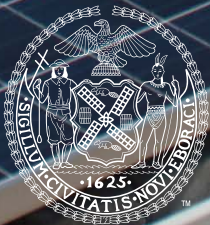


# New York City's Roadmap to 80 X 50



The City of New York  
Mayor Bill de Blasio

Anthony Shorris  
First Deputy Mayor

**#ONENYC**

## In 2050...

We envision that getting around the city will have become dramatically safer, cleaner, and more convenient. Mobility will have largely become an on-demand service with mobile applications allowing New Yorkers to plan the most efficient route from Point A to Point B, optimizing among available options such as the subway, bus, bike share, ferry, or a shared mini-bus, with seamless payment within the entire region and across all modes.

Sustainable modes of transportation—walking, biking, and transit—will comprise 80 percent of all trips taken in the city, with the transit system remaining New York’s workhorse for moving residents and visitors around, and new development focused around high-capacity transit hubs. Meanwhile, the share of trips taken by automobile will have dropped from 33 to 20 percent with travelers instead relying on app-based shared mobility services. Remaining vehicles will be cleaner and more efficient than today’s vehicles. Roughly half of new car purchases will be zero-emission vehicles, and low-carbon fuels will have largely replaced petroleum-based gasoline and diesel. Additionally, the proliferation of autonomous vehicles will have dramatically reduced the need for parking and personal car ownership.

Additionally, by 2050, the City and industry partners will have reshaped the freight network. Goods movement within the city will have shifted somewhat from trucks toward inherently lower-carbon modes, such as maritime and rail freight. Heavy trucks, locomotives, marine vessels, and freight yard equipment will run on lower-carbon fuels, and mini-distribution hubs served by trains and marine vessels will allow consumer goods to be transferred to low- or zero-emission vehicles and delivery bikes to reach their final destinations. Most significantly of all, the City’s sustained efforts towards Vision Zero combined with reductions in harmful air pollution from fewer and cleaner vehicles on the road will have greatly reduced public health impacts from transportation.



80 X 50



## Achieving 80 x 50: Transportation

New York City has the highest proportion of trips by modes other than private vehicles—walking, biking, and public transit—of any large U.S. city.<sup>1</sup> Achieving deep emission reductions from this already low base in the transportation sector, therefore, entails even more dramatic changes than might be required in a more car-dependent system. It will also require a holistic approach given the maturity and diversity of the New York metro region’s transportation network. There is no “silver bullet.”

Reducing transportation-related greenhouse gas (GHG) emissions is rooted in an “avoid/shift/improve” approach. Some trips can be avoided entirely through better integration of transportation and land-use decisions, transportation demand management and better use of data and technology—for example, locating affordable housing units in closer proximity to job centers is an effective way to avoid the need for longer trips. Of the

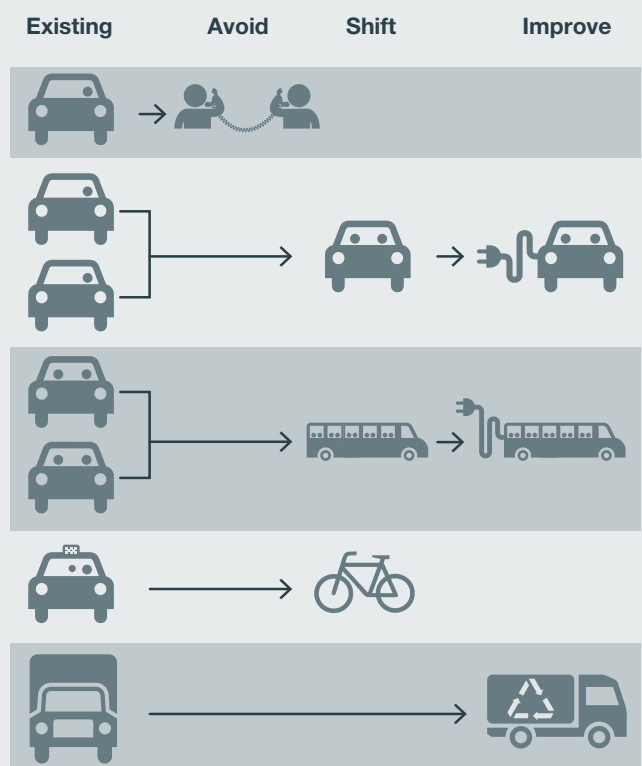
remaining trips, many can be shifted from high-carbon modes (such as single-occupancy private cars or taxis) to lower-carbon modes (transit, biking, walking, shared rides)—this is known as “mode shift.” In addition, the technology and fuel mix of all vehicles can be improved through a dramatic shift to electric and other zero-emission vehicles, as well as greater use of renewable or low-carbon fuels and improved vehicle designs. Long-term success in embracing this “avoid/shift/improve” framework will depend on our ability to leverage advances in technology, respond to market signals, influence travel behavior through smart planning and infrastructure investment, engage in fruitful collaboration with State and regional partners, and ultimately, embrace a wholesale change in our transportation culture. These changes will have the added benefits of reducing trip travel time, expanding options for getting around, and improving overall public health through better air quality and increased physical activity.

“Avoid/shift/improve” strategies also support the City’s OneNYC growth, equity, and resiliency visions. Beyond

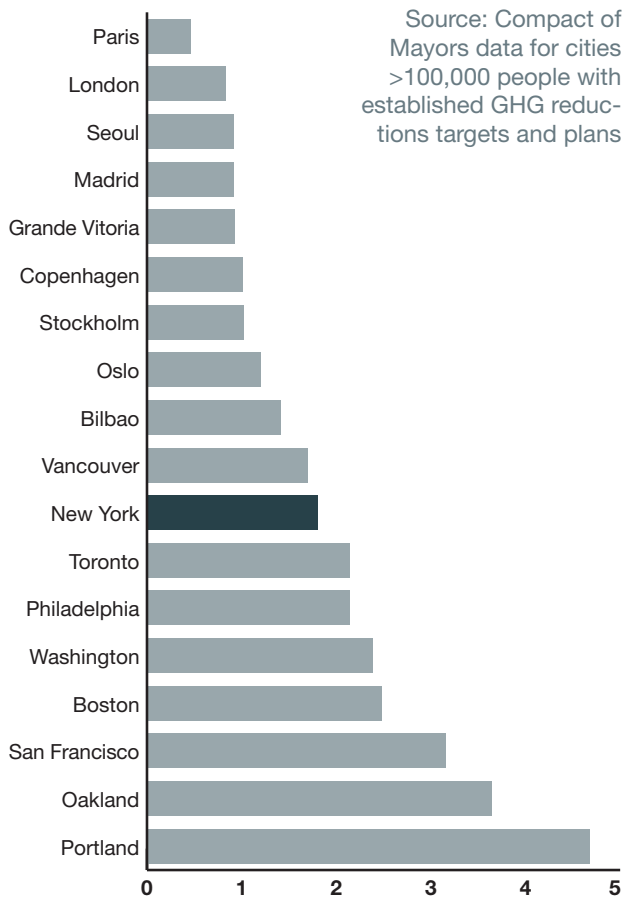


### Avoid/Shift/Improve

The approaches outlined in this chapter will alter travel patterns in the city between today and 2050 in three fundamental ways. Some trips will be avoided, no longer needed because of improvements in land-use or technology (such as teleconferencing instead of driving to an off-site meeting). Others will be shifted to lower-carbon modes as walking and biking, in particular, become increasingly safe and convenient. Still others will be improved through a transition to cleaner technologies, such as electric powertrains or renewable forms of common fuels like diesel and compressed natural gas. Certain trips will be impacted by more than one element of this paradigm, as when multiple current single-occupancy vehicle trips in gasoline-powered cars that transition to a single shared ride trip powered by electricity.



