Transportation

ENVISIONING A CONNECTED SYSTEM:
HOW CAN WE ENSURE SUSTAINABLE MOBILITY FOR ALL NEW YORKERS?

June 15th, 2017

GETTING NYC TO

80 ✕ 50

A policy forum series on NYC'S 2050 goal to reduce
greenhouse gas emissions by 80% from 2005 levels

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INTRODUCTION: VISION OF A CONNECTED SYSTEM

The Paris climate agreement, signed by 195 nations in December 2015, aims to limit global temperature increase to no more than two degrees Celsius above pre-industrial levels, and urges emissions reduction targets that would limit global temperature growth to 1.5 degrees Celsius. Achieving these ambitious targets requires developed nations to reduce greenhouse gas emissions by at least 80 percent by 2050.

As a global leader in combatting climate change, New York City committed to this 80 x 50 target in September 2014, with an interim goal of achieving a 40 percent emissions reduction by 2030. In September 2016, the city released its Roadmap to 80 x 50, which used greenhouse gas emissions modeling to determine which policies would help the city achieve its 80 x 50 goal, with a focus on energy supply, buildings, solid waste and transportation. Achieving this vision will be accomplished, the roadmap says, by employing three types of strategies: avoiding trips through better land use or communications technology; shifting trips to low-carbon modes like walking, bicycling and transit; and improving trips through transitions to cleaner fuels.

The roadmap begins its transportation section by laying out a vision for 2050, with smartphone navigation seamlessly integrating different modes and operators, a proliferation of zero-emission and autonomous vehicles, a revival of maritime and rail freight, and a reduction in air pollution. New Yorkers will have a range of fast, affordable, frequent and convenient low-carbon options. Achieving this vision will be accomplished, the roadmap says, by employing three types of strategies: avoiding trips through better land use or communications technology; shifting trips to low-carbon modes like walking, bicycling and transit; and improving trips through transitions to cleaner fuels.

This will involve a careful marriage between old and new. Legacy low-carbon infrastructure like rail, buses, bicycling and walking must to continue to integrate new technologies, from real-time information to integrated fare payment systems. Meanwhile, trips by high-carbon modes, like automobiles, will have to become more efficient, through a combination of shifting to existing low-carbon modes like transit or active transportation; utilizing low-carbon fuels or zero-emission vehicles, and wringing efficiency out of the automotive system by converting to shared and on-demand vehicles.

Moving New York City to a low-carbon transportation system, however, requires more than just a policy wish list. As technologies develop, are utilized, and have impacts in often unexpected ways, the city must be ready to not only adapt but to lead the charge to ensure these technologies help, rather than hinder, the city's greenhouse gas reduction goals.

Achieving this vision also requires sustained work, not just at the city level, but at the state and regional levels, as well. Achieving the goal of

reducing citywide carbon emissions 80 percent by 2050 can only be achieved through a coordinated response across all levels of government. There is much the city can do on its own to accelerate the implementation of its 80 x 50 goals, but for it to realistically achieve such significant GHG reductions in this timeframe, it must also assume its role as a national leader by engaging in the difficult state, regional and national policy decisions that will impact its ability to achieve its GHG reduction goals.

CONTEXT: TRANSPORTATION CONTRIBUTIONS TO GREENHOUSE GAS EMISSIONS

NYC has a relatively carbon efficient system

Compared to the rest of the U.S., New York City has a carbon-efficient transportation system, with per capita transportation-sector GHG emissions roughly one quarter the U.S. average. This is in part because among the 30 largest U.S. urbanized areas, the New York-Newark region has the lowest daily vehicle miles traveled (VMT) per capita.[1] But compared to peer cities internationally, New York trails behind cities such as Paris, London and Seoul in per capita transportation GHG emissions.[2]

The transportation sector in New York City was responsible for 10.5 million metric tons of carbon dioxide equivalents in 2014 – the latest year for which data is available – comprising 28 percent of citywide greenhouse gas emissions.[3] This proportion is roughly on par with United States nationwide GHG emissions, of which 26 percent came from the transportation sector in 2014.[4]

GHGs overwhelmingly come from private vehicles, especially in the outer boroughs

New York City's transportation greenhouse gas emissions are driven by on-street vehicles, and in particular, private cars. 91.6 percent of citywide transportation emissions come from on-road sources, the vast majority of which are powered by gasoline.[5] There are 21 billion miles driven on New York City streets each year, and 94 percent of the GHG emissions from these miles driven comes from private vehicles, buses, trucks and for-hire vehicles. In fact, light-duty on-road private vehicles (i.e. cars) are responsible for 78 percent of citywide transportation GHG emissions.[6]

Limited success in reducing transportation GHG emissions to date

From 2005 to 2014, citywide GHG emissions have fallen by 11.7 percent. Most of the reduction occurred prior to 2012, driven by a shift in electricity generation from coal to natural gas, plus city policies to encourage clean heating fuels and energy efficiency measures to reduce GHG emissions from buildings.[7]

Transportation has played a limited role in citywide GHG reductions to date. From 2005 to 2014, transportation sector greenhouse gases have dropped 5 percent, comprising just 1.1 percent of total citywide GHG reduction.

1 State Transportation Statistics 2015. U.S. Department of Transportation, Bureau of Transportation Statistics. https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/STS_2015.pdf (Table 5-4, page 87)

2 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20 City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 79)

3 Inventory of New York City Greenhouse Gas Emissions in 2014. New York City Mayor's Office of Sustainability. April 2016. https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/ NYC_GHG_Inventory_2014.pdf (page 27)

4 Sources of Greenhouse Gas Emissions. U.S. Environmental Protection Agency. https://www.epa. gov/ghgemissions/sources-greenhouse-gas-emissions

5 Inventory of New York City Greenhouse Gas Emissions in 2014. New York City Mayor's Office of Sustainability. April 2016. https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/ NYC_GHG_Inventory_2014.pdf (page 27)

6 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20 City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 81)

7 Inventory of New York City Greenhouse Gas Emissions in 2014. New York City Mayor's Office of Sustainability. April 2016. https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/ NYC_GHG_Inventory_2014.pdf (page 25)

Cleaner and more efficient electricity generation has reduced GHG emissions from subways and commuter rail, but the bulk of citywide transportation GHG reductions, approximately 72 percent, have come from a reduction in per capita VMT.[8] In other words: Transportation greenhouse gas emissions have dropped in New York City mostly because New Yorkers are driving less.

THE CHALLENGE: REDUCING EMISSIONS OUTSIDE THE CENTRAL BUSINESS DISTRICT (CBD)

Manhattan is a low-carbon international success story

New York City's efforts to shift trips from personal vehicles to transit have historically focused on trips to and from the Manhattan core. Decades of investment in the region's subways, commuter buses, commuter railroads and bicycle network, combined with limits on the construction of new off-street parking in the Manhattan core, have helped shift Manhattan-bound trips to more environmentally-friendly modes of transportation.

