Moving Forward

Your Region, Connected

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

1

2050 SOCIOECONOMIC AND DEMOGRAPHIC FORECASTS

1.1 OVERVIEW

*This appendix describes the methodologies and technical tools used to produce New York Metropolitan Transportation Council's (NYMTC) Socioeconomic and Demographic (SED) forecasts described in Chapter 3 of **Moving Forward** (or the Plan). NYMTC's SED forecasts through 2055 were adopted by NYMTC's Program, Finance, and Administration Committee on October 22, 2020. However, the focus of this appendix is to present data and information on a wide range of recent socioeconomic and demographic trends and forecasts over the course of the Plan.*

SED forecasts have been developed for a 31-county "forecast region" in the multi-state metropolitan region. The forecasts are disaggregated into five subregions:

- New York City's five boroughs
- Nassau and Suffolk counties on Long Island
- Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, and Westchester counties in the Hudson Valley
- Bergen, Essex, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, and Warren counties in northern New Jersey
- Fairfield, Litchfield, and New Haven counties in western Connecticut

To produce the 2055 forecasts, NYMTC updated the previous 2050 employment, population, household, and labor force forecast models, as well as the transportation analysis zone (TAZ) distribution model, from 2012 to a 2017 base year using the same data sources as in the original 2050 SED forecast models, and then extended the forecast period from 2050 to 2055.

For the sake of clarity, the previous 2050 forecasts prepared with a 2012 baseline will be referred to in this appendix as "2050 Forecast(s)," the update of these models to the 2017 baseline will be referred to as the "Forecast Update(s)."

1.2   METHODOLOGY

NYMTC produced estimates for the forecasting region that were disaggregated into TAZs for the 28-county region that is included in the NYMTC's regional demand forecasting model, the New York Best Practice Model (NYBPM). All analyses included in this appendix are from 2017 to 2050.

In the following sections, the SED forecast methodology will be described for the following variables:

- **Employment:** Total Employment (Wage and Salary Employment and Self-Employment)
- **Population:** Total Population, Household Population, Group Quarters Population
- **Labor Force:** Total Civilian Labor Force, Employed Civilian Labor Force
- **Households:** Total Households, Average Household Size

For this Forecast Update, historical rates were used to inform each model's assumptions to project the socioeconomic and demographic variables, and the initial projections for each forecast were balanced to conform with land use constraints, county and municipal master plans where available, development opportunities, and planned development projects within the forecasting region. No changes have been made to the previously set adjustment factors. In-depth overview and the details of following models are described in *Technical Memorandum 2: Baseline Model Update TM2*.

1.2.1 EMPLOYMENT MODEL OVERVIEW

Employment projections were developed using three SED models. As shown in *Figure C-1-1*, historic employment benchmarks were established for national and county payroll employment and self-employment (modules in green). Third-party forecasts were then used to develop national employment forecasts and region/county employment shares (modules in olive), followed by projections of payroll and self-employment for the NYMTC planning area and the subregions and counties within the planning area (modules in blue). Finally, place of work employment forecasts were calibrated against place-of-residence labor forecasts (modules in gold) established from the population forecast model. Adjustments were made based on Forecasting Working Group (FWG) member feedback. The FWG is composed of NYMTC's member agencies and representatives of other metropolitan planning organizations and councils of government in the forecasting region who review work products related to development of SED forecasts.

The employment forecasts are critical to the NYBPM; the number of jobs by place-of-work location provides the number of potential work trips and their destination location. The employment model interacts with the population and labor force models because employment opportunities influence migration rates and imply the level of employment demand for each subregion and county.