**Transportation GHG Emissions With Peer Cities**  
 (tCO<sub>2</sub>e per Capita)

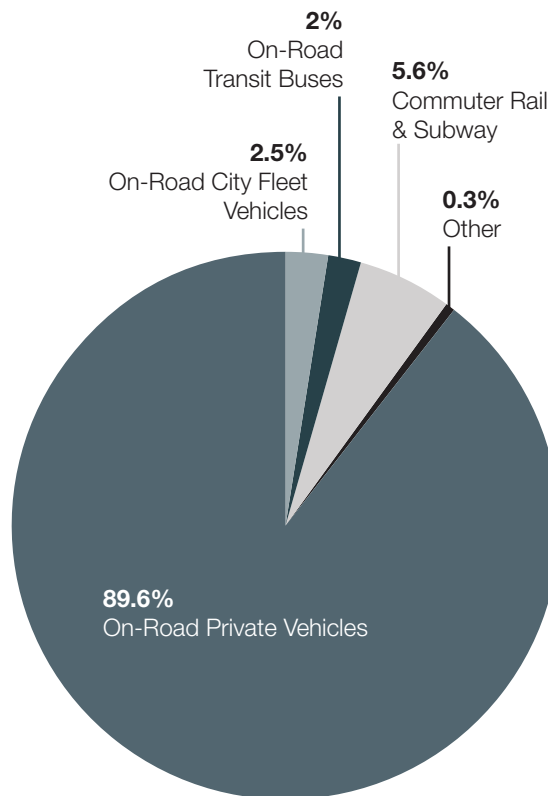


climate action, sustainable transportation planning boosts the economy by cutting down on congestion caused by single occupancy vehicles, promotes healthy, active modes of transport such as walking and biking that can reduce the prevalence of chronic diseases, and creates a safer transportation system that leads us toward realizing the “zero” in Vision Zero. Expanding travel choices for New Yorkers who do not have easy access to a vehicle through smart transit investments will also strengthen the critical link between transportation and access to jobs and economic opportunity. In addition, reducing the number of trips and shifting to cleaner vehicle technologies and fuels can reduce emissions of fine particulate matter (PM2.5) and other air pollutants.

**Drivers of Transportation GHG emissions**

The transportation sector is responsible for 28 percent of citywide GHG emissions. On-road transportation (ve-

**Drivers of Transportation GHG Emissions**



hicles, transit and long-distance buses, trucks, taxis, and for-hire vehicles) comprises 94 percent of transportation-related GHG emissions in New York City from the more than 21 billion annual vehicle miles traveled (VMT) on the city’s streets. Private on-road light-duty vehicles (i.e., cars) alone account for 78 percent of all transportation GHG emissions.

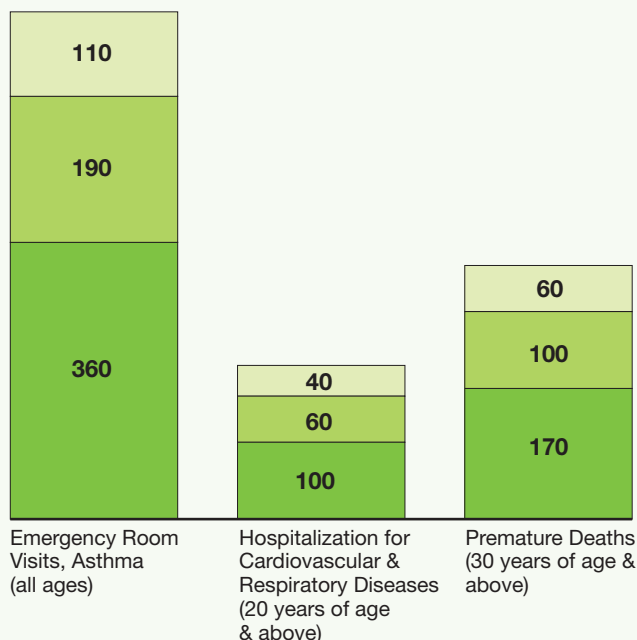
A majority of VMT in the city (90%) is generated from trips that neither begin nor end in the central business district (CBD, or Manhattan below 60th Street) but rather in upper Manhattan, the Bronx, Brooklyn, Queens, and Staten Island. Some of these miles are associated with trips that begin or end outside the city (36%), but most are contained within the city (54%). Trips that begin and end outside the city (“transboundary trips”) make up a small percentage of in-city VMT (6%). Trips associated with travel to, from, or within the CBD are also relatively limited (10%).



## Public Health Impacts due to Vehicle Emissions

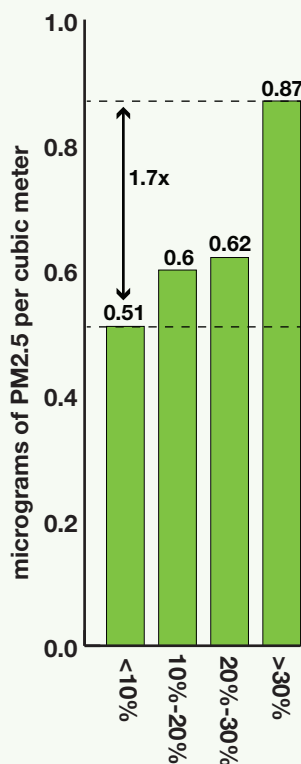
Reducing emissions from traffic in and around New York City can improve public health – especially among our most vulnerable residents. Vehicles emit fine particulate matter (PM2.5), which contributes to multiple adverse health outcomes. The City’s Department of Health and Mental Hygiene recently released a study which found that traffic-related PM2.5 causes 320 premature deaths and 870 emergency department visits and hospitalizations each year among City residents. The largest adverse health outcomes came from trucks and buses traveling the City’s streets, which account for over half of traffic PM2.5-related health outcomes.

**Annual Health Events due to PM2.5 Exposure from Vehicle Emissions** (Number of Cases per Year by Source)



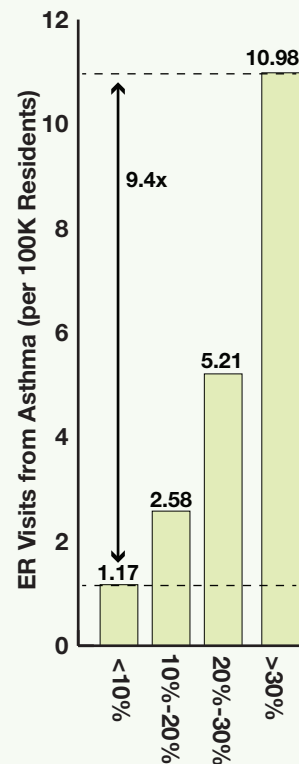
All Motor Vehicles Outside NYC
  Cars in NYC
  Trucks and Buses in NYC

## PM2.5 Exposure due to Trucks & Buses



Percent of Residents Below Federal Poverty Level

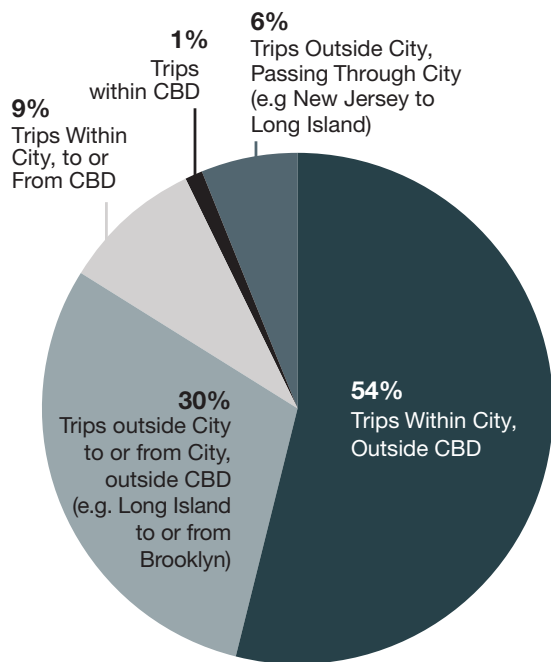
## PM2.5-Attributable Health Impacts due to Trucks & Buses



The study also found that traffic-related PM2.5 pollution and its health impacts were greater in the City’s poorer neighborhoods. Relative to more affluent neighborhoods, high-poverty neighborhoods had 1.7 times the PM2.5 exposure and 9.3 times the rate of emergency department visits for asthma due to emissions from trucks and buses. By prioritizing attention to the most polluting vehicles and the most burdened neighborhoods, we can help to reduce health inequities in New York City.