Three-fourths of all commutes to Manhattan are made primarily by transit, with only 11 percent of Manhattan workers driving alone to work. Even those who own cars choose to leave them at home when they commute to Manhattan: 82 percent of Manhattan workers who own cars commute by transit, making them seven times more likely to choose transit than the average U.S. worker.[9]

The reliance on transit holds for all trips, not just commute trips. The share of people entering Manhattan below 60th Street by auto, taxi, van and truck peaked at 36 percent in 1998, plummeting to just 23 percent in 2015. The share of trips by transit or bicycle, meanwhile, increased from 64 to 77 percent. Even as the Manhattan core has grown, the number of people arriving by automobile on an average weekday has dropped, from 1.3 million in 1999 to 918,000 in 2015, and the number of vehicles has dropped, from 844,000 in 1999 to 724,000 in 2015.[10]

This is due in large part to the strength of the transit network after decades of investment. The Metropolitan Transportation Authority's five-year capital program, begun in 1982, has funded $128.68 billion (in 2017-adjusted dollars) of state of good repair, system upgrades, and expansion from 1982 to 2011. As a result, the reliability of the transit network has improved greatly; for example, the mean distance between failures (MBDF) for subway trains improved from just 7,186 miles in 1982 to more than 170,000 miles in 2012.[11] Similar investments in other regional transit systems, such as the inauguration of Midtown Direct train service on New Jersey Transit in 1996, also improved travel to and from the Manhattan core.[12]

In addition to investing in transit, New York City worked to constrain the supply of parking in the central city. The number of off-street parking spaces in the Manhattan core has dropped, from 127,000 spaces south of 60th Street in 1978 to 102,000 in 2010. This drop happened as redevel-

8 Inventory of New York City Greenhouse Gas Emissions in 2014. New York City Mayor's Office of Sustainability. April 2016. https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/NYC_GHG_Inventory_2014.pdf (page 27)

9 Commuting to Manhattan: A study of residence location trends for Manhattan workers from 2002 to 2009. Mitchell L. Moss, Carson Y. Qing, and Sarah Kaufman. Rudin Center for Transportation Policy and Management, New York University Wagner School of Public Service. March 2012. http://wagner.nyu.edu/files/rudincenter/ManhattanCommuting.pdf (page 3)

10 HUB Bound Travel Data 2015. New York Metropolitan Transportation Council. December 2016. https://www.nymtc.org/Portals/0/Pdf/Hub%20Bound/2015%20Hub%20Bound/DM_TDS_Hub_Bound_Travel_2015.pdf?ver=2017-01-11-123902-670 (page I-3)

11 The Road Back: A Historic Review of the MTA Capital Program. The Permanent Citizens Advisory Committee ot the MTA. May 2012. http://www.pcac.org/wp-content/uploads/2014/09/The-Road-Back.pdf (page i; pdf page 3)

12 Kearny Link Is Finished, Reducing Trip by Rail. Richard Perez-Pena, New York Times. May 28, 1996. http://www.nytimes.com/1996/05/28/nyregion/kearny-link-is-finished-reducing-trip-by-rail.html

opment replaced parking garages and lots, and because of changes to the city's zoning code enacted in 1982. These regulations, pursued in response to the 1970 Clean Air Act and the city's subsequent 1973 transportation control plan, instituted New York City's first parking maximums, limiting the amount of parking built with new development and restricting by-right construction of public parking.[13]

The implementation of bus lanes, protected bicycle lanes and bike-share have started in the city's core, benefitting from the high density of potential riders, before expanding outward. The nation's busiest bus lane, carrying Manhattan-bound morning commuters through the Lincoln Tunnel and its New Jersey approaches, was opened by the Port Authority in 1970.[14] Starting in 1981, Mayor Ed Koch began installing on-street bus lanes in Manhattan, on Madison Avenue, Fifth Avenue, Broadway, and 42nd Street, among other corridors.[15] The network of bus lanes has expanded, including through the introduction of Select Bus Service in 2008,[16] though bus lanes remain overwhelmingly concentrated in the Manhattan core.[17]

New York City's first modern on-street protected bicycle lane was installed on Ninth Avenue in Chelsea in 2007.[18] While these types of bike lanes can now be found across the city, the densest and most useful network of protected bicycle lanes remains in the Manhattan core.[19] Citi Bike, taking advantage of these bike lanes, launched below 60th Street and in nearby sections of Brooklyn in 2013, and is in the process of continuing its expansion to adjacent neighborhoods. A separate Citi Bike program launched in Jersey City in 2015, the same year a separate bike-share system launched in Hoboken and Weehawken.[20] The Citi Bike system's strong ridership numbers in New York City are driven by its high concentration of stations in contiguous central neighborhoods.[21]

The extreme density of the Manhattan core, and its role as the region's primary node of activity, means the various costs of automobile trips — in the form of pollution, use of public space, and storage of parked vehicles — are readily apparent to the public, the press, and elected officials. The fight to maintain and build upon these gains in the Manhattan core dominate New York's transportation policy discussions, including debates about how to continue funding the MTA capital plan, the replacement of the Port Authority Bus Terminal, the fate of congestion pricing, and planning for the Gateway Tunnel beneath the Hudson River.

The challenge is making an impact in the boroughs outside Manhattan

While much of the current transportation policy discussion is focused on the Manhattan core, the vast majority of New York City's transportation-sector greenhouse gas emissions can be attributed to car and truck traffic outside the CBD. Reducing greenhouse gas emissions will require not only sustaining and building upon the VMT-reduction techniques that have proven

13 Manhattan Core Public Parking Study. New York City Department of City Planning, Transportation Division. December 2011. https://www1.nyc.gov/assets/planning/download/pdf/plans/manhattan-core-public-parking/mncore_study.pdf (page 9)

14 The Lincoln Tunnel Exclusive Bus Lane. Port Authority of New York and New Jersey. https://www.panynj.gov/bridges-tunnels/lincoln-tunnel-xbl.html

15 Two Lanes on Madison Ave to Be Reserved for Buses. Ari L. Goldman, New York Times. May 26, 1981. http://www.nytimes.com/1981/05/26/nyregion/2-lanes-on-madison-ave-to-be-reserved-for-buses.html and Fifth Ave to Get Bus Lane Along Midtown Stretch. Ari L. Goldman, New York Times. September 7, 1982. http://www.nytimes.com/1982/09/07/nyregion/5th-ave-to-get-bus-lane-along-midtown-stretch.html

16 Select Bus Service: Fordham Road/Pelham Parkway. New York City Department of Transportation. http://www.nyc.gov/html/brt/html/routes/pelham.shtml

17 Bus Lanes in New York City. New York City Department of Transportation. http://www.nyc.gov/html/brt/downloads/pdf/bus_lanes_map.pdf

18 Ninth Avenue Bicycle Path and Complete Street. Ryan Russo, Randy Wade, Joshua Benson, and Christopher Lucas. http://www.nyc.gov/html/dot/downloads/pdf/rr_ite_08_9thave.PDF (page 1)

19 Current Bicycle Route Projects. New York City Department of Transportation. http://www.nyc.gov/html/dot/html/bicyclists/bike-projects.shtml

20 Citibike to Expand to Jersey City as Hoboken's Bike Share Goes it Alone. Megan Malloy, New Jersey Public Radio. July 15, 2015. http://www.wnyc.org/story/citibike-expand-jersey-city-hobokens-bike-share-program-forges-ahead/

21 Citi Bike: The First Two Years. Sarah M. Kaufman, Lily Gordon-Koven, Nolan Levenson and Mitchell L. Moss. Rudin Center for Transportation Policy and Management, New York University Wagner School of Public Service. June 2015. http://wagner.nyu.edu/rudincenter/wp-content/uploads/2015/06/Citi_Bike_First_Two_Years_RudinCenter.pdf

successful in the central business district, but expanding them to outer-borough areas, which have different transportation needs and political climates than the region's core.

