and additional works at: <https://ir.lawnet.fordham.edu/ulj>

Recommended Citation

Christopher Jones, *Transportation Planning in an Era of Inequality and Climate Change*, 44 Fordham Urb. L.J. 1005 (2017).
Available at: <https://ir.lawnet.fordham.edu/ulj/vol44/iss4/3>

This Article is brought to you for free and open access by FLASH: The Fordham Law Archive of Scholarship and History. It has been accepted for inclusion in Fordham Urban Law Journal by an authorized editor of FLASH: The Fordham Law Archive of Scholarship and History. For more information, please contact tmelnick@law.fordham.edu.

TRANSPORTATION PLANNING IN AN ERA OF INEQUALITY AND CLIMATE CHANGE

*Christopher Jones**

Introduction	1005
I. Background	1005
II. Economic and Social Equity Challenges	1008
III. Resilience and Climate Change	1011
Conclusion.....	1016

INTRODUCTION

This Article will describe the challenges facing regional transportation planners in American metropolitan regions in an era characterized by uneven growth and accelerating impacts of climate change. The Article focuses first on the way growing inequality and technological change affect the priorities for transportation planning. It then discusses how climate resiliency is adding a new dimension to the traditional concerns of planning for metropolitan transportation systems. It takes the New York region as an instructive example because of its size, the expansiveness of its transit system, and its vulnerability to climate change due to its extensive coastlines. However, the planning principles and solutions that this Article offers for the New York region can be applied to other cities around the U.S. and globally. Much of the research used in this Article comes from work done by the Regional Plan Association.

I. BACKGROUND

In the last decade, the New York region began expanding its vast transit network for the first time in well over half a century. A growing population¹ and thirty years of investment to return subways, buses, and commuter rails to a state of good repair paved the way for

* Christopher Jones is Senior Vice President and Chief Planner of Regional Plan Association.

1. REG'L PLAN ASS'N, CHARTING A NEW COURSE: A VISION FOR A SUCCESSFUL REGION 5 (2016) [hereinafter CHARTING A NEW COURSE].

new services, targeted primarily to the region's congested urban core. No. 7 subway line was extended to 11th Avenue and 34th Street to open up the last, large tract of land that could extend Manhattan's central business district.² On New Year's Day of 2017, the Second Avenue Subway opened to the public after a century of false starts, relieving the nation's most congested transit corridor along Manhattan's East Side.³ The Long Island Rail Road's East Side Access Project, connecting the railroad to Grand Central Terminal, is scheduled for completion in 2022.⁴ There is growing momentum for new rail tunnels under the Hudson River to supplement the aging existing tunnels that are straining to meet existing demand.⁵

At a cumulative cost of thirty-five billion dollars, these projects reflect the urgencies of the late twentieth century.⁶ By the 1990s, New York and its transit system had sufficiently recovered from its 1970s fiscal crisis to be able to consider large new transit investments. Yet, another steep downturn in the early 1990s reinvigorated fears that the city was losing its place in the global economy. From 1989-1992, the New York region suffered its worst recession since the 1930s. Moreover, a surge in crime in the mid-1980s threatened to undo investments in housing and transit that were just beginning to reverse years of neglect and deterioration. New York's economic performance had lagged behind the nation for decades. By the 1990s, cities from Tokyo to London seemed poised to leave New York behind in the competition for high-value businesses.⁷

2. *New 34th Street Hudson Yards Station Opens*, METRO. TRANSP. AUTH., http://web.mta.info/capital/no7_alt.html [<https://perma.cc/397Y-WKY9>].

3. Emma G. Fitzsimmons, *A Long Wait for the Second Avenue Subway, But Worth It*, N.Y. TIMES (Dec. 28, 2016), <https://www.nytimes.com/2016/12/28/nyregion/second-avenue-subway-opening-sunday.html> [<https://perma.cc/2WGZ-4MK3>]. See Emma G. Fitzsimmons & Albert Sun, *Second Avenue Subway Relieves Crowding on Neighboring Lines*, N.Y. TIMES (Feb. 1, 2017), <https://www.nytimes.com/2017/02/01/nyregion/second-avenue-subway-relieves-crowding-on-neighboring-lines.html> [<https://perma.cc/TJ7S-HX4E>].