Study reference: <http://ehjournal.biomedcentral.com/articles/10.1186/s12940-016-0172-6>

Share of Total NYC Vehicle Miles Traveled by Trip Origins and Destinations



### Business as usual findings

To better understand what it will take to achieve 80 x 50 citywide, the City modeled projected emissions through 2050 from the transportation sector under a business as usual (BAU) scenario. This analysis took into account general background growth in the city’s population and transportation activity as well as the emissions impacts of relevant previously committed and funded initiatives and regulations at the city, state and federal levels and assumes no further intervention by the City. Under this scenario, transportation-related GHG emissions are expected to decline 36 percent by 2030 and 40 percent by 2050 compared to 2005. These reductions are largely the result of federal fuel economy standards, such as the Corporate Average Fuel Economy (CAFE) standards, as vehicle fleets turn over, as well as prior investments over the last decade that were intended to encourage mode shift. These include the rollout of the first wave of Select Bus Service (SBS) routes, which feature several benefits over standard bus service including traffic signal priority and dedicated bus lanes.



### Mobility as a Service

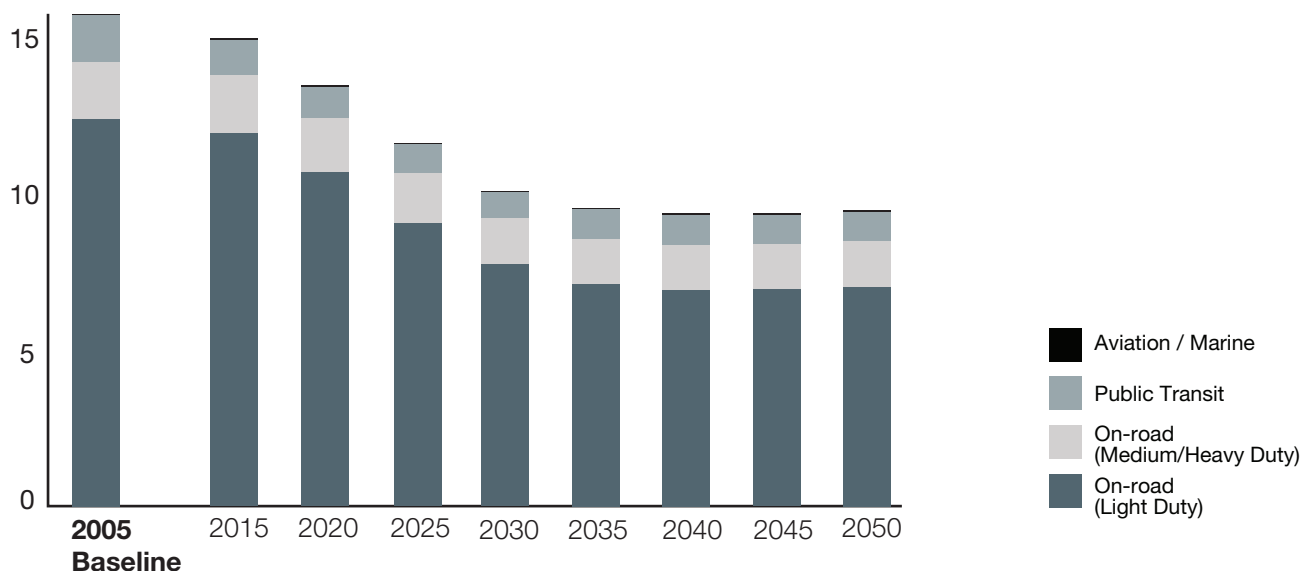
New York has a vast and growing array of transportation options: buses and subways, taxis and ridesharing, commuter vans and on-demand shared rides, bike share and car share. We want to get around in whatever way makes the most sense, whether in terms of cost, time or enjoyment. What if we did not have to worry about how we made our trip and paid for it, but rather could rely on technology to help us get where we need to go using whichever modes work best for a given trip?

Shared mobility, which encompasses any transportation mode outside of driving your own car, presents new opportunities for New Yorkers who currently own personal vehicles to reconsider these major purchases. Shared mobility can mean many things, from point-to-point car share, filling empty seats in on-demand for-hire vehicles, or making what could have been a slow, congestion-filled

vehicle trip on a more flexible (and healthy) bike share ride. The common theme is a widening spectrum of choice regarding travel options that blend modes together and provide only the necessary level of service for a given trip. By removing the vehicle ownership element from the travel equation, the number of cars on the road—and parked on the curb—may decrease.

If done right, shared mobility services, along with technology-enabled trip planning and universal fare payment, offer the potential to be even more convenient than today’s numerous but mostly separate systems, providing more ubiquitous and affordable mobility to more of the population. Mobility as a service will create a dynamic marketplace of travel options, allowing New Yorkers to more fluidly choose a customized “basket” of transportation modes depending on their needs.

Business as Usual GHG Emissions: Transportation, in Million Metric Tons of Carbon Dioxide Equivalent (MtCO<sub>2</sub>e)



Therefore, without further action, the City is almost on track to achieve 40 x 30, but is well short of the citywide 80 percent reduction goal for 2050. Private on-road light-duty vehicles are expected to account for 51 percent of transportation GHG emissions in 2030 and 46 percent in 2050, demonstrating the need for additional effort to facilitate the avoidance of certain types of trips, shift others to lower-carbon modes, and expedite the improvement of all vehicle trips to cleaner and more efficient technologies and fuels.

**Emerging trends**

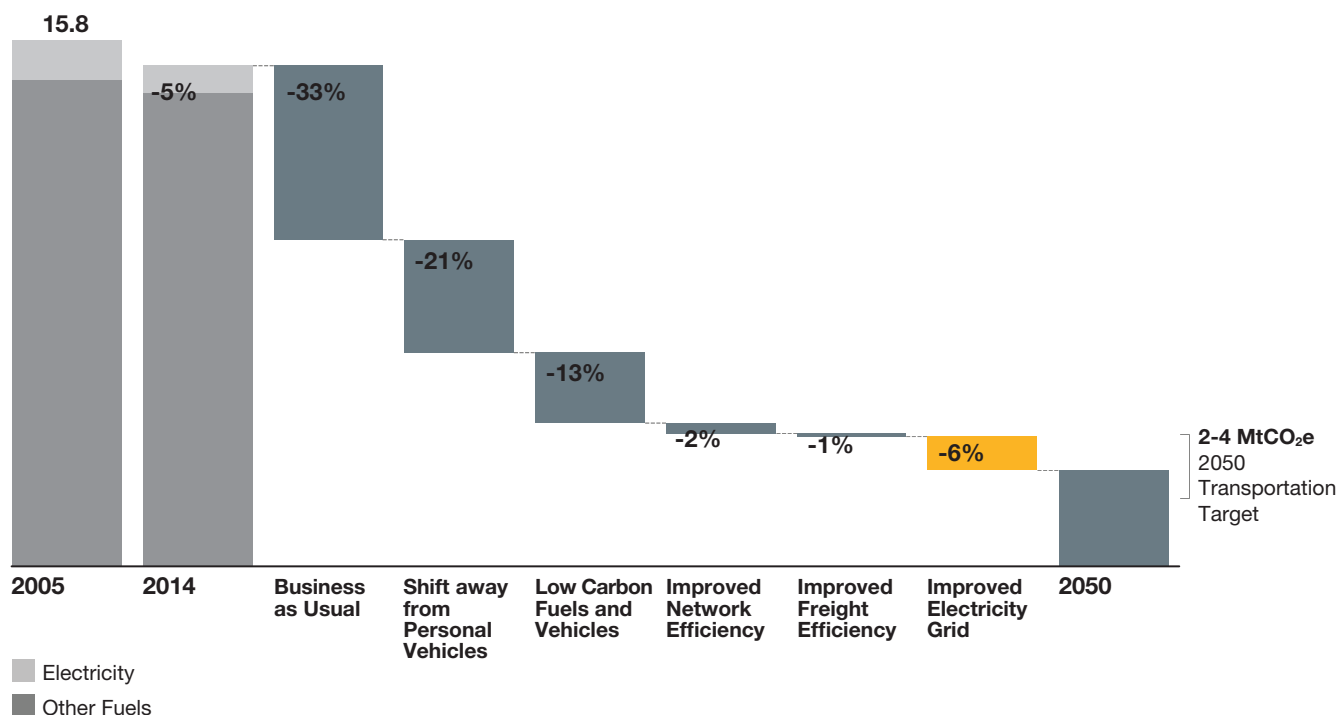
**Shared mobility.** The transportation sector is on the verge of more dramatic changes than at any point since the advent of the automobile. Our society is shifting towards a more blended mix of mobility options than has traditionally been the case. These shifts include more shared mobility models, more low-emission vehicles that operate on renewable or low-carbon fuels, and the impending introduction of autonomous vehicles. These shifts have the potential to work in support of GHG reduction and other City goals, such as improving traffic safety, job access, and air quality.