Ninety percent of the city's car and truck VMT occurs outside the Manhattan core: 54 percent are trips entirely within the five boroughs that never enter the central business district, and an additional 30 percent are trips outside the CBD that start or end outside New York City. Just nine percent are trips between the CBD and other parts of the city, and just one percent are trips within the Manhattan core.[22]

One indicator of the greater level of automobile dependency in areas beyond the Manhattan core is the city's disparate automobile ownership rate. In Manhattan, 78 percent of households are car-free, dropping to 59 percent in the Bronx, 56 percent in Brooklyn, 38 percent in Queens, and 17 percent on Staten Island.[23] Approximately half of the workers who live in the Bronx, Queens, Brooklyn and Staten Island work in their own borough. Yet fewer than half of these commutes are made by transit, because driving across town is often easier, faster and more appealing than riding the bus or, if the option even exists, taking the train.[24]

It is more difficult to promote transit in areas of New York City that are less concentrated than the CBD. These jobs, while often concentrated in hubs like Flushing or Long Island City, are not as readily accessible to the regional transit network as jobs located in the Manhattan core. In addition, land use in many outer-borough areas is less dense and more automobile-oriented. The zoning code almost always requires that parking be built with new development, and lower densities relative to the CBD can make walking a less appealing transportation option.

The enormous greenhouse gas impact of outer-borough vehicle travel threatens to grow. While the CBD continues to dominate as the center for the city's job growth in absolute terms, absorbing almost half of all New York City jobs between 2010 and 2014, employment in the outer boroughs is growing at a much faster rate.[25] For example, while the number of private sector jobs in Manhattan increased by 2.9 percent in 2014 and the first half of 2015, the rate in the Bronx, Queens, Brooklyn and Staten Island was a combined 6.4 percent.[26]

VMT in New York City has been dropping, but threatens to increase along with national trends. After years of increasing, nationwide urban VMT dropped from 1.995 million miles in 2007 to 1.975 million miles in 2009. But since the end of the recession, what once appeared to have been a plateau in VMT has begun increasing once more, to 2.105 million miles in 2014.[27]

Fortunately, New York City has the ability to buck national vehicular transportation trends. One example is the sustained reduction in vehicular trips to the Manhattan core, despite national increases in VMT over the same period. Another encouraging indicator is traffic safety, where the city has seen a nearly continuous decline in traffic fatalities, despite a recent increase

22 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20 City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 83)

23 U.S. Census Bureau, 2011-2015 American Community Survey 5-Year Estimates, Table S2504

24 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20 City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 8)

25 Employment Patterns in New York City: Trends in a Growing Economy. New York City Department of City Planning. July 2016. http://www1.nyc.gov/assets/planning/download/pdf/data-maps/ nyc-economy/employment-patterns-nyc.pdf (page 15)

26 NYCEDC Announces 6.4 Percent Job Growth in Boroughs Outside Manhattan Since Mayor de Blasio Has Taken Office. New York City Economic Development Corporation. February 1, 2016. https://www.nycedc.com/press-release/nycedc-announces-64-percent-job-growth-boroughs-out-side-manhattan-mayor-de-blasio-has

27 Table 1-36: Roadway Vehicle-Miles Traveled (VMT) and VMT per Lane-Mile by Functional Class(a). U.S. Department of Transportation, Bureau of Transportation Statistics. https://www.rita.dot.gov/ bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_01_36. html

nationwide. Last year, for example, the city saw 229 deaths, its lowest-ever recorded total, a decrease of five from the year before.[28] This contrasts with national fatality numbers, which increased 7.2 percent over the same period.[29]

Another challenge facing reducing outer-borough VMT: Measuring trips within and between the boroughs is more difficult than quantifying how people move into and out of the Manhattan core. Each year, the New York Metropolitan Transportation Council produces the Hub Bound Travel report, which aggregates information about all trips, not just work trips, in and out of, but not within, Manhattan below 60th Street.[30] While other data sources, including the U.S. Census and NYMTC's Best Practice Model, are available to capture and model travel across the region, it could be worthwhile for DOT and the Mayor's Office of Data Analytics to develop metrics to benchmark travel outside the CBD with an eye toward GHG reduction. As mobile phone technology has proliferated, there are also new ways to collect information on travel behaviors available through firms like Airsage, Inrix, Citilogik and StreetLight Data, which track movement based on cellular signals and could inform the city's borough-to-borough travel models.

Encouraging low- and zero-emission vehicles

While some things are outside the city's direct control, like fuel-efficiency standards and the development of autonomous vehicle technology, city government can have the greatest impact by encouraging low- and zero-emission vehicles while simultaneously implementing policies that are already proven to reduce VMT.

The first place to look for city action is within government itself. The City of New York operates a fleet of more than 27,000 vehicles. In 2015, city-owned fleet emissions were down 11 percent over 2005 levels, and the city has established a goal of reducing city fleet emissions by 50 percent in 2025 and 80 percent by 2035 — a standard that's more aggressive than the overall 80 x 50 goal.[31]

One place the city is making headway is by reducing the size of the city-owned fleet by shifting to a car-share model and, when possible, encouraging city employees to take modes other than city vehicles for work trips. The city has installed car-share technology on 707 of its vehicles, an increase of 110 in the past year. In addition, 603 employees at 55 agencies or divisions have used Zipcar vehicles that are offered for city use at a discounted rate. Taken together, the initiatives have more than 4,500 participating city employees and have reduced use of city-owned vehicles by over 150,000 hours a year.[32] The contract the city has for this program with Zipcar will expire in mid-2017 and the city has put out an RFP that includes a number of improvements to the program, such as one-way trips, enabling vehicle sharing between and not just within departments, and integration with existing safety and fleet monitoring databases used by DCAS.[33]

Reducing the GHG impact of the city-owned fleet involves not just reducing the size of the fleet and shifting to car-share, but also moving toward low- and zero-emission vehicles. The city

28 Vision Zero: Mayor de Blasio Announces 2016 Saw Fewest Fatalities Ever on New York City Streets. New York City Mayor's Office. January 11, 2017. http://www1.nyc.gov/office-of-the-mayor/news/013-17/vision-zero-mayor-de-blasio-2016-saw-fewest-fatalities-ever-new-york-city-streets#/0

29 Traffic Fatalities Up Sharply in 2015. U.S. Department of Transportation. August 29, 2016. https://www.transportation.gov/briefing-room/traffic-fatalities-sharply-2015

30 Hub Bound Travel. New York Metropolitan Transportation Council. https://www.nymtc.org/Data-and-Modeling/Transportation-Data-and-Statistics/Publications/Hub-Bound-Travel

31 NYC Clean Fleet. New York City Mayor's Office of Sustainability. December 2015. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/NYC%20Clean%20Fleet.pdf

32 NYC Car and Fleet Share. New York City Department of Citywide Administrative Services. February 1, 2017. http://www.nyc.gov/html/dcas/downloads/pdf/fleet/Local_Law_41_Report_On_NYC_Car_And_Fleet_Share_2-1-2017.pdf

33 NYC Car and Fleet Share. New York City Department of Citywide Administrative Services. February 1, 2017. http://www.nyc.gov/html/dcas/downloads/pdf/fleet/Local_Law_41_Report_On_NYC_Car_And_Fleet_Share_2-1-2017.pdf

has established goals for the adoption of electric vehicles in its fleet, aiming for 2,000 EVs by 2025 under its NYC Clean Fleet plan.[34] In September 2016, the city announced that its electric fleet had grown to more than 500 vehicles, and that all nonemergency sedans ordered in Fiscal Year 2017 would be EVs, bringing the total to nearly 1,000 by the end of 2017.[35]

If the city is already approaching the halfway point to its 2025 goal for EV adoption in the city fleet, perhaps it's worth considering targets that would further expand EV adoption in the city's owned and shared fleet. But the city fleet comprised just four percent of citywide on-road transportation GHG emissions in 2013.[36] Making a real dent in citywide transportation-related GHG emissions means these clean-vehicle efforts must expand beyond the city-owned fleet.