4. *Building for the Future: Second Av Subway*, METRO. TRANSP. AUTH., http://web.mta.info/capital/sas_alt.html [<https://perma.cc/T4VV-SWKW>].

5. See Eleanor Randolph, *Only a Decade to Go on the New Hudson Tunnel*, N.Y. TIMES (Nov. 17, 2015), <https://takingnote.blogs.nytimes.com/2015/11/17/only-a-decade-to-go-on-the-new-hudson-tunnel/> [<https://perma.cc/36ZM-XLB4>].

6. The completed first phase of the Second Avenue Subway cost \$4.5 billion, and East Side Access is currently projected to cost \$10.1 billion. See METRO. TRANSP. AUTH., *supra* note 4. Cost estimates for the Gateway project to build new tunnels under the Hudson are approximate, with twenty billion dollars as a recent estimate. Larry Higgs, *Feds Agree to Fund Half of New Hudson Rail Tunnels*, NJ.COM (Nov. 11, 2015, 9:00 PM), http://www.nj.com/traffic/index.ssf/2015/11/booker_brokers_deal_on_entity_to_oversee_gateway_t.html [<https://perma.cc/7AWJ-X4GN>].

7. CHARTING A NEW COURSE, *supra* note 1, at 9.

A 1996 plan by Regional Plan Association,⁸ its third plan in its then seventy-five year history, captured the zeitgeist of the time with its title, *A Region at Risk*.⁹ It argued for major reinvestment in physical infrastructure and workforce capabilities to restore New York's international competitiveness, support more sustainable development patterns, and create a more socially equitable region. The plan included five campaigns to improve the environment, urban centers, workforce, governance, and mobility.¹⁰ Notably, it launched a public debate that led to the expansion of the transit system.¹¹ The Second Avenue Subway, East Side Access, new trans-Hudson tunnels, and new transit to Manhattan's far west side were part of the plan's transportation vision, and public campaigns in subsequent years created momentum for their implementation.¹²

In 2017, the region faces a different set of challenges. New York is one of the most, if not *the* most, globally prominent cities in terms of economic strength and influence.¹³ Its economic recovery since the early 1990s has been remarkable, spurred first by a recovery in the financial markets and sharp reductions in crime, and then sustained by national expansions, changing preferences that helped revive cities worldwide, and public investments in housing, education, transportation, and public spaces.¹⁴

8. Regional Plan Association ("RPA") is an urban research and advocacy organization focused on improving the prosperity, infrastructure, sustainability, and quality of life of the New York-New Jersey-Connecticut metropolitan region. Since the 1920s, RPA has produced three landmark plans for the region and is now working on a fourth plan. See REG'L PLAN ASS'N, <http://www.rpa.org/about> [<https://perma.cc/D99A-8P22>]. Christopher Jones, this Article's author, is the Senior Vice President and Chief Planner at RPA. See *generally* REG'L PLAN ASS'N, <http://www.rpa.org/people/christopher-jones> [<https://perma.cc/3TUR-J62J>].

9. See ROBERT D. YARO & TONY HISS, *A REGION AT RISK: THE THIRD REGIONAL PLAN FOR THE NEW YORK-NEW JERSEY-CONNECTICUT METROPOLITAN AREA* (1996). RPA's first and second plans, in 1929 and 1968, created blueprints for many of the infrastructure and land use systems that shaped the development of the New York region in the twentieth century. See *id.* at xix-xx.

10. *Id.*

11. REG'L PLAN ASS'N, *SHAPING THE NEW YORK REGION: THE THREE REGIONAL PLANS* 19, 21-22, <http://www.rpa.org/pdf/RPA-Shaping-the-NY-Region.pdf> [<https://perma.cc/LYH5-5QMM>].