**Electric vehicles.** In addition to changes in the way New Yorkers get around, a growing recognition of the dangers of climate change and supportive policies are

expected to continue to impact purchasing decisions, especially as cleaner vehicle technologies mature. While battery electric, plug-in hybrid, and fuel cell vehicles comprise a very small share of today’s car market, these zero-emission vehicles are projected to comprise 15 percent of new car purchases in 2030 and will be roughly half of all new cars sold in 2050. The trend toward electrification will extend beyond cars, reaching medium- and heavy-duty vehicles as well as non-road equipment and maritime vessels in more limited applications. For instance, shore power (also called “cold-ironing”), or the use of land-side electricity to power onboard systems for ships while at port, has already been deployed for cruise ships in Brooklyn and can greatly reduce idling emissions and improve local air quality.

**Renewable and low-carbon fuels.** Where no electric alternative is feasible, vehicles will increasingly use renewable or lower-carbon versions of today’s petroleum-based fuels. For heavy-duty vehicles, ferries, and other large non-road engines, natural gas is likely to continue its recent market growth. Renewable natural gas from landfill, agriculture, or other non-fossil feedstocks offer an opportunity to provide low-carbon replacements for today’s natural gas in the future, and renewable diesel can replace the use of petroleum in any remaining diesel engines.

Transportation 80 x 50 Roadmap (MtCO<sub>2</sub>e)



**E-commerce.** A final trend that relates to transportation is the way in which we purchase and consume. The growing popularity of e-commerce has the potential to place additional strain on our street network, even as it reduces consumer vehicle trips and as fleets become more efficient.

**80 x 50 Roadmap: Transportation**

Beyond those initiatives included in the BAU analysis, the City has recently launched or expanded many programs and initiatives that will help the city move closer to 80 x 50. OneNYC includes several programs related to transportation that will result in future emissions reduction, including Vision Zero. The NYC Department of Transportation’s (DOT) *Strategic Plan 2016: Safe-Green-Smart-Equitable (Strategic Plan 2016)*, provides more specificity and additional commitments that will help pave the way towards significant emissions reductions, including increasing the efficiency of freight movement in New York City, dramatically expanding bike infrastructure, and planning for the next generation of SBS and light rail routes.

These recently launched programs are expected to reduce GHG emissions below the BAU trajectory by an additional 6 percent by 2030 and 9 percent by 2050. These

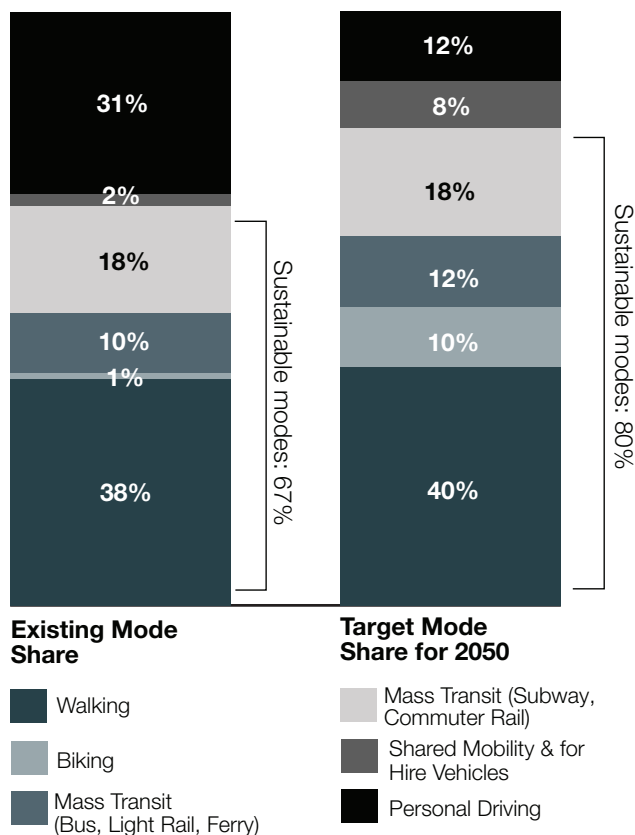
programs set New York City on a track to achieve an anticipated 42 percent reduction in transportation-related GHG emissions relative to 2005 by 2030, exceeding the City’s 40 x 30 goal. By 2050, these recently launched and expanded efforts are projected to get the City to an estimated 49 percent reduction in transportation-related GHG emissions below 2005 levels.

Since existing initiatives alone will not get us to 80 x 50, the City assessed additional scenarios to understand the level of reductions in VMT and uptake of cleaner vehicles necessary to achieve the goal. The analysis showed that significant adoption of zero-emission vehicle (ZEV) technologies—those that have either zero or near-zero tailpipe emissions and very low lifecycle GHG emissions—and low-carbon fuels such as compressed natural gas (CNG), combined with existing initiatives, could achieve a 51 percent reduction by 2030 and a 71 percent reduction in transportation-related GHG emissions by 2050.

To estimate potential GHG emissions reduction associated with lower VMT, the City tested several scenarios using the New York Metropolitan Transportation Council’s (NYMTC) regional travel demand model (the Best Practice Model, or BPM). The results showed that



Mode Shift Targets for In-City Trips



reaching 80 x 50 citywide will require a wide variety of transportation strategies to incentivize a shift away from single-occupancy driving towards lower-carbon modes. BPM simulations also revealed that enhancements to make transit service more convenient are a necessary complement to provide an attractive alternative to single-occupancy vehicle (SOV) use.

Altogether, the analysis found that expanding current commitments and supplementing them with strategies to reduce the number of trips made by personal driving and to shift new vehicle purchases to cleaner technologies can result in GHG emissions reduction of 58 percent by 2030 and 82 percent by 2050 relative to the 2005 baseline. Importantly, this portfolio of actions translates to a mode share of 80 percent for walking, biking, or public transit, whereas these sustainable modes comprise only 67 percent of trips today.

Challenges to address

The efficiency of New York City’s transportation system is largely the result of plans and investments made over the past 150 years. The systems that exist today are not easily changed, and the interrelated challenges posed by regulatory and operational jurisdictions are deeply institutionalized.

For many of the strategies necessary to achieve 80 x 50, New York State government including the Metropolitan Transportation Authority (MTA) and New York State Department of Transportation (NYSDOT), regional partners such as the Port Authority of New York and New Jersey and NJ Transit, and federally regulated entities like Amtrak are critical for implementation. Addressing certain transportation needs in the city is complicated due to the City’s lack of control over key elements of the system, such as the improvement and expansion of the core transit network, setting of fares, pricing to manage the city’s busiest roads and bridges, and the use of cameras for enforcement (e.g., of bus lane restrictions, speeding, and red lights). In order to reach 80 x 50, these partnerships with outside stakeholders will be essential in implementing an “all of the above” basket of strategies that facilitates the necessary transitions.

Another significant challenge to improving the transit network in particular is the magnitude of the funding needed simply to maintain a state of good repair for existing assets, let alone to upgrade and expand the system. New York’s infrastructure is aging, and major new funding is required to make the investments necessary to simply keep pace with our global peer cities. This task is all the more difficult because of less dependable federal funding: the federal gas tax, the primary revenue source for the Highway Trust Fund, has not been increased since 1992. There is a need to find innovative ways to fund new investments and, just as importantly, to maintain existing assets.