One area where New York City has lagged behind other U.S. jurisdictions is in the adoption of electric charging facilities, potentially using existing on-street power supplies, such as nearby street lamps, bus shelters, and traffic signals.[37] Charging facilities could also be implemented in city-owned parking garages and lots, or, like bicycle parking, be mandated by local law in privately-owned public parking facilities.

The city also has significant leverage over shared mobility and for-hire services. The city could use its role as regulator of the taxi and for-hire vehicle industries to spur wider adoption of hybrid and electric vehicles. Of the 13,587 yellow cabs on the road in 2015, 73 percent were hybrids, while just 26 percent of the 7,676 boro taxis were hybrids — a gap that can be attributed to the 2009 hybrid incentive plan.[38] TLC does not provide similar statistics for the more than 46,000 livery and black car vehicles on the road.[39] A goal, announced by Mayor Michael R. Bloomberg during his final State of the City address in Janu-

ary 2013, for one-third of the taxi fleet to be comprised of EVs, resulted in a "Roadmap to Electric New York City Taxis" being released at the end of that year, but implementation of the report's recommendations has stalled.[40]

Meanwhile, electric vehicle technology has advanced and private actors in the for-hire vehicle industry have begun launching their own EV pilots. In April 2017, Uber set a goal of having EVs comprise 10 percent of its fleet by 2019 in Portland, Oregon, through a combination of incentives.[41] It echoes an initiative the company launched in London in September 2016 by leasing Nissan Leaf EVs to drivers. That program is being expanded by installing rapid chargers throughout central London for use by its drivers.[42] Perhaps these initiatives, and electric taxi efforts in Santiago, Bogotá and Beijing could inspire the Taxi and Limousine Commission to jump-start its dormant efforts to bring electric vehicles to the city's taxi and for-hire fleet.

The city could also use its role as regulator of curbside space, through the Department of Transportation, to encourage EV adoption by car-

34 NYC Clean Fleet. New York City Mayor's Office of Sustainability. December 2015. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/NYC%20Clean%20Fleet.pdf

35 Climate Week: Mayor de Blasio Announces NYC Fleet Now Operates More Than 500 Electric Vehicles. New York City Mayor's Office. September 21, 2016. http://www1.nyc.gov/office-of-the-mayor/news/759-16/climate-week-mayor-de-blasio-nyc-fleet-now-operates-more-500-electric-vehicles

36 NYC Clean Fleet. New York City Mayor's Office of Sustainability. December 2015. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/NYC%20Clean%20Fleet.pdf

37 Urban Mobility Index Report. Centre for Economics & Business Research. April 2017. https://www.qualcomm.com/documents/urban-mobility-index-report (page 26)

38 NYC Taxi and Limousine Commission Approves Hybrid Incentive Plan. New York City Taxi and Limousine Commission. March 26, 2009. http://www.nyc.gov/html/tlc/downloads/pdf/press_release_03_26_09.pdf

39 2016 TLC Factbook. New York City Taxi and Limousine Commission. http://www.nyc.gov/html/tlc/downloads/pdf/2016_tlc_factbook.pdf (page 1)

40 Take Charge: A Roadmap to Electric New York City Taxis. New York City Taxi and Limousine Commission. December 2013. http://www.nyc.gov/html/tlc/downloads/pdf/electric_taxi_task_force_report_20131231.pdf

41 Uber's first U.S. Electric Vehicle Initiative: Celebrating Portland's commitment to clean energy. Uber. https://www.uber.com/drive/portland/resources/electric/

42 More electric cars on the road in London. Uber. March 28, 2017. https://newsroom.uber.com/uk/more-electric-cars-on-the-road-in-london/

share companies. A program announced in December 2016 by DOT to dedicate 300 on-street spaces and 300 spaces in municipal garages for car-share services is a start, but it is in many ways simply catching up to a policy other cities have had in place for years.[43] The city could do more to encourage adoption of electric vehicles by these firms, many of which are already utilizing EVs. Of the more than 13,700 vehicles Car2Go operates worldwide, approximately 1,360 are electric vehicles.[44] The company had launched an all-electric fleet in San Diego, but converted it to a gasoline-powered fleet after it struggled with a lack of charging stations.[45] New York City could learn from this experience by dramatically boosting its on-street EV charging network.

Zipcar has also put EVs into service in its fleets in the United Kingdom,[46] Portland,[47] and Chicago.[48] But it does not operate EVs in New York City. ReachNow, a car-share service operated by BMW, has added electric vehicles to its fleet in New York, but their use is restricted to residents of two Battery Park City apartment buildings, because ReachNow was granted access to charging stations in the parking garage for the buildings.[49] The absence of charging locations in municipal garages and on the street certainly seems to be playing a role in the lack of publicly-available EV car-share in New York City, and this is something the city could change.

Automobiles are not the only types of vehicles that can benefit from electrification. Electric-assist bicycles can help attract riders concerned about their physical ability to travel by bicycle. They can also allow riders to use bicycles for a wider range of trips, covering greater distances or carrying additional cargo.[50] While federal rules allow the sale of e-bikes, they are currently illegal to operate on the road in New York state, despite their widespread use in the restaurant

industry for food delivery.[51] By lobbying for New York state to legalize the use of e-bikes under the vehicle and traffic law, the city would open the door to wider adoption of e-bikes as part of the city's green transportation network. In addition to wider adoption by the general public, it could allow Citi Bike to explore the possibility of installing e-bikes as part of the city's bike-share network, as systems in other cities have done.[52] The new operator of Paris's Velib bike-share, for example, will have electric-assist capabilities on a third of its bicycles.[53]

Changes in freight transport

In New York City, more than 91 percent of all goods are delivered by truck.[54] This reliance on a high-carbon mode has enormous implications for the city's greenhouse gas output, but the 80 x 50 transportation roadmap projects that just one percent of citywide transportation-related

43 Oversight - How Can New York City More Efficiently Manage its Parking to Meet Diverse Community Needs, Including Through Meters, Car Sharing and Other Innovative Ways?. New York City Council. December 12, 2016. http://legistar.council.nyc.gov/MeetingDetail.aspx-?ID=517882&GUID=740B27AE-B3E5-4C11-9C53-B0027376A5F2&Search=

44 Fact sheet car2go. car2go. June 2016. https://www.car2go.com/media/data/germany/micro-site-press/files/fact_sheet_car2go_june_2016_en.pdf

45 Car2Go switching electric cars to gas. David Garrick, San Diego Union-Tribune. March 16, 2016. http://www.sandiegouniontribune.com/news/politics/sdut-car-share-car2go-fleet-gas-electric-2016mar16-story.html