12. *Id.*

13. See Richard Florida, *What Is The World's Most Economically Powerful City?*, ATLANTIC (May 8, 2012), <https://www.theatlantic.com/business/archive/2012/05/what-is-the-worlds-most-economically-powerful-city/256841/> [<https://perma.cc/D8KX-RCQB>] (finding New York to be the most economically powerful metropolitan in the world based on an assessment of five comprehensive rankings of global cities).

14. CHARTING A NEW COURSE, *supra* note 1, at 9-11.

II. ECONOMIC AND SOCIAL EQUITY CHALLENGES

New York's economic and social successes are both incomplete and fragile. Economic growth has not resulted in rising incomes for most households, exacerbating long-standing inequalities. Growth itself has made an already dense and expensive region even more crowded and unaffordable. Challenges to the global economic order, such as rising nationalism that put the future of the European Union and other international alliances in doubt, could erode many of the advantages that New York has thus far offered. Further, climate change is creating a new map that will alter the region's future development and settlement patterns.¹⁵

These issues underlie the rationale of a new plan under development by Regional Plan Association.¹⁶ For the transportation elements of the plan, the challenges are in many ways more complex than they were in prior years, when the overriding goal was to support a growing economy by improving mobility.

While twenty-five years ago, the goal was reviving New York's economy, now the goal is dealing with the endemic problems of the region's strong, but imbalanced, economic growth that, instead of bringing broadly shared prosperity, has produced rising inequality. Median household income has grown only for the top portion of households, and has declined for the bottom three-fourths. While this is a national problem, it has particular relevance for the New York region, which already had some of the widest disparities by income and race.¹⁷

Transportation can be a powerful mediator in determining economic well-being and opportunity. As an example of both its creative and destructive power, the construction of the interstate highway system helped spur national growth in the 1950s-1970s, but also largely facilitated postwar suburban sprawl, urban deterioration, and metropolitan-scale segregation.¹⁸ Conversely, recent studies by Raj Chetty and his colleagues at the Equality of Opportunity Project

15. REG'L PLAN ASS'N, FRAGILE SUCCESS (2014), <http://fragile-success.rpa.org> [<https://perma.cc/CD6J-SCPJ>] [hereinafter RPA FRAGILE SUCCESS].

16. REG'L PLAN ASS'N, THE FOURTH REGIONAL PLAN, <http://www.rpa.org/fourth-plan> [<https://perma.cc/6REQ-UHUU>].

17. RPA FRAGILE SUCCESS, *supra* note 15.

18. See Matthew D. Lassiter, *Suburban Strategies: The Volatile Center in Postwar American Politics* in THE DEMOCRATIC EXPERIMENT: NEW DIRECTIONS IN AMERICAN POLITICAL HISTORY 328 (Meg Jacobs, William J. Novak & Julian E. Zelizer eds., 2003). See also Thomas Laidley, *The Problem of Urban Sprawl*, CONTEXTS (Sept. 30, 2016) <https://contexts.org/articles/the-problem-of-urban-sprawl/> [<https://perma.cc/5596-CRKT>].

have identified a positive statistical relationship between metropolitan regions with robust transit networks and those where someone born in a poor household has the greatest chance for upward economic mobility.¹⁹ In other words, metropolitan regions that connect more people to more job opportunities through mass transit also have more people who escape poverty and rise to middle-class incomes.

This raises several questions for the next regional plan. The plan must consider how the transportation system can address underserved communities and how transportation can improve job access, particularly for low-income areas. Further, the plan must evaluate whether its suggestions mitigate or reinforce patterns of residential segregation, or increase displacement pressures on particular communities.