There are also many challenges associated with wide-scale adoption of new vehicle technologies and low-carbon fuels. Primarily, there is the “chicken-and-egg” problem: investments in electric vehicles are hampered by uncertainty regarding charging capacity throughout the city, while investments in publicly available charging infrastructure are uncertain to pay off as long as demand for charging remains low. In addition to this coordination barrier, the prospect of wide-scale adoption of ZEVs poses its own challenges. Namely, the

charging and fueling infrastructure required to support the level of ZEV adoption necessary to achieve 80 x 50 would place significant demands on the local electricity system and would introduce the challenge of siting infrastructure in a dense urban setting where parking is already at a premium.

Finally, the potential increase in truck trips associated with the growth of internet-based commerce and home deliveries could worsen congestion on our streets and along our curbs. This issue is exacerbated by the city's current lack of significant freight rail connections, which further increases our reliance on trucks to move our goods throughout the city.

### Near-term actions to reduce greenhouse gas emissions

The following strategies include a mix of existing and expanded City initiatives along with several new City strategies intended to provide reductions in GHG emissions. The City can implement many of these approaches directly; others will require partnerships with regional stakeholders, New York State government, or others. Taken together, these strategies seek to encourage travel by lower-carbon modes over personal vehicles; minimize congestion and total miles driven through technology, market signals, and new mobility service models; transition towards more efficient vehicles that run on cleaner and renewable fuel sources; and re-envision freight policies to reduce congestion, emissions, and costs. These strategies are also intended to improve the health and quality of life of our communities.

### Modernize, expand, and reduce crowding on the city's transit system

New York City already has the most comprehensive transit system in the U.S. To achieve 80 x 50, many more New Yorkers and visitors will need to opt for lower-carbon modes over vehicles, which requires these modes to be safe, convenient, and enjoyable.

In partnership with the MTA, the City continues to launch new SBS lines throughout the five boroughs and has committed to launch ten additional routes by 2021, including two new routes by the end of 2016. The City has also begun a detailed feasibility analysis for the Brooklyn-Queens Connector (BQX), a modern streetcar line planned to connect residents to burgeoning job centers along the Brooklyn and Queens waterfronts that currently lack robust transit access. In addition,

the launch of Citywide Ferry Service in 2017 will better meet the transportation needs of growing neighborhoods and provide redundancy for the existing transit system.

The City is also committed to improving critical first- and last-mile trips to and from transit hubs, and is currently exploring the potential for ride-sharing services to meet these travel needs in areas underserved by the subway system. As stated in DOT's recently released Strategic Plan 2016, the agency, in partnership with the MTA, will conduct a study of unmet transit needs in communities across the five boroughs and develop a set of recommendations to meet these needs. Possible recommendations include expansions of Select Bus Service (SBS), the rail system, and streetcars.

Speeding up bus service is critical to reversing the decline in bus ridership and making the bus an attractive alternative to driving. The introduction of paperless all-door boarding on all buses (not just those branded as SBS) would enable buses to spend less time waiting for passengers to board and would have a significant



Image credit: NYC Economic Development Corporation



Protected bike lane at Clinton St. in Manhattan

Photo credit: NYC Department of Transportation

impact on bus service quality and the efficiency of bus travel. The City will continue to advocate for paperless all-door boarding on the MTA's local bus routes as part of the MTA's new fare payment system, in addition to working with the State Legislature to expand the City's authorization to use bus lane enforcement cameras, which are essential to providing more reliable and faster bus service.

The City will also continue to support the expansion of the transit system through its historic \$2.5 billion contribution to the MTA's 2015-2019 capital plan, which funds the second phase of the Second Avenue Subway, the Penn Station Access project to bring Metro North trains into Penn Station, and expansion of communications-based train control, which enables more frequent subway service. Working with the Port Authority, Amtrak, and others, the City will also support key investments in the regional transit network, including the Gateway project to expand and enhance trans-Hudson rail service through a new tunnel, station, and track expansion. This support will extend to smaller but equally crucial investments that improve the subway system such as the rollout of the new MTA fare payment system (which will replace MetroCard) and investments in open gangway subway cars to increase capacity. Finally, through a 2017 citywide transit needs study, the City will communicate its priorities for the next generation of major regional capital investments.

Since most improvements in the subway and commuter rail system are the responsibility of State and regional partners, the City will continue to engage with them to plan for major expansions of the transit network.

The goal of these improvements is to increase transit use, which could be achieved through reduced fares for commuter rail trips within the five boroughs and more frequent service at commuter rail stations within the city, among other strategies. These improvements will enable more New Yorkers, especially those who live beyond the reach of the subway system, to use the commuter rail network to get around.

### **Make walking and biking safer, more convenient options for all New Yorkers**

Walking and biking are carbon-free modes of transportation that support an active lifestyle, promote public health, and reinforce New York's role as a leader in sustainability among American cities. It is critical to make walking and biking even safer, more convenient, and more enjoyable in order to promote them over car trips, both as primary modes and as first- and last-mile connections to the core transit network.

Consistent with Vision Zero and DOT's Strategic Plan 2016, the City will continue to implement record numbers of Vision Zero street safety projects, including new markings, pedestrian refuge islands, and shortened pedestrian crossing distances, and will invest in the Great Streets program to transform major corridors across the city. DOT will continue to make pedestrian improvements around schools and in neighborhoods with high numbers of senior citizens, create neighborhood open spaces through pedestrian plaza projects using underutilized street space, and improve the streetscape with benches and wayfinding signs, among other enhancements. DOT will also improve accessibility for New Yorkers with disabilities by upgrading the Street Design Manual and capital project standards to reflect the principles of universal access, installing accessible pedestrian signals, investing in an expansion of curb ramps, and conducting new wayfinding technology pilots for visually impaired pedestrians.

DOT is also currently testing new design treatments to reduce left turn conflicts—one of the leading causes of crashes involving pedestrians—and is seeking State authorization to expand the use of speed cameras, which have been shown to reduce dangerous speeding by as much as 50 percent. DOT will also explore how new tools, including stationary and mobile traffic cameras and video processing software, may help DOT to better understand and manage the street network and improve safety, such as by helping the agency diagnose potential safety problems before a serious crash occurs.

While New York remains a walking city, more New Yorkers are biking now than ever before. The City will continue its expansion of a growing bicycle network, with a record 75 miles of bike network to be added in 2016, including 18 miles of protected lanes, and an accelerated annual target of at least 10 miles of protected lanes to build out a more robust protected network. DOT is also expanding its efforts to create bicycle connections across bridges and is advancing efforts to create a continuous greenway loop around the entirety of Manhattan. In partnership with Motivate, the parent company of Citi Bike, the City has committed to expand Citi Bike to over 12,000 bikes in over 700 stations by the end of 2017, and is exploring a phase three expansion to bring Citi Bike to all five boroughs. DOT is also developing secure, high-capacity bicycle parking facilities near transit hubs and expanding the popular bicycle corral program for on-street bicycle parking. The City will continue to work with the State Legislature to create a sensible legal framework to regulate pedal-assist bicycles (e-bikes) to improve safety and allow more New Yorkers to travel by this environmentally friendly mode. Finally, DOT will complete a Bicycle Safety Study and Action Plan, along with new measures to assess bicycling progress, improve data collection, and understand travel decisions.

Despite the rapid growth in the city's bicycle network, there are still many areas that lack sufficient bike connections. In addition to planned expansions, the City will emphasize an all-ages and abilities core network of protected bike lanes throughout the five boroughs, and the build-out of key connectors linking neighborhoods to transit hubs. The City will explore opportunities to provide high-capacity bicycle parking facilities near transit stops across the city so that more people can readily access the subway and commuter rail systems. The City will work with the State Legislature and at the federal level to expand commuter benefits for bicyclists and bike share users to encourage the mainstream adoption of cycling.

**Ensure that the City's policies prioritize walking, biking, and transit**

The strategies to encourage surface transit use, walking, and biking will only be successful if the City prioritizes street space for these modes and makes them attractive alternatives to driving. To do so, the City is expanding sidewalks and pedestrian plazas in areas of pedestrian crowding; hosting events that open up streets for public recreation such as Summer Streets, Weekend Walks, and Shared Streets; building on the Lower Manhattan

Shared Streets pilot project; and exploring similar projects in other neighborhoods. In tandem with an improved curbside management strategy, the City will also continue to repurpose on-street parking into space for other uses such as commercial loading, bus lanes, bike lanes, public plazas, bicycle parking, and bike share stations.