46 Zipcar Launches New Fleet of 50 Cutting-Edge Volkswagen Golf GTE Plug-In Hybrid Electric Cars for Zero-Emission Driving in London. Zipcar. June 7, 2016. https://www.zipcar.co.uk/press/releases/zipcar-launches-new-fleet-of-50-cutting-edge-volkswagen-golf-gte-plug-in-hybrid-electric-cars

47 Portland Honda Fit EV. Zipcar. http://www.zipcar.com/portlandev

48 Zipcar Charges Up Car Sharing in Chicago with Electric Vehicle Pilot Program. Zipcar. March 22, 2012. http://www.zipcar.com/press/releases/zipcar-pilots-electric-vehicle-program-in-chicago

49 BMW's ReachNow car-sharing service brings private fleet to Manhattan apartments. Kyle Campbell, New York Daily News. December 9, 2016. http://www.nydailynews.com/autos/news/bmw-reachnow-starts-private-fleet-manhattan-apartments-article-1.2904607

50 E-Bikes in the North America: Results from an online survey. John MacArthur, Jennifer Dill, Mark Person. Submitted for presentation and publication to the 93rd Annual Meeting of the Transportation Research Board. January 12-16, 2014. http://ppms.trec.pdx.edu/media/project_files/E-bikes_in_North_America.pdf

51 The Murky Legality of E-Bikes. Vicky Gan, Citylab. February 17, 2016. http://www.citylab.com/crime/2016/02/the-murky-legality-of-e-bikes/426969/

52 Electric assist might be bike share's next big thing. April Corbin, PeopleForBikes. March 7, 2016. http://betterbikeshare.org/2016/03/07/bike-shares-next-big-thing-electric-assist/

53 New Paris Velib scheme to end bicycle parking misery. Geert De Clercq, Reuters. May 10, 2017. http://www.reuters.com/article/us-paris-bicycles-velib-idUSKBN1862NB

54 Urban Freight Initiatives. New York City Department of Transportation. September 2015. http://www.nyc.gov/html/dot/downloads/pdf/2015-09-14-urban-freight-initiatives.pdf (page 1)

GHG emission reductions will come from improved freight efficiency.[55]

One of the big reasons why New York is so reliant on trucks is that it is nearly cut-off from the rest of the nation's freight rail network due to the lack of Hudson River crossings. Tracks through Manhattan are used exclusively for passenger rail, while the nearest freight rail crossing of the Hudson is in Selkirk, in Albany County. A rail barge service operates between Brooklyn and New Jersey, but it is of limited capacity.[56] A rail tunnel to replace the barge service has long been championed by U.S. Rep. Jerrold Nadler, and the state recently announced $70 million for the Port Authority of New York and New Jersey to conduct a Tier II Environmental Impact Study and additional design and engineering work.[57]

The city has already invested $100 million in the South Brooklyn Marine Terminal and associated rail upgrades. The cross-harbor tunnel, which could connect to train lines that today are primarily used for passenger rail by Metro-North and Long Island Rail Road, could bring changes to the region's freight distribution network and reduce freight-related greenhouse gas emissions, particularly by reducing the amount of truck traffic moving across the Hudson River and through New York City. The Port Authority estimates the tunnel could reduce annual GHG emissions by 80,000 to 110,000 metric tons by 2035.[58]

While the cross-harbor freight tunnel is a large-scale solution to a regional problem, the city could activate its waterfronts for small-scale shipping and distribution. The city is investing in marine terminals in Brooklyn and Staten Island, but these facilities could be complemented by smaller-scale distribution ports that can take cargo from, for example, Port Elizabeth and bring it to the South Bronx or Brooklyn waterfronts, eliminating truck trips on the Cross Bronx and Staten Island express-

ways. In Paris, for example, the Franprix supermarket chain, with 80 locations in the city, has begun moving goods by barge on the Seine. This allows the company to avoid congestion in the city while using up to three times less energy than a truck over a comparable distance and emitting two to four times less CO_2. Its drivers are now able to make more rounds, instead of driving to and from distribution centers outside the city.[59]

No matter the rail and water innovations, the vast majority of freight and delivery in New York City will continue to travel its "last mile" on city streets. The city initiated an off-hours delivery program in Manhattan, which has had some success in reducing associated congestion. Lessons learned from the Manhattan deployment could be applied citywide.[60] Additionally, shifting many of these trips to lower-impact modes, particularly in the densest parts of the city, could be worth additional attention. UPS, for example, has piloted package delivery by cargo e-bike in Portland, Oregon.[61] This model could be particularly useful in New York City, as well, but as discussed earlier, e-bikes are currently illegal in New York state and so their development as on-road freight delivery vehicles is prohibited.

Trucks, of course, will continue to play a major

55 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 85)

56 Rail Facilities. New York City Economic Development Corporation. https://www.nycedc.com/program/rail-facilities

57 Governor Cuomo and Congressman Nadler Announce Milestone in Cross Harbor Freight Project. New York State Governor's Office. May 5, 2017. https://www.governor.ny.gov/news/governor-cuomo-and-congressman-nadler-announce-milestone-cross-harbor-freight-project

58 One New York: The Plan for a Strong and Just City. City of New York. http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf (page 95)

59 Une innovation majeure pour la distribution alimentaire au cœur de Paris. Franprix. http://www.franprix.fr/qui-sommes-nous/franprix-en-seine/

60 The New York City Off-hour Delivery Project: Lessons for City Logistics. José Holguín-Veras, Cara Wang, Michael Browne, Stacey Darville Hodge, Jeffrey Wojtowicz. Procedia - Social and Behavioral Sciences. Volume 125, 20 March 2014, Pages 36-48. http://www.sciencedirect.com/science/article/pii/S187704281401492X

61 First UPS U.S. Delivery eBike Debuts In Portland, Ore. UPS. December 7, 2016. https://pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=PressReleases&id=1481114356396-572

role in on-road freight delivery. The city could accelerate the development of its Smart Fleet rating system, which it outlined in its OneNYC plan as "similar to the Leadership in Energy & Environmental Design (LEED) standard for buildings, but based on truck safety, noise reduction, energy efficiency, and emissions-control technology."[62] Such a system is not unattainable: the mayors of London and Paris, for example, announced in March a vehicle rating system more stringent than existing European standards, allowing car buyers to identify the most efficient vehicles on the road.[63] Given the city's extreme dependence on trucks for freight transport, New York City would be a natural city to aggressively lead on the Smart Fleet rating system.

Other initiatives, such as the Hunts Point Truck Replacement Program, have been successful at upgrading fleets in areas that see a high amount of truck traffic. The city has continued to fund additional rounds of the program, which could be expanded to other areas with a high density of trucks, such as Industrial Business Zones in Maspeth and elsewhere.[64] Longer term, the city could modify this citywide truck replacement program to shift not just to fuel-efficient and lower-emission vehicles, but to incentivize the adoption of electric and other low-emission freight vehicles.