The plan will have to modernize an aging transportation system that has become much more crowded, not only because of increasing population and jobs, but also because a higher share of residents are choosing to travel by transit. New York subway ridership is now at the highest it has been since 1948,²⁰ causing strains on a network which is still using a signal system that was put in place in 1904.²¹

New passenger rail tunnels under the Hudson are arguably the most urgently needed infrastructure to accommodate growth in the New York region. Not coincidentally, this is also the largest transit project recommended in the last regional plan that has not been funded.²² The two existing tunnels, built a century ago and damaged by Hurricane Sandy, are badly in need of repairs.²³ They will eventually need to be shut down for repairs, probably within the next

19. Raj Chetty et al., *Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States*, 129 Q. J. ECON. 1553, 1556-57, 1618, 1661 (2014) (finding geographical location and commute time to be significant predictors of upward mobility). See Bill Bradley, *Mass Transit Investment Also Matters for Economic Mobility*, NEXT CITY (July 23, 2013), <https://nextcity.org/daily/entry/mass-transit-per-capita-spending-economic-mobility-atlanta-detroit-san-jose> [<https://perma.cc/TBL3-G47G>].

20. *Highest Figures Since 1948*, METRO. TRANSP. AUTH. (Apr. 2016), <http://www.mta.info/news-ridership-subway-new-york-city-transit/2016/04/18/highest-figures-1948> [<https://perma.cc/ZS24-2Q6L>].

21. Richard Barone et al., *Moving Forward: Accelerating the Transition to Communications-Based Train Control for New York City's Subways*, REG'L PLAN ASS'N, May 2014, at 5, 13.

22. YARO & HISS, *supra* note 9, at 162-71.

23. AMTRAK, STRUCTURAL ASSESSMENT OF THE AMTRAK UNDER RIVER TUNNELS IN NYC INUNDATED BY SUPER STORM SANDY 2 (Sep. 18, 2014), http://dng.northjersey.com/media_server/tr/2014/10/tunnels/nyc-tunnels-assessment-report.pdf [<https://perma.cc/4CKZ-EBX6>].

twenty years. Without new tunnels, the region's transportation network and the network throughout the northeast United States would suffer immensely. Only about twenty-five percent of trains currently using the tunnel would be able to get through; further, there would be no capacity for expected growth in trans-Hudson travel.²⁴

Modernizing the transportation system will need to take place in a period of economic and technological uncertainty. New York's recent success benefited greatly from a global economic order that allowed the city to become the dominant financial center in the world's most dominant national economy.²⁵ These advantages cannot be taken for granted as China and other Asian economies pull the economic center of gravity Eastward,²⁶ and as continuing fissures from the 2008-2009 financial crisis and growing nationalist movements strain global alliances, particularly in Europe and the United States.²⁷

Technological change could have its most profound impact on transportation since the private automobile replaced rail and streetcars as the predominant mode of urban transportation.²⁸ On-demand and shared car services are already influencing the way people use buses and subways in urban centers,²⁹ and autonomous vehicles, which are likely to come on the consumer market in 2018,

24. Reg'l Plan Ass'n, *Tunnel Trouble: Crumbling Infrastructure Is Putting the Region at Risk*, <http://www.rpa.org/tunnel-trouble-crumbling-infrastructure-is-putting-region-at-risk> [<https://perma.cc/T2Q3-QYSV>].

25. Jeff Desjardins, *All of the World's Stock Exchanges by Size* (Feb. 17, 2016, 8:32 PM), <http://www.visualcapitalist.com/all-of-the-worlds-stock-exchanges-by-size/> [<https://perma.cc/M4KS-M2EC>]. See Matthew Johnson, *How New York Became the Center of American Finance*, INVESTOPEDIA (Feb. 25, 2016, 11:18 AM), <http://www.investopedia.com/articles/investing/022516/how-new-york-became-center-american-finance.asp> [<https://perma.cc/GUS2-J25C>].

26. Mike Patton, *China's Economy Will Overtake The U.S. In 2018*, FORBES (Apr. 29, 2016, 10:47 AM), <http://www.forbes.com/sites/mikepatton/2016/04/29/global-economic-news-china-will-surpass-the-u-s-in-2018> [<https://perma.cc/6KST-NGT7>].

27. *League of Nationalists*, ECONOMIST (Nov. 19, 2016), <http://www.economist.com/news/international/21710276-all-around-world-nationalists-are-gaining-ground-why-league-nationalists> [<https://perma.cc/6YCP-GVVX>].