Moving forward, the City will continue to encourage walking, biking, and transit and will integrate planning for these modes into the design and operation of streets and into the City's enforcement efforts. Doing so will justify, underpin, and tie together all future efforts to reallocate street space, manage demand, and ultimately reduce emissions from transportation.

As part of this policy, the City aspires to a sustainable mode share of 80 percent by 2050, an increase from 67 percent today and a figure indicated by our analysis to be consistent with an 80 x 50 transportation system. Of this 80 percent sustainable mode share, 40 percent of trips will be made by foot, 10 percent by bike, and 30 percent by transit. The remaining 20 percent of trips in 2050 will still involve vehicles, but a significant number of those trips will shift towards shared rides that more effectively utilize the network by filling empty seats to reduce the total number of vehicles on New York City's streets. The City will also continue to construct bus lanes and protected bike lanes on major streets and explore the expansion of shared streets, based on a successful pilot in lower Manhattan. Additionally, the City will begin planning for opportunities to create car-free or shared streets in dense areas of the city, in the vein of the downtowns of many global peer cities.

Land-use decisions and rules can also influence how New Yorkers live and travel, and the City is committed to promoting growth that supports sustainable, mixed-use, mixed-income communities. Housing New York includes targeted initiatives that identify specific opportunities for new housing in transit-accessible areas, supported by infrastructure and services, with a level of density and mix of uses that supports and encourages walking and bicycling for neighborhood trips.

**Leverage technology and data to expand travel options and optimize the transportation network**

New York City is experiencing record levels of employment, population, tourism, and economic activity, all of which contribute to added congestion on city streets. The City is making efforts to improve real-time traffic





## Autonomous Vehicles: What Does the Future Hold?

Autonomous vehicles (“AVs” or “driverless cars”) are coming, and may completely transform the driving experience as we know it, by smoothing vehicular traffic patterns and greatly improving roadway safety. However, the impact of AVs on greenhouse gas emissions is uncertain. While AVs will almost certainly feature cleaner technology than today’s vehicle stock, they may still result in more emissions if vehicle miles traveled skyrockets as a product of the increased convenience and safety of driving. On the other hand, if we guide implementation of this emerging technology correctly, we could see truly remarkable societal benefits and still manage to reduce transportation emissions.

### Potential advantages of AVs:

- Mobility options increase for those unable to drive
- Crashes, serious injuries and traffic deaths plummet, and we reach Vision Zero
- AVs are managed by transportation network companies and become integrated with an overall shift toward Mobility as a Service
- Most AVs are actually a form of on-demand shared ride, and we see improved efficiency compared to today’s typical auto occupancy of under two people per vehicle
- Parking demand plummets, and we reclaim a vast amount of curbside space and repurpose it for more sustainable and public uses
- Vehicles themselves are completely redesigned and become new social spaces in their own right

operations management, but more needs to be done to improve traffic data collection, monitoring, and enforcement. Meanwhile, new mobility services, such as ridesharing, e-hail taxi services, and car sharing offer the potential to reduce the demand for private motor vehicle ownership and use, but also could spur a move away from more GHG-efficient public transportation. The City will continue to explore how these emerging mobility services might best be regulated and guided to support sustainability goals.

### Potential challenges from AVs:

- Many AVs fall short of coping all of the time with the city’s complex traffic environment and thus require distracted drivers to suddenly take over vehicle operation, leading to road crashes, injuries, and fatalities
- Driving becomes so easy that everyone wants to own an AV, and overall VMT skyrockets
- We mainly continue to drive alone, and we see no improvement and in fact worsening traffic congestion
- Demand for curbside space dramatically increases as pick-ups and drop-offs become much more common for both people and packages
- Many AVs are roaming our streets with no occupants as they return from dropping off their owners at work, leading to empty vehicles stuck in their own congestion
- We cater to this new technology and redesign our streets for the benefit of AVs, to the detriment of walking, cycling, and high-capacity public transport
- The City, led by DOT and TLC is currently working to evaluate the potential safety, congestion, social, environmental, and economic impacts of autonomous vehicles and develop a set of policies for federal and state advocacy and to guide future pilot projects.

The City will continue to make transportation data available to third-party mobile application developers, and generally encourage an open-data environment. We will continue to support MTA’s work to update its transit payment technology. There may also be opportunities for the City to explore partnerships with the private sector to foster a seamless “mobility as a service” experience that empowers New Yorkers to plan trips across all modes—transit, bike share, rideshare, and others—in real-time and on-demand. We will study examples from other cities that have implemented formal car-sharing

policies and programs, and will adapt them to our current transportation system, as appropriate, in light of our sustainability goals. The City will likewise explore other opportunities to manage travel demand, such as partnerships with large employers or linking lower-carbon travel choices to the Electronic Benefit Transfer (EBT) program.

In addition, the City and the U.S. Department of Transportation have begun a “connected vehicle” pilot project to test safety applications and vehicle-to-vehicle communication systems. As part of this effort, DOT is developing an Intelligent Transportation System (ITS) strategic plan and is expanding transit signal priority systems for SBS. The City will also continue to expand the use of data analytics to support real-time traffic operations management and encourage compliance with traffic laws. In addition to saving lives, automated speed enforcement and red light camera programs promote good driving behavior and have a significant impact on

keeping the network flowing at a steady pace, which reduces congestion and emissions. The City will also continue to work with the State Legislature to expand the use of speed and red-light camera enforcement at high-crash areas and near schools, which will also enhance the efficiency of the roadway network.

**Better manage and price parking to encourage efficient travel choices**

Through the PARK SMART program, the City has already begun to price curbside parking in commercial areas at variable rates, encouraging efficient levels of turnover and enabling drivers to more easily find parking spaces. Following the success of the PARK SMART program, DOT will begin a more comprehensive analysis of the use of metered parking spaces in commercial districts across the five boroughs. The analysis will inform the development of a 21st-century parking management strategy to increase curb availability for deliveries, customer parking, and eventually pick-up and drop-off of



**NYC Clean Fleet**

NYC Clean Fleet is the most comprehensive and ambitious blueprint for municipal fleet sustainability in the nation. Unveiled by Mayor de Blasio in December 2015, Clean Fleet expands on NYC Fleet’s substantial strides in sustainability by setting concrete targets to reduce its consumption of greenhouse gas-emitting petroleum-based fuels—50 percent by 2025 and 80 percent by 2035.

In the near term, Clean Fleet committed New York City to add 2,000 electric vehicles (EVs) to its sedan fleet by 2025—the largest such commitment of any U.S. city. In less than a year since the announcement of Clean Fleet, the City has increased the size of its EV fleet by more than 60 percent with more than 500 total EVs. In April 2016, the City reinforced its EV commitment by announcing it would only purchase plug-in vehicles for all non-emergency sedan orders beginning in fiscal year 2017. This should bring NYC Fleet near 1,000 total EVs by the end of 2017. The Department of Citywide Administrative Services (DCAS) is exploring

innovative channels to ensure that its sizable EV fleet can charge up, including a solicitation for standalone solar canopies that can charge fleet EVs with renewable power without relying on the electricity grid. DCAS is also exploring an interagency EV carshare pilot to address congestion in Downtown Brooklyn, where several agencies have active vehicle fleets.

NYC Clean Fleet also set forth a vision of displacing petroleum diesel with alternative fuels for use in medium- and heavy-duty fleets. With a requirement that diesel vehicles use biodiesel blends of at least 5 percent (B5) year-round, many agencies were already using B20 during warmer months for their fleets. In support of Clean Fleet, nonemergency vehicles are now beginning trials of B20 during colder months and B50 during warmer months. The New York City Police Department (NYPD) has also begun using B10 in its heavy-duty vehicles during summer months. The City is also actively investigating the supply chain, fire safety, and permitting steps that would be required to run portions of the heavy-duty fleet on renewable diesel, which can completely replace petroleum diesel in existing diesel engines from the same feedstocks that produce biodiesel.