Factors outside the City's control

Even if the city took no new actions to reduce transportation GHG emissions, under a "business as usual" projection, the 80 x 50 roadmap says the city is already on target to achieve a 36 percent reduction over 2005 levels by 2030 and a 40 percent reduction by 2050. These improvements are driven by prior city, state and federal investments to shift trips to green modes and reduce VMT, but also by stricter federal fuel economy standards.[65] Today, 78 percent of citywide transportation GHG emissions are due to private cars. The city's "business as usual" projection forecasts that figure will drop to 51 percent in 2030 and 46 percent in 2050.[66]

Relying on federal fuel economy standards to drive down GHG emissions is no sure bet under the Trump administration, which has announced its intentions[67] to revisit fuel economy standards set by the Obama administration that would push the average mileage of new car fleets to 36 miles per gallon between 2022 and 2025, from the current level of approximately 25 mpg.[68] The Trump administration could also rescind waivers granted to California under the Clean Air Act that allow it to set stricter fuel economy standards for cars and light trucks, and require carmakers to sell a certain number of zero-emission vehicles. New York is one of nine states that has signed on to California's stricter standards.[69] Removing these federal waivers would make it more difficult to achieve carbon reduction the city is assuming as part of its "business as usual" projection.

"A very important piece of our 80 x 50 strategy is dependent on our capacity to move forward with the California clean car standards," said Michael Replogle, NYC DOT Deputy Commissioner for Policy. "We get a lot of carbon reduction in the transport sector out of that association with California's standards."

62 One New York: The Plan for a Strong and Just City. City of New York. http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf (page 96)

63 Press Release: Mayors of Paris and London Announce Car Scoring System to Slash Air Pollution on City Streets. C40 Cities. March 29, 2017. http://www.c40.org/press_releases/press-release-mayors-of-paris-and-london-announce-car-scoring-system-to-slash-air-pollution-on-city-streets

64 About the Hunts Point CTP. Hunts Point Clean Trucks Program. http://www.huntspointctp.com/about.html

65 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 83)

66 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 84)

67 Trump's plan to roll back Obama's fuel economy rules for cars, explained. Brad Plumer, Vox. March 15, 2017. http://www.vox.com/energy-and-environment/2017/3/15/14828070/trump-fuel-economy-standards

68 U.S. Environmental Protection Agency. Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation. January 2017. https://www.epa.gov/sites/production/files/2017-01/documents/420r17001.pdf

69 Low and Zero Emission Vehicles. New York State Department of Environmental Conservation. http://www.dec.ny.gov/chemical/8575.html

LOOKING TO THE FUTURE

The promise and pitfalls of ride-hailing

The city's 80 x 50 roadmap envisions shared mobility and for-hire vehicles taking a larger share of trips, from two percent today to eight percent in 2050. This would happen as transit, walking and bicycling also take over an increased share of trips, pushing personal driving from 31 percent of trips today to just 12 percent in 2050.[70]

It remains an open question whether shared mobility and for-hire services in the future will replace trips currently taken by private vehicle or trips currently taken by transit. The city's goals notwithstanding, it's not quite clear yet whether a future in which cars are regularly summoned by app helps or hurts the goal of reducing greenhouse gas emissions. For now, it appears that for-hire services operated by transportation network companies like Uber and Lyft have added to VMT on New York City streets at the expense of greener modes like transit, walking and bicycling. TNCs have resulted in an estimated additional 600 million miles of vehicle travel in the five boroughs from 2013 to 2016, even after declines in yellow cab and personal vehicle travel are taken into account. As a result, for-hire vehicles (including yellow cabs, car services and TNCs) have increased their share of citywide VMT from 14 percent to 19 percent in just three years, according to an analysis by former NYC DOT official Bruce Schaller.[71]

Although TNCs have offered pooled rides as an option since 2015, solo rides predominate, and most TNC trips are not replacing journeys that would have been taken by private car. As TNCs expand, Schaller says, this pattern is unlikely to change. "If you put large volumes of TNCs in the boroughs, even if they do a lot of pooling, I think you'll still get big increases in VMT, because so many of the trips come from transit," he said.

The prospect of shared, low-emission autonomous vehicles becoming a replacement for private car ownership looms on the horizon in the minds of transportation and environmental experts, but until the technology is developed and deployed on a mass scale — which could happen in years or decades — it's simply not something that can be used to reduce greenhouse gas emissions today. In fact, according to Schaller's analysis, the rise of app-based for-hire vehicles has led to an increase in VMT and the attendant greenhouse gas emissions, not a reduction.

Taking walking, bicycling, and transit to the next level

The Roadmap to 80 x 50 envisions 80 percent of all trips being made by walking, bicycling and transit, with the share of trips by private automobile dropping from 33 percent to 20 percent of all journeys. This would result in in additional GHG reduction gains to the city's "business as usual" projection, achieving a 58 percent reduction from 2005 levels by 2030 and an 82 percent reduction by 2050.[72]

The roadmap to 80 x 50 calls for walking's share of citywide trips to increase modestly, from 38 percent to 40 percent in 2050.[73] Achieving this goal, small though it may seem, could be a chal-

70 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20 City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 86)

71 Unsustainable? The Growth of App-Based Ride Services and Traffic, Travel and the Future of New York City. Bruce Schaller, Schaller Consulting. February 27, 2017. http://www.schallerconsult.com/ rideservices/unsustainable.pdf (page 1)

72 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20 City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 86)

73 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20 City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 86)

lenge, particularly at a time when the appeal of vehicular trips is likely to grow as on-demand car services seek to reduce their prices and grow demand for their product. Walking as a mode of transportation is highly dependent on both density of land use, to ensure that a wide variety of destinations are available within a short distance, and the quality of the built environment, typically referred to as "walkability," to ensure that walking is a safe, convenient and attractive first choice for transportation.[74] Measuring the number of walking trips made is also difficult, since it relies on projections from Census data and pedestrian counts at a limited number of locations around the city, as opposed to more reliable data tracking the number of transit and vehicle trips.[75]

A more dramatic increase is envisioned by the 80 x 50 roadmap for bicycling, from one percent of all trips today to 10 percent in 2050.[76] Contemporary research on cycling often builds off two seminal pieces: one, by Roger Geller for the City of Portland, Oregon, classifies people into four categories when it comes to their inclination to bicycle: Strong and Fearless, Enthused and Confident, Interested but Concerned, and No Way No How.[77] Most policy development has focused on developing the conditions that coax people who are "interested but concerned" into bicycling by addressing their concerns with solutions — often around traffic safety, bicycle maintenance, storage and theft. In New York, these solutions frequently take the form of protected bike lanes, traffic calming and bike-share. There are also a range of policy changes, including bike rack installation, traffic enforcement against dangerous behavior by drivers, and bikes-in-buildings laws, which allow people to bring bicycles into their office and apartment buildings.

Compared to bicycling, the 80 x 50 roadmap has less aggressive targets for transit use. The

share of trips handled by bus, light rail and ferry is targeted to increase from 10 percent to 12 percent in 2050, while the share of trips by subway and commuter rail is targeted to hold steady at 18 percent.[78] While expansions to the rail network typically take years and billions of dollars, there are some changes that could better utilize the city's existing rail right-of-way. One such example that's already underway is Penn Station Access, which is being planned to bring New Haven Line Metro-North trains to Penn Station after East Side Access to Grand Central Terminal is complete.[79] Commuter rail right-of-way elsewhere in the city, particularly in the Bronx and eastern Queens, could be better utilized to bring high-frequency service to residents of transit "deserts." These services must also be integrated in the fare payment system used for buses and subways, rather than being a premium service requiring suburban-level fares. The launch of a "Freedom Ticket" pilot program by the MTA is an encouraging sign,[80] but such efforts must be integrated with the ongoing project to replace the MetroCard to ensure beefed-up commuter rail becomes a real option for city residents.