28. Martin V. Meloni, THE AUTOMOBILE SHAPES THE CITY, AUTOMOBILE IN AMERICAN LIFE AND SOCIETY, http://www.autolife.umd.umich.edu/Environment/E_Casestudy/E_casestudy1.htm [<https://perma.cc/DU23-5QTM>].

29. Dan Rivoli, *Subway Overcrowding Forces Some to Ditch the MTA*, N.Y. DAILY NEWS, (Sept. 30, 2016), <http://www.nydailynews.com/new-york/subway-overcrowding-forces-ditch-mta-data-suggests-article-1.2813485> [<https://perma.cc/WZU6-NZY8>].

could impact settlement patterns as well in addition to transit use.³⁰ While their effect on the balance of urban and suburban development remains to be seen, they will certainly raise a number of regulatory and equity issues. They could bring incredible efficiencies, such as reducing the vast amount of real estate that is now reserved for parking, for example, but they could also make transportation less affordable for many who are transit dependent (if fixed-price transit is phased out without a new subsidy system for for-hire vehicles) and promote more dispersed, low-density development with negative environmental implications.

Both economic and technological uncertainties underscore a growing challenge for transportation planning. While external conditions are changing more rapidly, transportation projects are taking even longer to build.³¹ Planning projects that cost billions take more than a decade to build and are intended to last more than a century are difficult to mesh with services and expectations that transform quickly and unexpectedly. This makes it an even higher priority to shorten time frames for planning, decision-making, and construction, and to build operational flexibility into project plans.

III. RESILIENCE AND CLIMATE CHANGE

The increasing certainty and pace of climate change is the biggest existential difference between now and the early 1990s. The acceleration of global warming, the destruction of Hurricanes Irene and Sandy in 2011 and 2012,³² and the growing evidence of sea level rise add an entirely new dimension to planning transportation systems for a future environment.³³ Goals need to go much further than just mitigating the effects of climate change and reducing carbon emissions. Plans must focus on adapting to climate changes in the present, and more importantly, they must be forward-looking to adapt to future conditions.

30. *Forecasts*, DRIVERLESS CAR MKT. WATCH, http://www.driverless-future.com/?page_id=384 [<https://perma.cc/36TX-5FBE>].

31. REG'L PLAN ASS'N, FRAGILE SUCCESS: TAKING STOCK OF THE NEW YORK METROPOLITAN REGION (2014), <http://fragile-success.rpa.org/c/6.html> [<https://perma.cc/A6UB-7BV4>].

32. Will Oremus, *Is Climate Change Turning New York Into a Hurricane Hotspot?*, SLATE (Oct. 30, 2012, 6:16 PM), http://www.slate.com/blogs/future_tense/2012/10/30/irene_sandy_and_climate_change_why_do_hurricanes_keep_hitting_the_northeast.html [<https://perma.cc/QY84-PLY6>].

33. REG'L PLAN ASS'N, UNDER WATER: HOW SEA LEVEL RISE THREATENS THE TRI-STATE REGION 6-7 (2016), <http://library.rpa.org/pdf/RPA-Under-Water-How-Sea-Level-Rise-Threatens-the-Tri-State-Region.pdf> [<https://perma.cc/H2YH-TBMX>].

The impacts of sea level rise, as described in Regional Plan Association's December 2016 report, *Under Water: How Sea Level Rise Threatens the Tri-State Region*, are perhaps the best way to illustrate the issue:

Sea levels already have risen by about a foot since 1900. That rate, which is ahead of the global average, is expected to accelerate over course of this century By the first half of the next century, over 600,000 of today's residents and critical regional infrastructure such as power plants, wastewater treatment plants, LaGuardia airport and low lying rail lines could be permanently inundated by flood waters

...