Figure C-1-1

Overview of Employment Forecasting Methodology

Source: NYMTC, 2015. Modeling Methodology TM, p. 6
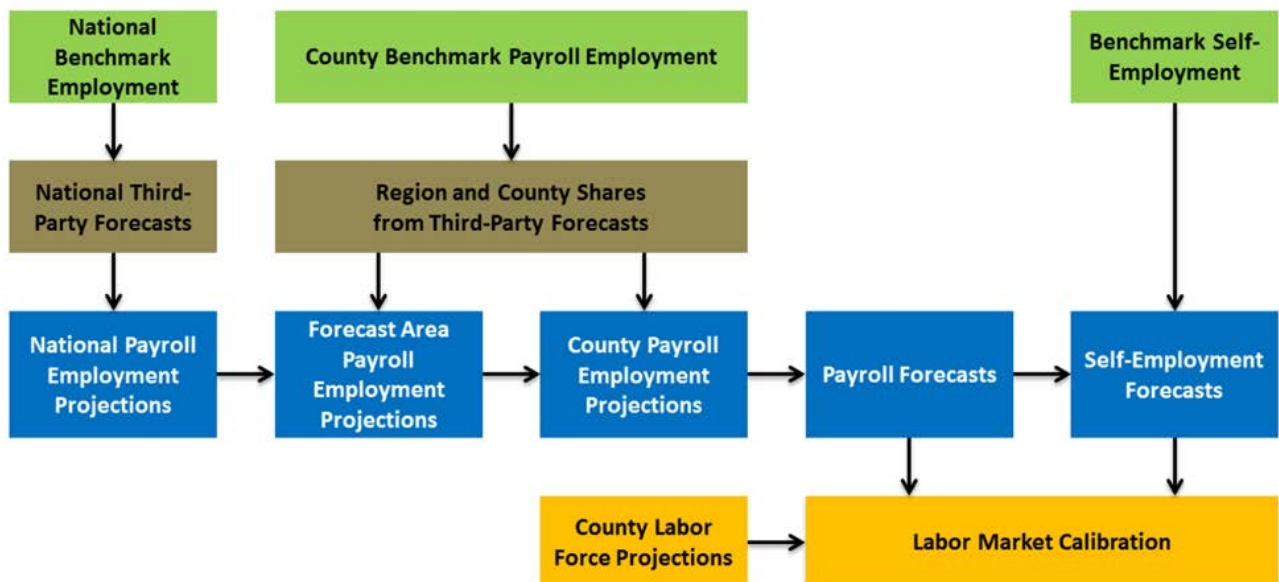
1.2.2   POPULATION MODEL OVERVIEW

Two separate population forecasts were developed for the 31-county forecast region. The New York City Department of City Planning developed population projections for the New York City's five boroughs, while a separate model was used to generate population projections for the remaining 26 counties.

The Population Model is based on five components, one for each of the non-New York City subregions listed in *Section 1.1*. These subregional components are driven by a cohort-component approach (births, deaths, net migration) based on 1990–2010 decennial censuses by age/sex, updated to 2015 in the original 2050 model. The model employs a demographic-economic method linked to employment demand to adjust for regional net migration in future years as shown in *Figure C-1-2*.

In the 2050 Forecast, the 2010 U.S. Census is the launch point for the cohort-survival components, which were then extrapolated to 2012. For the 2050 Forecast Update, 2015 is used as the launch point for the cohort-survival components, which are extrapolated to 2017, the launch point of the employment forecast projections.

The primary outputs generated through the Population Model include:

- Total population
- Population in households
- Population in group quarters

The Population Model yields a forecast of travelers in the 31-county forecast region.