Expanding outer-borough passenger rail service along the underused freight rail line between Bay Ridge and Jackson Heights, as the Regional Plan Association has proposed as part of a larger

74 Walkability Research. Walkscore. https://www.walkscore.com/professional/walkability-research.php

75 Data Feeds: Pedestrians. New York City Department of Transportation. http://www.nyc.gov/html/dot/html/about/datafeeds.shtml#Pedestrians

76 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 86)

77 Four Types of Cyclists? Testing a Typology to Better Understand Bicycling Behavior and Potential. Jennifer Dill, Ph.D. and Nathan McNeil. Portland State University. August 10, 2012. http://web.pdx.edu/~jdill/Types_of_Cyclists_PSUWorkingPaper.pdf

78 New York City's Roadmap to 80 x 50. New York City Mayor's Office of Sustainability. September 2016. http://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20City's%20Roadmap%20to%2080%20x%2050_Final.pdf (page 86)

79 Penn Station Access Study. Metropolitan Transportation Authority. http://web.mta.info/mta/planning/psas/

80 Freedom Ticket pilot launching in Brooklyn, Queens this fall, Borough President Adams says. Vincent Barone, AM New York. February 8, 2017. http://www.amny.com/transit/freedom-ticket-pilot-launching-in-brooklyn-queens-this-fall-borough-president-adams-says-1.13078196

circumferential rail line dubbed "The Triboro," deserves additional study.[81] While it may conflict with or have to coexist with the Cross-Harbor Freight Tunnel, which would also use this right-of-way, and the dispersed nature of outer-borough trips could make rail a less practical mode than upgraded bus service, the expansion of borough-to-borough trail service could play a significant role in reducing vehicle trips and their associated greenhouse gas emissions.

Borough-to-borough trips can most quickly and reliably be improved through upgrades to the city's bus system. Select Bus Service upgrades, including all-door boarding, proof-of-payment fare collection, limited-stop service, bus lanes, and priority at traffic signals for buses, have improved bus trip times by up to 20 percent and led to a 10 to 20 percent increase in ridership in the first year after implementation.[82] A coalition of advocates gathered under the umbrella of the NYC Bus Turnaround Campaign have been pushing to expand these types of improvements, as well as larger changes like redesigning inefficient lines, to all city bus routes in a bid to reverse the city's downward bus ridership trend, which is most pronounced in Brooklyn and Manhattan.[83]

Ultimately, road pricing must be considered as a means of shifting automobile trips to transit, whether by pricing for-hire vehicle trips in congested areas, implementing a cordon congestion charge in the central business district, reforming tolls in a manner similar to the Move NY plan, or some other form. In addition to raising funds for transit and other low-carbon modes of transport, road pricing can change behavior and shift trips from automobiles.

Vision Zero, Urban Design and Parking Reform

The city's Vision Zero initiative to eliminate traffic fatalities involves a number of design changes to city streets that can improve walkability by making it safer to cross New York City streets, such as pedestrian islands and curb extensions at intersections to shorten crossing distances. It also includes an expansion of the city's protected bike lane network. These types of changes are necessary, but they are framed within Vision Zero as safety initiatives. A larger, more holistic perspective is required if these initiatives are also to be seen in the context of shifting trips to low-carbon modes.

Pedestrianization schemes, for example in pedestrian-dense locations like Lower Manhattan or downtown Flushing, could be undertaken not simply to improve safety but also to encourage additional pedestrian and transit trips to these nodes.[84] Design manuals by the Department of Transportation should be seen not just as guidebooks for safe streets, or even just as tools to create a pleasing public realm, but as ways to encourage people to walk and bicycle.[85]

Similarly, tweaks to the zoning code to create a more pleasing streetscape, such as those undertaken in Zoning for Quality and Affordability, should be understood not just as urban design niceties but also as changes that encourage people to walk and reduce overall dependence

81 The Triboro: Transit for the Boroughs. Regional Plan Association. http://library.rpa.org/interactive/the-triboro/

82 Select Bus Service. New York City Department of Transportation and Metropolitan Transportation Authority. November 2013. http://www.nyc.gov/html/brt/downloads/pdf/brt-routes-fullreport.pdf (page 9)

83 Decline in NYC Bus Ridership Concentrated in Manhattan and Brooklyn. David Meyer, Streetsblog NYC. February 21, 2017. http://nyc.streetsblog.org/2017/02/21/decline-in-nyc-bus-ridership-concentrated-in-manhattan-and-brooklyn/

84 Lower Manhattan Pedestrianization Study. New York City Department of City Planning. November 1997. http://www1.nyc.gov/assets/planning/download/pdf/plans/transportation/td_full-lowermanhattan.pdf

85 Street Design Manual. New York City Department of Transportation. Updated December 2015. http://www.nyc.gov/html/dot/html/pedestrians/streetdesignmanual.shtml

on automobiles.[86] There are additional changes that could be made to the zoning code. Research both nationwide and in New York City shows that off-street parking at home, which is mandated for most new construction in New York City, encourages those who have it to make journeys to work by automobile rather than by more sustainable modes.[87] The enactment of a "Transit Zone" in Zoning for Quality and Affordability eliminated parking requirements for new affordable housing in parts of the city. Eliminating parking mandates citywide, for all land uses — not just affordable housing — is a logical next step if the city is serious about shifting trips from automobiles to low-carbon modes.

Parking can also be reformed on the street level. An average 30 percent of traffic in congested commercial areas is searching for on-street parking, and this "cruising" can have negative effects on congestion, fuel use, and GHG emissions.[88] Initiatives around the country, like SFpark in San Francisco, have adjusted meter rates and regulations with the goal of achieving 85 percent parking occupancy on each block, ensuring that parking is available to those searching for it.[89] An evaluation of SFpark showed that greenhouse gases emitted by drivers fell by 30 percent during the pilot evaluation period, compared to just 6 percent in control areas.[90]

New York City has its own version of parking meter reform, called PARK Smart. It has adjusted meter rates and regulations in Greenwich Village, Park Slope, Jackson Heights, and Downtown Brooklyn.[91] However, this program has stalled and a promised "PARK Smart 2.0" has failed to materialize with changes on the street. On-street parking reform is an area in which the city could take immediate action if it seeks to reduce greenhouse gas emissions.