The region could see at least one foot of sea level rise by 2050, possibly as soon as the 2030s. Three feet could be realized by the end of the century, possibly as soon as the 2080s. Six feet of sea level rise is possible early in the next century.³⁴

The most threatened communities and infrastructure are in the region's bay areas, including the Great South Bay and South Oyster Bay on Long Island, Flushing Bay and Jamaica Bay in New York City, and Raritan Bay and Barnegat Bay in New Jersey, and the region's tidal estuaries, including the Hackensack Meadowlands and the Navesink and Shrewsbury Rivers.³⁵

While the pace of sea level rise is uncertain, its impact on coastal areas can be measured and mapped with relative precision. One foot of sea level rise will inundate nearly sixty square miles, where more than 19,000 residents in 10,000 homes live today, and where approximately 10,000 people work. Places that are most affected are directly adjacent to the waterfront along the region's bays and tidal rivers, in many cases where wetlands and marshes were filled for development decades ago.³⁶

Three feet of sea level rise could inundate close to 133 square miles where nearly 114,000 residents in 68,000 homes live today. Some 62,000 jobs are currently located in these areas. Affected communities will extend further into the suburbs along Long Island's south shore and New Jersey's coast, and include some urban places, such as the Rockaways, Howard Beach, and eastern Staten Island.³⁷

Six feet of sea level rise could inundate 280 square miles with 619,000 residents, 308,000 homes and more than 362,000 of today's

34. *Id.* at 6.

35. *Id.* at 4.

36. *Id.* at 8.

37. *Id.* at 9.

jobs.³⁸ Six feet of sea level rise will also threaten twenty percent of the region's power generating capacity and around 12,000 units of public housing.³⁹ Moreover, at six feet, many areas in urban centers such as Hoboken and Jersey City, communities around Jamaica Bay and the Rockaways in New York City, and the iconic beach towns of the Jersey Shore would be under water.⁴⁰

While flooding from sea level rise is permanent, flooding from storms is intermittent, unpredictable, and temporary. Once storm water recedes, homes, buildings, and infrastructure can theoretically be repaired and re-inhabited. However, storm flooding can reach much farther inland. Further, rising seas exacerbate storm surge. While one million people live in areas susceptible to storm surge today, two to three feet of sea level rise will extend vulnerable areas to places that now house more than two million people.⁴¹

Protecting against storm surge is difficult and expensive, but in many cases, can be accomplished with temporary structures or closures that can be removed, lowered, or opened once a storm has passed.⁴² Rising seas, however, can only be addressed with fixed barriers, either natural or engineered, raised structures, or retreat from the water's edge. As a further complication, water kept at barriers must go somewhere else; this is a particularly difficult obstacle in complicated systems like the New York Harbor estuary or in populated areas with long coastlines.⁴³

Other aspects of climate change also impact regional and transportation planning. Extreme heat, especially in urban neighborhoods, strains energy systems, requires more vegetation to absorb heat, and creates service and emergency management needs.⁴⁴

The implication for transportation planning is that governments can no longer plan or build for the environment their citizens have now; they must plan for the transformed environment that will exist in the future. The considerations are complex, and include energy efficiency, building resilient systems, and supporting land uses that can be protected from climate impacts. Carbon mitigation is still a

38. *Id.*

39. *Id.* at 4.

40. *Id.* at 9.

41. *Id.* at 7.

42. *Id.*

43. *See id.* at 5.

44. *Heat Island Impacts*, ENVTL. PROTECTION. AGENCY (last updated Jan. 11, 2017), <https://www.epa.gov/heat-islands/heat-island-impacts> [<https://perma.cc/YBN2-D5N9>].

primary goal, and accomplished by encouraging public transit use, reducing vehicle miles traveled, and transitioning to renewable fuels. Hardening or adapting the infrastructure itself to become resilient to flooding, heat, and power disruptions is still not as high a priority as it needs to be, as building redundancy and flexibility can be a major benefit of building new transportation facilities and capacity.⁴⁵

But climate impacts also require choices: where to build, where to reinforce, and where to withdraw. These are ultimately land use decisions, but transportation infrastructure costs are often a major factor in those decisions. System planning needs to both anticipate climate-related land use changes and remain flexible to unexpected changes in use or intensity.

Three examples illustrate the types of choices that need to be made. First, the New Jersey Meadowlands illustrates a large landscape with multiple uses and complex hydrology. Second, New York's commercial airports illustrate the considerations for where to invest in an infrastructure system that affects the entire region. Third, the coastal area around lower New York Bay illustrates the difficult choices for a heavily populated area with many vulnerable, low-income residents.