Figure C-1-2

Population Model Structure for 26 Counties Outside New York City

Source: NYMTC, 2014. County Level Forecast Methodology WP, p.36
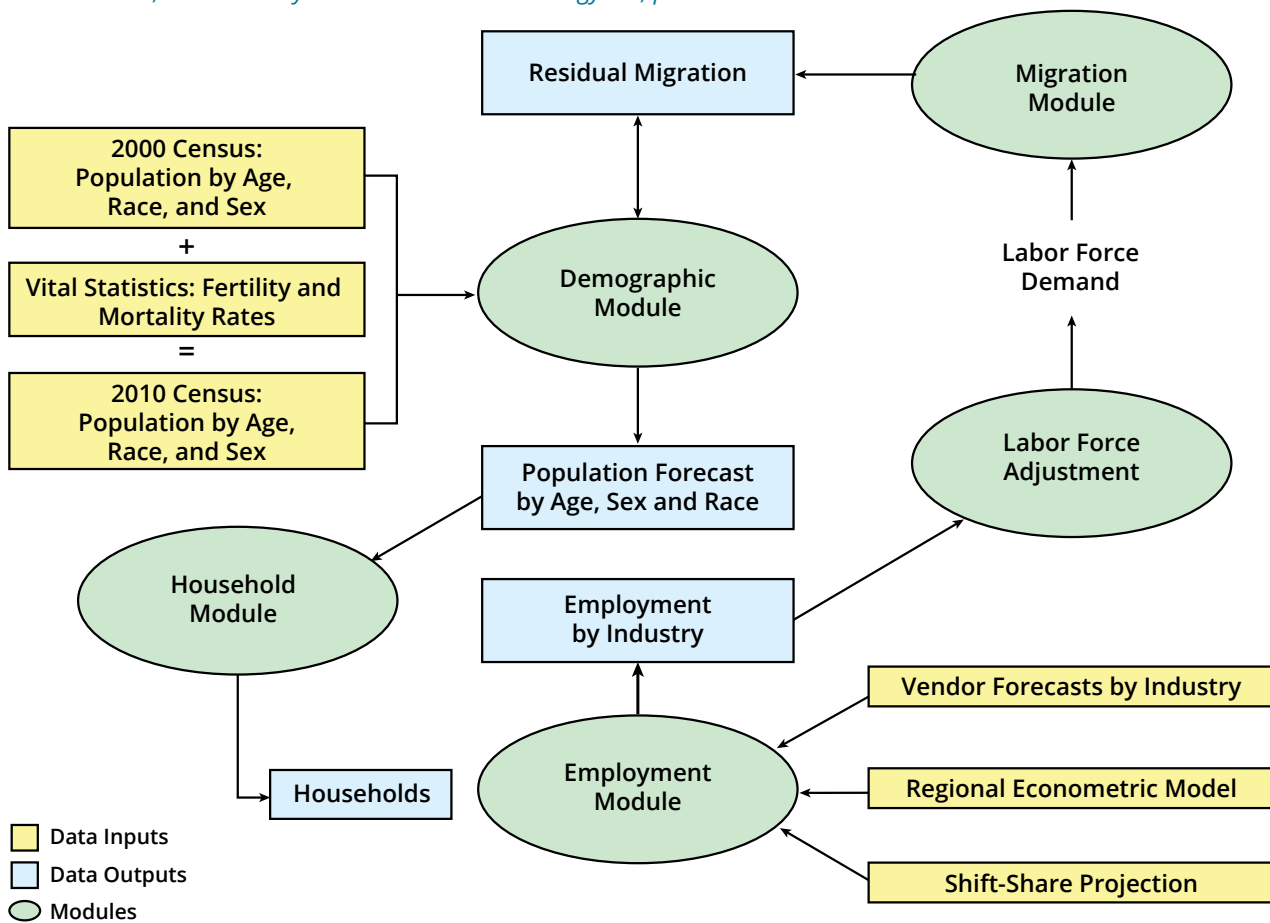
1.2.3 LABOR FORCE MODEL OVERVIEW

Labor force is defined as the resident population of a place, aged 16 years or older, that is employed or, if not employed, actively looking for work. The Population Model generates county-level forecasts of population distinguished by age and sex. As shown in *Figure C-1-3*, the Labor Force Model then converts population projection inputs into estimates of civilian labor force by combining various other inputs through a series of calculations that forecast the following:

● Civilian labor force.

● Labor Induced Migration Adjustment (LIMA). The Population Model provides several methods for adjusting the components, the most powerful of which are the adjustments to migration. The LIMA adjustment within the Population Model increases the net migration component of population consistent with forecasted employment growth.

● Employed labor force by county of residence.

Figure C-1-3
Labor Force Model Structure
Source: NYMTC, 2015. Modeling Methodology TM, p. 84

For the labor force forecast, the Forecast Update incorporates the same data inputs used in the previous model with new data points added for the years from 2011 to 2017. For the Forecast Update, labor force participation rates were adjusted to reflect more recent trends.

The established methodology of the Labor Force model creates greater consistency with employment projections by linking migration to employment. Labor demand implied by the employment forecasts is reconciled against labor supply estimates generated from the conversion of preliminary population forecasts into labor force estimates. The volume of total economic migrants (workers and their dependents) that cannot be housed in New York City because of housing supply constraints are reallocated to the surrounding commuting shed to be compatible with commuting patterns observed in the data.

1.2.4 HOUSEHOLD MODEL OVERVIEW

The household is a key unit of analysis in demographic and travel demand forecasting. The Household Model forecasts the average