A mobility future that includes autonomous shared vehicles

As vehicle-service companies develop not just electric but also autonomous vehicles, there is exciting potential for shared autonomous EVs to revolutionize the way New Yorkers get around. Combining self-driving vehicles with transit could result in significant reductions in both vehicle ownership and the share of people commuting by car. The New York metropolitan statistical area, for example, could see anywhere from a 46 to 60 percent reduction in the number of personal vehicles in a future that combines self-driving vehicles with increased transit use.[92]

Academics are already modeling possible service scenarios for shared automated vehicles. A study of a potential shared taxi system in Lisbon, Portugal, found that moving to a trip-matching system that pairs shared trips together can reduce the size of the taxi fleet by between one-third and one-half, achieving savings in average taxi fares while increasing travel and wait time only slightly.[93]

This study laid much of the groundwork for modeling the benefits of shifting taxi and for-hire vehicle fleets to a shared model. A study from MIT, for example, used trip-level data from

86 Zoning for Quality and Affordability. New York City Department of City Planning. https://www1.nyc.gov/site/planning/plans/zqa/zoning-for-quality-and-affordability.page

87 Death by a thousand curb-cuts: Evidence on the effect of minimum parking requirements on the choice to drive. Rachel Weinberger. Transport Policy, Volume 20, March 2012, Pages 93–102. http://www.sciencedirect.com/science/article/pii/S0967070X11001028

88 Cruising for Parking. Donald Shoup, Access Magazine, Number 30, Spring 2007. http://shoup.bol.ucla.edu/CruisingForParkingAccess.pdf (page 17)

89 How it Works. SFpark. http://sfpark.org/how-it-works/

90 Pilot Project Evaluation. SFpark. June 2014. http://sfpark.org/wp-content/uploads/2014/06/SFpark_Pilot_Project_Evaluation.pdf (page 93)

91 PARK Smart. New York City Department of Transportation. http://www.nyc.gov/html/dot/html/motorist/parksmart.shtml

92 Driverless Future: A Policy Roadmap for City Leaders. Arcadis HR&A, Sam Schwartz. 2017. http://driverlessfuture.webflow.io/ (page 9)

93 An agent-based simulation model to assess the impacts of introducing a shared-taxi system: an application to Lisbon (Portugal). Luis M. Martinez, Gonçalo H. A. Correia, José M. Viegas. Journal of Advanced Transportation. July 28, 2014. http://onlinelibrary.wiley.com/doi/10.1002/atr.1283/abstract

the New York City taxi fleet to determine that a 3,000-vehicle fleet of four-passenger cars could adequately serve 98 percent of New York City taxi demand, reducing the size of the taxi and for-hire fleet by 75 percent.[94] The congestion GHG reduction possibilities from these schemes are appealing, and researchers have also been adding autonomous vehicles to the modeling mix. For example, a fleet of 150 to 450 12-person autonomous on-demand vehicles could serve the same transit needs as the BQX streetcar, a modeling exercise at New York University found.[95]

While these technologies are not yet on the road, early versions in the form of Via, Uber-POOL, Lyft Line and other services are already moving some for-hire vehicle trips to shared vehicles. Developing a mobility strategy that includes this developing sector and encourages its adoption as a means of reducing greenhouse gas emissions will be crucial for the city over the coming decades.

94 Study: Carpooling apps could reduce taxi traffic 75 percent. Adam Conner-Simons, Massachusetts Institute of Technology Computer Science and Artificial Intelligence Laboratory. December 1, 2016. http://www.csail.mit.edu/ridesharing_reduces_traffic_300_percent

95 Simulation experiment to compare light rail streetcar against shared autonomous vehicle fleet for Brooklyn Queens Connector. Lucas Mestres Mendes, Manel Rivera Bennassar, Joseph Y.J. Chow. January 2017. https://www.researchgate.net/publication/309537916_Simulation_experiment_to_compare_light_rail_streetcar_against_shared_autonomous_vehicle_fleet_for_Brooklyn_Queens_Connector

CONCLUSIONS

Decisions must be made together by governments throughout the metro area

Implementing solutions to reduce VMT are difficult without regional cooperation. For example, the 80 x 50 roadmap envisions that, in 2050, people will be able to use smartphones to seamlessly utilize different modes of transportation run by different operators. But a look at the current state of regional cooperation among transit operators yields little reason to be hopeful.

Someone looking to take travel from Jamaica, Queens, to Newark, N.J. — two dense, walkable regional hubs — could either hop in a car or take a combination of New Jersey Transit, PATH, Long Island Rail Road, or New York City Transit. Railroad operators treat Penn Station as a terminal, rather than a through-station, thereby requiring an extra transfer for regional trips. Similarly, there is no free transfer between PATH and the New York City subway.

While transit operators share schedule and real-time information with the public that is already used in transit navigation apps today, New York does not have a single, integrated fare payment system like those in cities such as Paris, London, San Francisco and Washington, D.C. Even as New York City Transit moves to replace the MetroCard, there is no serious discussion about implementing a unified fare-payment system across all of the region's operators (or even, for that matter, across the MTA's different subway and rail offerings) to make transit easier to use.

"There's a number of agencies that are working, and they don't work together," said Dr. Buzz

Paaswell, director emeritus of the University Transportation Research Center. "You have to address the fact that there are institutional issues... We need to rethink ways of integrating our systems so they are more attractive to riders."

There is an overarching sense in the New York region that its transportation infrastructure bureaucracies do not work well together and struggle with internal cultures that make them slow to adapt new technologies and new ways of thinking. This problem is rarely thought about in the context of climate change, but it should be: achieving aggressive carbon reduction targets in the transportation sector will be very difficult without regional transportation agencies rowing in the same direction.

"Reforming transportation agency and institutional governance," NYC DOT's Replogle said, "will be as important as the technology shifts that we'll see over the coming years to reduce vehicle emissions."

Outer boroughs must be a focus in the short-term to reduce vehicle miles traveled

In the absence of widespread adoption of low-emission and electric vehicles in the national automotive market, reducing VMT in the outer boroughs by shifting trips to transit, walking and bicycling, through both transportation and land use policies, will be key if the city is to achieve its 80 x 50 goals.

However, the city's transportation and climate plans do not establish a measuring stick against which its efforts to reduce VMT — the most significant driver of GHG reductions since 2005 — can be judged. Despite the direct relationship

between VMT and the triple threats of congestion, traffic fatalities, and pollution, the City of New York does not set a specific VMT reduction target for the purposes of transportation management, traffic safety, or reduction of greenhouse gas emissions.

VMT reduction measurements could be included in DOT's section of the Mayor's Management Report, as well as the administration's OneNYC and 80 x 50 documents. A natural place to legislatively establish such a target could be in §19-180 of the New York City Administrative Code, which was created by Local Law 23 of 2008[96] to establish performance indicators for the Department of Transportation. This reporting requirement has resulted in DOT's "Sustainable Streets Index" under the Bloomberg administration[97] and DOT's "Mobility Report" under the de Blasio administration.[98]

Integrating and forecasting the impact of rapidly-evolving technologies must be part of any plan

As technologies rapidly evolve, particularly in the automotive sector, the city must take a lead in shaping their adoption to ensure that they help rather than hinder its greenhouse gas reduction goals. This is of particular importance in the developing fields of autonomous and shared vehicles, where the impacts are highly uncertain and early indications from the for-hire vehicle industry indicate a net increase in VMT using conventional gasoline-powered vehicles. The city can use its significant power as a regulatory body, particularly for taxi, ride-hail, and shared mobility services, to ensure that they contribute to a reduction in VMT and that the vehicular trips they do enable are undertaken using low-emission and electric vehicles.

Reducing greenhouse gas emissions by 80 percent by 2050 is an achievable goal. Transportation has an important role to play in achieving that goal, but it requires significant and decisive action by the city in the areas over which it has direct control, in addition to muscular engagement by the city in federal, state and regional policy.

96 Int 0199-2006: Modifying department of transportation performance targets and indicators towards the goal of reducing traffic congestion citywide. New York City Council. http://legistar.council.nyc.gov/LegislationDetail.aspx?ID=445655&GUID=A703ACF1-6251-4089-B7BD-D227AC8F7163

97 Sustainable Streets. New York City Department of Transportation. http://www.nyc.gov/html/dot/html/about/stratplan.shtml

98 New York City Mobility Report. New York City Department of Transportation. http://www.nyc.gov/html/dot/html/about/mobilityreport.shtml

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