## Sustainable Freight

New Yorkers want what they want, when they want it. As a result, local trucks carry goods to residents and businesses all day long. As a city of islands, with the exception of the Bronx, we have limited rail and marine connections to the mainland, and therefore most freight moving through the city is carried on trucks, rather than by rail or ship.

New York City needs a reliable and efficient freight network to support our economy as well as the needs of our residents, businesses, and visitors. But the current system is not sustainable—goods movement contributes roughly ten percent of the City’s transportation-related GHG emissions, exacerbates particulate and ozone pollution, adds to congestion on our streets, increases wear-and-tear on our pavements, and increases risk of vehicle crashes.

Many of the foundational elements to the 2050 sustainable freight system are already in place. Here’s a snapshot of some of the steps already or soon to be underway at City agencies and in collaboration with regional partners:

- Expand the Hunts Point Truck Replacement Program to new fleets and locations—and, if possible, citywide
- Expand off-hour delivery programs to shift truck deliveries away from peak hours
- Use technology to expand the enforcement of truck parking and delivery zones in congested areas
- Evaluate the feasibility of zero-emission truck refrigeration units (TRUs)
- Expand the use of weigh-in-motion sensors and cameras to detect overweight trucks and develop strategies to foster a culture of compliance with traffic rules and regulations to mitigate infrastructure deterioration and safety challenges caused by overweight trucks
- Reactivate the South Brooklyn Marine Terminal to connect the City to the national rail network, which will create 300,000 square feet of shed space for warehousing, and provide more than 1,000 feet of berthing space for ocean-going vessels

- Expand the transload facility at 65th Street rail yard in Sunset Park to enhance rail-to-truck cargo movements and reduce “last-mile” truck congestion, costs, and pollution
- Coordinate with the private railroads through the Metropolitan Rail Freight Council to increase rail freight; the Council has identified 18 projects that preserve and expand rail freight, such as the preservation and development of the Bay Ridge Branch in Brooklyn and Queens
- Study ways to unlock the value of NYC’s smaller, secondary waterways (e.g., Newtown Creek, Gowanus, and Eastchester Creek) that are home to many maritime industrial businesses that move over 4.4 million tons of aggregate, fuel, and recyclables each year
- Study feasibility of Low-Emission Zones to reduce truck emissions in congested areas or in communities that bear a disproportionate impact of truck traffic
- Implement safety improvements at the at-grade rail crossings in the Maspeth Industrial Business Zone, which will enhance both mobility and safety
- Work with our regional partners to advance implementation of the Cross Harbor Freight Program



**Freight Movement**

Photo credit: NYC Department of Transportation

passengers from shared rides and autonomous vehicles. Adding to these improvements, drivers will soon be able to pay meter fees with their smartphones. Additionally, the City is assessing an expanded off-peak commercial delivery program to decrease the competition for scarce curb space, and exploring the potential for automated enforcement of curb regulations. Looking beyond commercial districts, we will also assess how parking policy can encourage emissions reductions citywide.

**Support new mobility options that reduce GHG emissions and prepare for autonomous vehicles**

Shared mobility services such as car share, bike share and shared taxi and for-hire vehicle (FHV) trips are changing how New Yorkers get around. To prepare for continued changes and ensure that they reduce transportation emissions, DOT will undertake a shared-use mobility plan to identify the opportunities and challenges posed by new transportation services and models. The plan may include evaluating the potential for ridesharing services to meet travel needs in areas underserved by the subway, the ability for carsharing to reduce car ownership and improve parking availability, and strategies to promote the adoption of low-emission vehicles.

The NYC Taxi and Limousine Commission (TLC) will continue to support the modernization of yellow and green taxis through the licensing of e-hail applications that help match passengers and drivers, including those that support the sharing of rides among passengers. DOT will consider dedicating more curbside parking to carshare and shared mobility services to facilitate a shift away from traditional private vehicle ownership. The City will also continue to work with the Port Authority to accommodate the expanding interest in and potential for ride sharing from the airports.

The City has already started to prepare for the significant technological and cultural shift that may be ahead as technology for autonomous vehicles advances. DOT and TLC are examining the potential safety, congestion, social, environmental, and economic impacts of autonomous vehicles, and will advocate to State and federal lawmakers for policies that reinforce these considerations. This assessment will also guide pilot projects, including the use of the municipal fleet to test self-braking and potentially other automated features as an introduction to this technology. The City will focus on the potentially transformative safety and mobility benefits of these technologies, while seeking to mitigate the possible unintended consequence of increasing GHG emis-

sions that could result if the emergence of autonomous vehicles generates a spike in vehicle trips.

**Accelerate purchases of zero-emission vehicles**

NYC Clean Fleet outlines how City agencies will lead by example and cut vehicle emissions while meeting their operating needs. With more than 29,000 vehicles, the City's procurement decisions can accelerate the development of the ZEV market and catalyze similar investments by other cities and large fleets.

To accelerate the use of ZEV technologies into high-mileage fleets, such as taxis and FHV, the City will partner with private sector stakeholders to provide high-value electric vehicle (EV) charging, and will advocate for State legislation to reduce or waive the existing rental car tax for short-term ZEV FHV rental services.

A lack of a robust public infrastructure network to support ZEVs is a major reason their uptake has lagged in New York City.<sup>1</sup> While Local Law 130 of 2013 requires that new parking garages and open lots be equipped to accommodate electric vehicle charging equipment for at least 20 percent of parking spaces (thus making them "charger-ready"), it does not require the installation of chargers. To begin addressing this barrier, the City is installing additional EV charging stations at its municipal parking lots and fields over the next year. The City will also develop a deployment roadmap that identifies advantageous locations for ZEV-enabling infrastructure based on factors including likelihood for use by high-utilization fleets, locations of charger-ready parking spaces, and proximity to existing electric distribution infrastructure. We will integrate this analysis into the Community Energy Mapping effort, detailed in the Energy chapter. Additionally, the City will continue to advocate for EV charging rate structures to encourage the deployment of EVs and enabling infrastructure in a manner that increases the efficiency of the electric distribution system.

In collaboration with stakeholders participating in the New York City Electric Vehicle Advisory Committee, formed by DOT pursuant to Local Law 122 of 2013, the City will enhance these efforts to accelerate the adoption of ZEVs, and in particular EVs. The advisory committee is composed of representatives from DOT, the NYC Department of Environmental Protection (DEP), the NYC Department of Buildings (DOB), the Mayor's Office of Sustainability, City Council, the five Borough Presidents' offices, the EV industry, and transportation



and environmental advocates. The City will ask the advisory committee to lead the necessary stakeholder discussions that will lead to an EV implementation roadmap to drive investment and regulatory reform to support the private sector's transition to ZEVs, and will continue to work with the City Council on these recommended measures.

Exploration is also underway on the potential for a hydrogen fueling station pilot in the city to provide access to fuel cell vehicles. For both the electric charging and hydrogen fueling stations, City agencies are working with the Fire Department of the City of New York (FDNY) to address energy storage technologies, charging issues, and any other safety concerns related to the introduction of these new low-carbon vehicles and fuels.

#### **Encourage the use of renewable and low-carbon fuels where electric vehicles are not an option**

Electric vehicles are presently not an option for most heavy-duty vehicles. Therefore, the City will increase its use of renewable and low-carbon fuels in its own heavy-duty fleet. The City already blends biodiesel into the diesel fuel it uses in trucks and buses. In 2015, 93 percent of the diesel fuel used by nearly 10,000 City trucks and buses ran on biodiesel blends ranging from 5 to 20 percent (B5 to B20). The City also uses alternative fuels such as compressed natural gas (CNG) in some of its trucks and buses where it makes operational sense to do so; roughly 250 heavy-duty vehicles operate on either CNG or propane, including 44 NYC Department of Sanitation (DSNY) collection trucks. The use of CNG and biodiesel, depending on the source, in vehicles reduces emissions of GHGs as well as particulate matter and other criteria air pollutants relative to petroleum diesel, providing air quality and public health benefits citywide.