household size and number of households for each geographic subregion. Derived from total population by age, the number of households is projected by applying historical headship rates by five-year age cohort. A headship rate is the ratio of household-heads (self-identified classification by census respondents) to the corresponding household population. 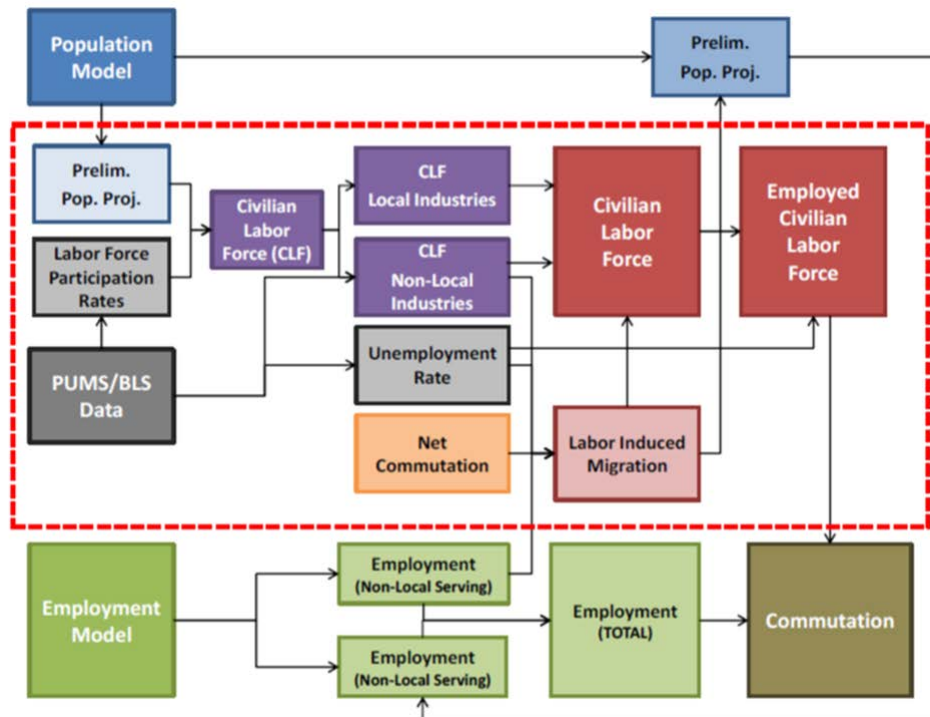It should be noted that the household model works on a five-year cohort basis and therefore defaults to the five-year period preceding the interim base year: in the case of this Forecast Update, the model defaults 2017. There were no changes to the data inputs in the Household Model beyond the additional collection of the 2015 American Community Survey Public Use Microdata Sample data.

Separate household projections were generated for New York City and the other 26 counties, in keeping with the clear distinction of household formation patterns within New York City and the surrounding, more suburban, counties. New York City's average household size has been stable since 1990. However, the changing population dynamics (i.e., the aging population or possible changes in immigration trends) at play in New York City make projecting the direction and magnitude of change difficult. Therefore, the 2010 average household size of 2.57 persons has been held constant throughout the forecast period.

The household formation forecasts for the other 26 counties were derived somewhat differently. Because of differing trends in these counties (e.g., declining household size and an increasing number of single person households), the model for these subregions was based on age-specific headship rates from the previous three decennial censuses. Headship rates were then used to forecast the projected number of households, given the projected age-distribution of the population. The Forecast Update incorporated the same inputs used in the previous model with new population and headship rates added for the years after 2017. Subsequently, in this model calibration, headship rates are held constant from 2020 to 2050 at either 2010 or an average of 2000 to 2017 historical levels. Household population divided by housing units yields the average household size.

1.3 TREND ANALYSES AND ASSUMPTIONS

An analysis was conducted of the forecasting region's demographic and economic trends, emerging issues, infrastructure changes, and transformational technologies that will influence the 2050 Forecasts Update and to get FWG feedback regarding the potential impact of these trends and technologies. Details of this trend analysis are described in *Technical Memorandum 1: Existing Trends Analysis*.

The trend analysis included a survey asking FWG members to assess the level and timing of impacts from various trends and technologies. The survey results provided local insights on how adjustments could be applied to the Population and Employment models.

1.3.1 SIGNIFICANT TRENDS

On both a national and regional basis, the following trends will have significant impacts on the updated model results.

- Declining fertility rates
- Declining mortality rates
- Aging population
- Declining international immigration
- Increasing housing costs
- Decreasing personal income
- Declining unemployment
- Shifts in industry mix
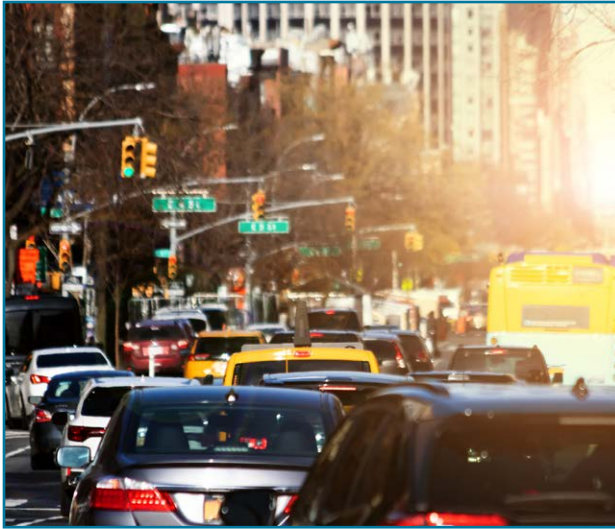
In addition, other emerging issues may affect future land use, traffic, and transit. These include:

- Transit and transportation trends such as ride-hailing through transportation network companies
- Climate change and sea level rise
- Land use trends (headquarter relocations, the growth of coworking spaces, conversions of office parks, malls, transit-oriented development, and golf courses)
- Infrastructure considerations such as utility access including sewers and broadband
- Congestion pricing in the region's core
- Transformational technologies including e-commerce, alternative energy, vehicle automation, and smart cities

Input from FWG members and others with local knowledge (e.g., county planners) helped to determine the extent to which these issues would affect the forecasting region as a whole and component counties individually. These individuals provided a higher-level perspective for the detailed information gathered from the development inventories and county planning meetings. *Table C-1-1* presents the survey results ranked by relative anticipated level of influence and anticipated year of the height of impact.

1.3.2   DEMOGRAPHIC TRENDS

POPULATION TRENDS

Major trends in the U.S. economy from 1990 to 2017 were analyzed and compared to the future trend expectations from 2017 to 2048 using the 30-year forecast released by IHS Markit2 in November 2018. For the forecast period, the primary purpose of the trend forecast is for planning. It purposefully does not indicate cyclical changes in the economy or try to pinpoint when they might occur.

The civilian population of the United States grew from 250.6 million in 1990 to 310.1 million in 2010, an annual rate of growth of 1.1 percent per year. From 2010 to 2048, growth is expected to trend down, from 0.7 percent per year between 2010 and 2020, to 0.6 percent between 2020 and 2040, to 0.5 percent a year from 2040 to 2048. Thus, from 2010 to 2048 the country will add 2 million residents per year, compared to a rate of 3 million per year from 1990 to 2010.

The population of the entire forecasting region grew from 19.9 million in 1990 to 23 million in 2017, an increase of 3.1 million during the period and an average annual growth rate of 0.5 percent a year. The IHS forecast projects very little population growth in the forecast period; almost all of which is expected to occur in the New Jersey subregion.

Since 2010, New York City has seen a population increase of 5.5 percent, while the population of northern New Jersey increased by 3.3 percent. The Hudson Valley subregion saw more modest population growth with an increase of 2.2 percent, followed by the western Connecticut subregion at 1.2 percent, and the Long Island subregion at 1.0 percent.

Between 1990 and 2017, the downtrend in the birth rate (births per 1,000 residents) and aging of the population are another possible reason for the expected decline in population growth nationally and regionally.

Table C-1-1

Local Impacts Survey Results Ranked by Anticipated Level of Influence

Source: NYMTC 2050 SED Forecast Update, Technical Memorandum 1

Topic	High/Med/Low Influence	Anticipated Average Year for Height of Impact (2020–2050)
High housing costs/lack of affordability	High	2025
Sea level rise and climate change	High	2030
Senior housing choices	High	2030
Building boom	High	2030
Aging populations	Medium	2030
New York City congestion pricing	Medium	2025
E-commerce	Medium	2030
Shifting industry mix	Medium	2030
Millennial housing choices	Medium	2025
Ridesharing	Medium	2025
Changing regional malls	Medium	2030
Increasing sewer access	Medium	2030
Expansion of the freight industry	Medium	2030
Smart cities	Medium	2035
Reinventing office parks	Medium	2025
Electric vehicles	Medium	2030
Headquarter relocations	Medium	2030
Coworking spaces	Medium	2030
Declining housing value	Low	2030
Golf course conversions	Low	2030
Autonomous vehicles	Low	2040
Slow growth of gross domestic product	Low	2030
Autonomous terrestrial delivery vehicles	Low	2040
Short distance aerial delivery vehicles	Low	2035
Moratorium on Con-Ed Gas hookups/infrastructure constraints	Low	2030

HOUSEHOLDS AND HOUSEHOLD SIZE

As the Baby Boom generation and Generation X aged over time, the number of households formed each decade in the United States shrank from a high of nearly 16 million from 1970 to 1980 to 12.5 million between 1980 and 1990, to fewer than 10 million per decade between 1990 and 2010. The number of household formations will average about 10 million per decade from 2010 to 2048.

Household size shrank from an average of more than 3 persons per household in 1960 to about 2.5 in 1990 and averaged about 2.6 persons per household between 1990 and 2010. The IHS forecasts expect average household size to resume a minimally downward direction in the forecast period, ending the forecast period at 2.4 persons per household. The expected decrease in household size combined with little movement in mortgage rates will keep single-family homes at about 70 percent of housing starts in the forecast period and multi-family units at about 30 percent.