First, the New Jersey Meadowlands are home to several communities with over thirty thousand residents, Teterboro Airport, the Secaucus rail station, thousands of industrial jobs and several critical roads and rail lines. Though parts will be impacted by as little as one foot of sea level rise, most will be inundated at six feet. Because of the area's size and complex ecology, it is difficult to design engineering solutions that will successfully keep the water out in some parts without flooding others. Choices on what to protect and what to move, change, or abandon will need to weigh how many people are affected, either directly or indirectly, and the feasibility of protecting particular places. Secaucus Station, for example, is on relatively high ground and a critical transfer point in the region's rail network. Teterboro Airport, on the other hand, may be unusable with as little as one foot of sea level rise.⁴⁶

Second, sea level and storm surge should also strongly influence where investments are made to absorb the expected growth in air passengers in the New York region, where all three major commercial

45. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT, 56-61 (2008), http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [<https://perma.cc/VLJ3-QJ9C>] (providing a comprehensive list of mitigation and adaptation strategies).

46. REG'L PLAN ASS'N, *supra* note 33, at 16-17.

airports are at risk. Among these airports, LaGuardia Airport will be most affected. Its main runway will be entirely inundated with three feet of sea level rise.⁴⁷ Keeping the water out requires putting up a wall and pumping water out; but wall height is necessarily restricted to allow for takeoffs and landings. However, without LaGuardia Airport there would be twenty-eight million air passengers today who would need service elsewhere.⁴⁸ The number of air passengers is expected to grow substantially, and there is no other good place in the region to put another airport.

Newark Airport is in a better position, and will not be much affected by sea level rise until approaching six feet.⁴⁹ There are places around Newark—roadways, etc.—that will be affected by three feet of sea level rise.⁵⁰ And storm surge still must be addressed. John F. Kennedy Airport is little affected by sea level rise, but does require protection against storm surge.⁵¹ As the airport least affected by sea level rise, as well as for market and facility reasons, it makes most sense to bring new capacity to JFK before the other two airports.⁵²

Third, the coastal communities around Lower New York Bay, including the Rockaways, Jamaica Bay, Coney Island, and the East Shore of Staten Island, are amongst the most threatened in New York City. With three feet of sea level rise, the communities of Broad Channel, Arverne, Edgemere, and Howard Beach will be particularly affected by flooding. With six feet of sea level rise, much of the Rockaway peninsula will be under water and Jamaica Bay, which will have extended its reach deeper into its waterfront communities, will threaten more than half of Coney Island's current population with permanent inundation.⁵³ Housing must play a factor as well, in connection with economic planning. Planning for any existing or new transportation services to these communities needs to account for where housing and jobs can be reinforced, and where a transition needs to take place over several decades.

47. *Id.* at 10.

48. *Id.* at 4.

49. *Id.*

50. *Id.*

51. *Id.*

52. See Danny King & Johanna Jainchill, *Resurrection: A New Life for JFK Airport Landmark*, TRAVEL WKLY. (Feb. 1, 2017), <http://www.travelweekly.com/Travel-News/Hotel-News/Resurrection-TWA-Hotel-breaks-ground-New-York-JFK> [<https://perma.cc/7F5T-UAEW>] (listing recent investments to restore and repair JFK facilities).

53. REG'L PLAN ASS'N, *supra* note 33, at 4.

CONCLUSION

New York may be unique among American metropolitan regions in its size, the reach of its transit network, and the extent of its coastline. But every region in the nation will need to address a changing economy and climate change in some fashion, adding another level to the already challenging task of long-term transportation planning. Land use, transportation, and the environment have always been closely linked, even though they are often analyzed and planned separately. Growing inequality, a more competitive global economic environment, and rapid technological change make it even more critical to consider jobs, housing, air, and water quality in planning the next generation of major transit, highway, port, and aviation projects. The accelerating impacts of climate change are raising the stakes by redefining the relationship between the built and natural environments.