As a major component of NYC Clean Fleet, the City will expand its focus from biodiesel and CNG to increasing the use of renewable and low-carbon versions of all of the fuels the municipal fleet uses. Where renewable diesel or natural gas can replace conventional fossil fuels, we will do so. To accelerate the private market for renewable and low-carbon fuels, the City will advocate for a state or regional low-carbon fuel standard, based on the success of the low-carbon fuel standard in California. In that state, more than half of the natural gas used in transportation comes from renewable sources, including landfills, water treatment facilities, and agriculture, rather than from fracked fossil sources.

#### **Encourage increased efficiency of local and “last-mile” freight delivery**

The City has taken steps to increase the efficiency of local and “last-mile” freight delivery. This includes pilot projects to incentivize off-peak deliveries, steps to improve curb management and truck parking, and innovative funding incentives to reduce truck emissions. In particular, the Hunts Point Truck Replacement Program has funded the replacement of 500 pre-2007, inefficient trucks with newer, cleaner models.

Looking ahead, DOT's recently released *Strategic Plan 2016* will guide the City's investments and planning for future freight policy. The plan considers a range of measures to increase the efficiency and reduce the carbon footprint of freight movement, including expanded camera enforcement of curb loading, an expanded off-hour delivery program, expanded enforcement of anti-idling laws, and increased enforcement of truck weight, size, emissions limits through GPS and other technology innovations.

The City will help transition local truck deliveries to the cleanest, most efficient technologies to address longstanding concerns about truck pollution and congestion. In particular, the City will study the potential for Low-Emission Zones (LEZs) that limit traditional truck traffic in overburdened neighborhoods and incentivize or require zero- or low-emission “last mile” deliveries. LEZs exist in more than 400 European cities, but have not been implemented in the U.S. By adapting European strategies such as variable emissions-based charges, time-of-day restrictions, and prohibition of the oldest, dirtiest trucks to the New York City context, LEZs could provide both GHG reductions and public health benefits to communities that have borne the disproportionate burden of our current system.

The City will also seek funding to extend the Hunts Point Truck Replacement Program into new fleets and locations, expanding this program to address the dirtiest diesel trucks citywide. The City will consider the suitability of new ZEV and other vehicle technologies for trucks (e.g., electric, hybrid, natural gas, stop-start, and others); new procurement policies to reduce GHGs from municipal government-related deliveries; incentives to reduce partial load shipments from private sector deliveries; and strategies to reduce emissions from truck refrigeration unit equipment.

### **Invest in rail, maritime, and other infrastructure to increase the efficiency of freight movement**

DOT, the New York City Economic Development Corporation (NYCEDC), and other agencies are advancing a number of approaches to increase freight efficiency using new or existing investments in rail, maritime, and other infrastructure as alternatives to long-haul truck freight. These investments will take trucks off New York City's limited bridge crossings and add valuable options for bulk cargo transportation. NYCEDC and DOT have also increased opportunities to capture new air cargo markets by allowing trucks carrying industry-standard 53' trailers to access JFK's air cargo facilities, supporting approximately 60,000 jobs in Queens. We will continue to explore opportunities to divert progressively greater shares of freight from trucks to rail, barge, or air through targeted investments and interventions such as those outlined above. To improve the efficiency of air freight, the City will coordinate closely with the Port Authority, including on a demonstration project of zero- and low-emissions ground support equipment, and will undertake a Phase 2 study to identify new opportunities for air cargo.

Until now, the City has focused most of its marine and non-road equipment interventions on the reduction of criteria pollutants, such as particulate matter and nitrogen oxides. Local Law 77 of 2004 requires the use of ultra-low sulfur diesel for any non-road equipment used on City construction projects. Earlier this year, the City's new contract for Citywide Ferry Service requires that vessels be powered by engines meeting or exceeding EPA's Tier 3 marine diesel engine emissions standard. Opportunities to reduce GHG emissions from marine and non-road equipment are limited, but the City will take several exploratory steps. We will continue to evaluate the potential to convert marine and non-road equipment to low-emission technologies, such as natural gas, hybrid, electric, and fuel cell powertrains. For example, the City will assess the ongoing implementation of NYCEDC's shore power collaboration with the Port Authority at Brooklyn Cruise Terminal to guide future prospects for providing alternative power to marine vessels at terminals in New York City. The City will also work to develop a program to implement and enforce anti-idling regulations for all non-road equipment operating in the City.

### **Laying the foundation for the future**

Emissions reductions of 80 percent citywide will require significant action beyond the above initiatives between now and 2050. Building on existing projects and studies, 80 x 50 will require major investments in expanding and improving low-carbon transportation networks under the City's control (i.e., those for surface transit, walking, and bicycling) and those under the control of others. Therefore, the City will continue working with State, regional, and federal partners to fund and invest in expansions of the core transit network.

We will need to leverage technological shifts that influence mode decisions, optimize the transportation network, and increase uptake of low-emission vehicles. The use of cameras, sensors, vehicle monitors, and other devices can provide rich data and analytics to perform real-time traffic management and promote network efficiency. However, the City cannot promote technological adoption on its own. Developing the market for electric vehicles in New York City, for example, will require working with utilities, building owners, and others to deploy the necessary charging infrastructure to support these vehicles.

Changes to the transportation landscape to enable deep GHG emissions reduction, supported by a wholesale shift to mobility as a service, will also require institutional changes that increase cooperation and commitment between the City and State, regional, and federal partners. The City will work to break down barriers between jurisdictions and agencies in pursuit of its emissions reduction goals as well as seek greater control over the funding, regulation, and enforcement of its transportation system. Stronger mechanisms for regional planning among these entities are critical, and the City stands ready to take the lead on a comprehensive regional agenda for GHG emissions reduction.

Regulatory changes will also play a role in reaching 80 x 50 in the transportation sector. The City will need to evaluate the level of regulation needed for shared mobility services and autonomous vehicles in order to ensure that they reduce GHGs and supplement, rather than replace, the transit network. The City will also need to work with the State and the federal government to establish fair, transparent, and practical regulatory environments to guide the deployment of emerging technologies to ensure that they operate safely, efficiently, and reduce overall VMT.

Cross-jurisdictional regulatory programs like a low-carbon fuel standard will have to be adopted to enable the rapid deployment of renewable and low-carbon fuels. Widespread adoption of cleaner vehicle technologies and fuel types will require substantial market changes; until the auto and truck industries see a market for a wide selection of ZEV offerings in every vehicle type, the options will be limited. The City will also need to help the industry create a common approach towards EV charging, which will overcome the current trend of different companies using different charging standards for their vehicles.

Similarly, bringing about the sustainable freight system that we will need in 2050 will require the City and its regional partners to invest in a diversity of strategic approaches. These include:

- New or rehabilitated rail and marine infrastructure to provide an alternative to trucking along congested roadways and river crossings;

- New strategies for local freight deliveries that meet businesses’ and residents’ desire for timely and on-demand goods delivery without adding stress to neighborhood streets;
- New approaches to freight distribution centers, waste transfer stations, and other centrally-located facilities to reduce impacts of heavy vehicle emissions, particularly in low-income communities; and
- Cleaner, more efficient engines to power the trucks, locomotives, and marine vessels that carry our goods where they need to go.

Many governments around the world are grappling with similar institutional, regulatory, and market challenges. To spur the scale of transformation needed to achieve global GHG reduction goals, New York City will continually strive to be a model of sustainable transportation governance for other cities to emulate.

Transportation Strategies	Energy	Buildings	Transportation	Waste
Modernize, expand, and reduce crowding on the city’s transit system			●	
Make walking and biking safer, more convenient options for all New Yorkers			●	
Ensure that the City’s policies prioritize walking, biking, and transit			●	
Leverage technology and data to expand travel options and optimize the transportation network			●	
Better manage and price parking to encourage efficient travel choices			●	
Support new mobility options that reduce GHG emissions and prepare for autonomous vehicles			●	
Accelerate purchases of zero-emission vehicles	●	●	●	
Encourage the use of renewable and low-carbon fuels where electric vehicles are not an option	●		●	●
Encourage increased efficiency of local and “last-mile” freight delivery			●	
Invest in rail, maritime, and other infrastructure to increase the efficiency of freight movement			●	●