REGIONAL HOUSEHOLDS AND HOUSEHOLD SIZE

In most counties in the forecasting region, the number of households grew similar to population growth between 1990 and 2017. Within both the forecasting region and the New York State 14-county subregion, which encompasses the New York City, Long Island, and Hudson Valley subregions, household size grew from 2.7 to 2.8 persons per housing unit. Household size differed considerably among counties—with the smallest average size in Manhattan at 2.1 in 2017 and the largest in Rockland County at 3.2 in 2017. The IHS forecast, which projects little population growth, subsequently shows household size falling in all counties within the New York State 14-county subregion through 2048. It is likely that the smaller household size in the forecast period is a result of the aging population. Older people who live in their own homes are likely to live in households of one or two people.

LABOR FORCE

The U.S. labor force increased at a rate of 0.9 percent per year between 1990 and 2017, less than half the rate in the previous three decades when women entered the labor force in large numbers. The labor force declined slightly during the "Great Recession" of 2007–2009, with the decline confined to workers between 16 and 54 years old who were less protected against cyclical employment trends; workers aged 55 and older increased in number as they retained their jobs and delayed retirement.

The number of people in the labor force who are 65 years old or older has been increasing since 1960. By 2017, older adults were 6 percent of the labor force, up from 2.7 percent in 1990. This increase in participation by older adults is likely the result of a combination of factors, including better health care, making for longer, healthier lives; and changes to the national economy's industrial structure and workforce environment, resulting in fewer workers involved in physical labor.

According to the IHS forecast, the increase in participation by older adults is expected to continue during the forecast period, so that by 2048, more than 11 percent of the labor force will be age 65 or older. However, the growth of the labor force will fall to only 0.6 percent a year between 2017 and 2048, primarily because of the concomitant decline in population growth in the United States as well as the likely stability of women's participation rate.
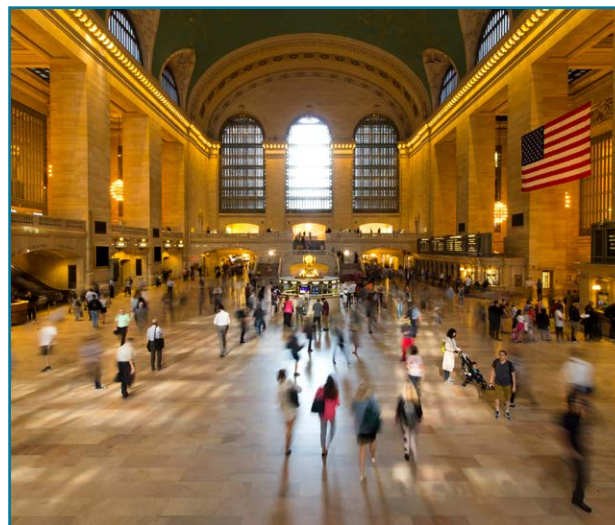
1.3.3 ECONOMIC TRENDS

EMPLOYMENT TRENDS

Total non-agricultural employment, or work-place employment, in the United States rose from 90.5 million in 1980 to 146.6 million in 2017 (*Figure C-1-4*). The impact of the recessions of the early 1980s and early 1990s can be seen in the dips in employment in those periods. The recovery from the much larger dip following the 2001 recession ended in 2004, while the recovery after the "Great Recession" of 2007–2009 lasted until 2014.

Total household employment includes proprietors, which are business owners and classified as self-employed workers as well as agricultural jobs, neither of which is included in the non-agricultural data. Total household employment has always been higher than non-agricultural employment, but its reaction to the business cycle tends to be more muted, falling more slowly in downturns and rising more slowly in upswings. That pattern will continue in the forecast period according to forecasts by IHS Markit. Between 2017 and 2048, non-agricultural employment is expected to rise at a rate of 0.64 percent a year compared to 0.60 percent

a year for household employment. Over that same period, workplace jobs are expected to rise by 32.2 million and household employment is expected to increase by 31.3 million. Moody's non-agricultural employment forecasts project slightly weaker average annual employment growth at 0.61 percent over that period.

Employment trends for the forecasting region and its component subregions are similar in some ways but quite different in others. *Figure C-1-5* shows the percentage growth in employment by subregion compared to the forecasting region as a whole and to the United States.

Over the trend period, New York City was the growth leader in the forecasting region, with employment increasing at an annual average rate of 0.8 percent. Long Island added jobs at a rate of 0.65 percent a year, while the Hudson Valley and northern New Jersey subregions lagged at only 0.45 percent and 0.29 percent per year, respectively. The western Connecticut subregion had the smallest growth at 0.15 percent. All were considerably slower than the United States, which added jobs at a rate of 1.1 percent a year.

Figure C-1-4

U.S. Employment, 1980–2048 (in Millions)

Source: USBLS, Current Employment Statistics Survey, IHS Markit & Moody's Employment Forecasts
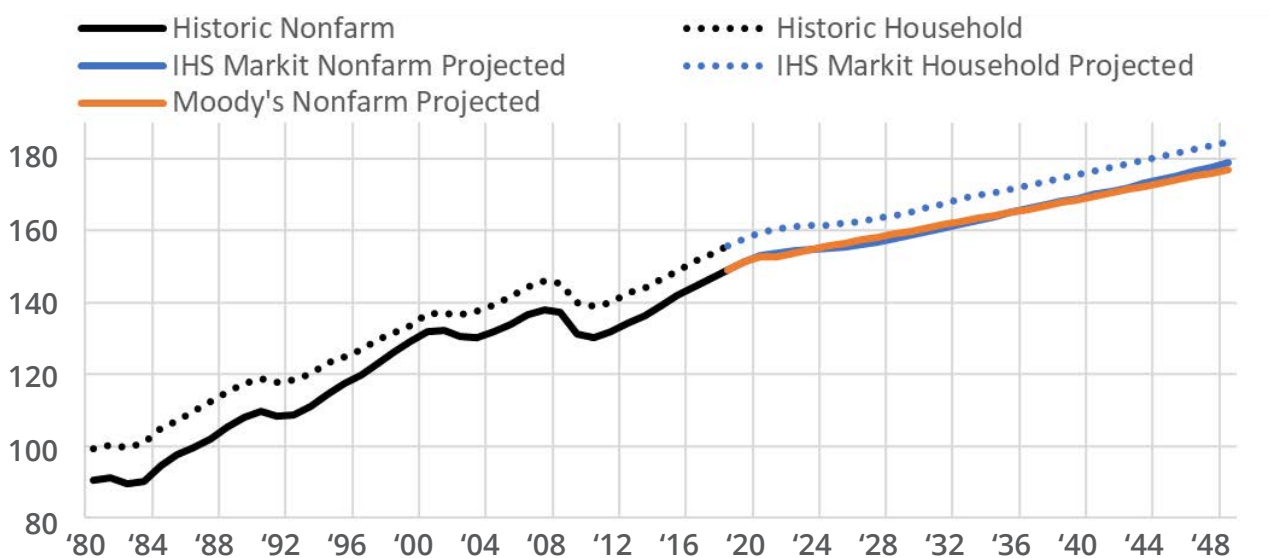
Figure C-1-5

Regional Nonfarm Payroll Employment Growth Rates, 1990–2017 and 2017–2048

Source: USBLS, Current Employment Statistics Survey, IHS Markit & Moody's Employment Forecasts
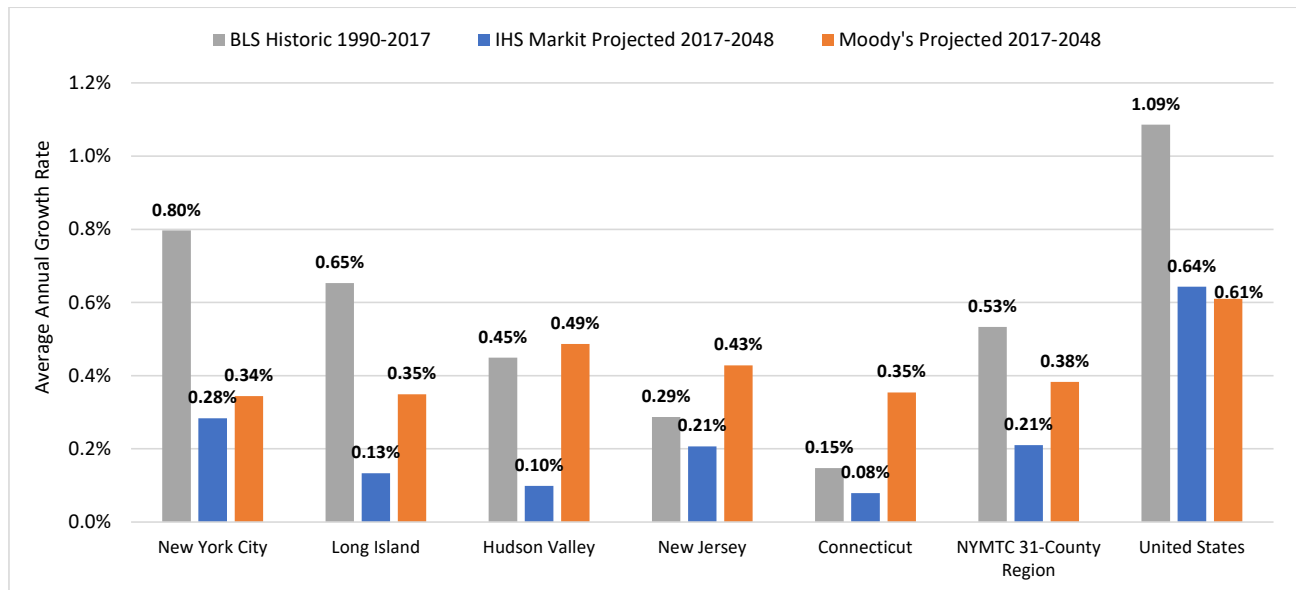
Future growth forecasts developed by IHS Markit and Moody's were similar at the national level but diverged for the forecasting region and its subregions. Moody's forecasts projected double the rate of growth forecasted by IHS Markit in the forecasting region (+0.38 percent and +0.21 percent, respectively). In New York City, both forecasts projected annual average growth of roughly 0.3 percent, while Moody's forecasts far exceeded growth projections in all other subregions.

The differences in the growth rates are, to a large extent, attributable to the varying impacts of the Great Recession. Between 1990 and 2007, all five subregions grew less than 1 percent a year, with western Connecticut and New York City at the low end of the range and the more suburban areas in New York and New Jersey at the high end. Employment in New York City peaked in 2008, a year after the national peak, and the jobs previously lost in the Great Recession (by number not industry) were recovered by 2011. The number of jobs lost in the recession were recovered in Long Island in 2013 and not until 2014 in the United States. The job recovery was completed in 2015 and 2016 in the Hudson Valley and northern New Jersey subregions, respectively, while, as of 2018, the job recovery was not yet complete in the western Connecticut subregion.

1.4 COVID-19 IMPACTS ON FORECASTS

The global novel coronavirus (COVID-19) pandemic that began in 2020 has affected cities throughout the world, as many urban cores became epicenters for the pandemic. The forecasting region was no exception, with higher infection and death rates due to a complex combination of factors, including population density and national and international connectivity. However, as of this writing, the ability to discern medium-term or longer-term effects of the COVID-19 pandemic and economic shock is constrained.

To determine how to address this ongoing public health emergency in the forecasts, the FWG considered the potential impacts of the pandemic. The forecast process had already incorporated assumptions of multiple economic cycles into its long-term outlook. However, in light of the pandemic-related economic shock beginning in 2020, some adjustments have been made to reflect economic conditions.

Based on this assessment, it is anticipated that economic conditions will diverge significantly from earlier forecasts during the early years of the forecasting period.

1.5 2050 31-COUNTY REGION FORECASTS

From 2017 to 2050 total employment is projected to expand by 1.57 million jobs (+13.01 percent) in the 31-county forecast region, reaching a high of 13.58 million jobs and 25.5 million residents.

1.5.1 EMPLOYMENT

The 2050 SED employment forecasts total jobs (both payroll[1] and proprietor) by place of work as modeled by the update of the 2015 Employment Model and adjusted to reflect the insights of the FWG.

ADJUSTMENT FACTORS

Adjustments to the 2050 SED Employment Forecasts

To get closer to the regional target and reflect changes in regional land use, including significant development in New York City and northern New Jersey, the county level forecasts were adjusted within the model consistent with the established methodology. Further, consistent with the scope of work, the resulting forecasts were projected to 2050, using a simple least squares linear trend of the forecast based on the years 2000–2050.

COVID-19 Adjustments

The project team coordinated closely with FWG members to consider the impact of COVID-19 on the forecasts. After several scenarios and adjustments, the agreed-upon forecasts reflect a uniform adjustment applied at the county-level in the employment model to create a "lag" in employment in 2020, roughly back to 2017 levels. After the employment lag was created, employment was reconciled with population and labor force distribution.

REGIONAL MODEL EMPLOYMENT RESULTS

From 2017 to 2050, total employment is projected to increase by 1.57 million jobs (+13.01 percent) in the 31-county forecast region, (see *Table C-1-2*). Growth through 2020 will be curtailed by the impacts of the COVID-19 pandemic before rebounding in 2025. After 2025, growth will be driven by a continuation of the current cyclical expansion, which will transition into a period of moderate long-term growth through 2050.[2]
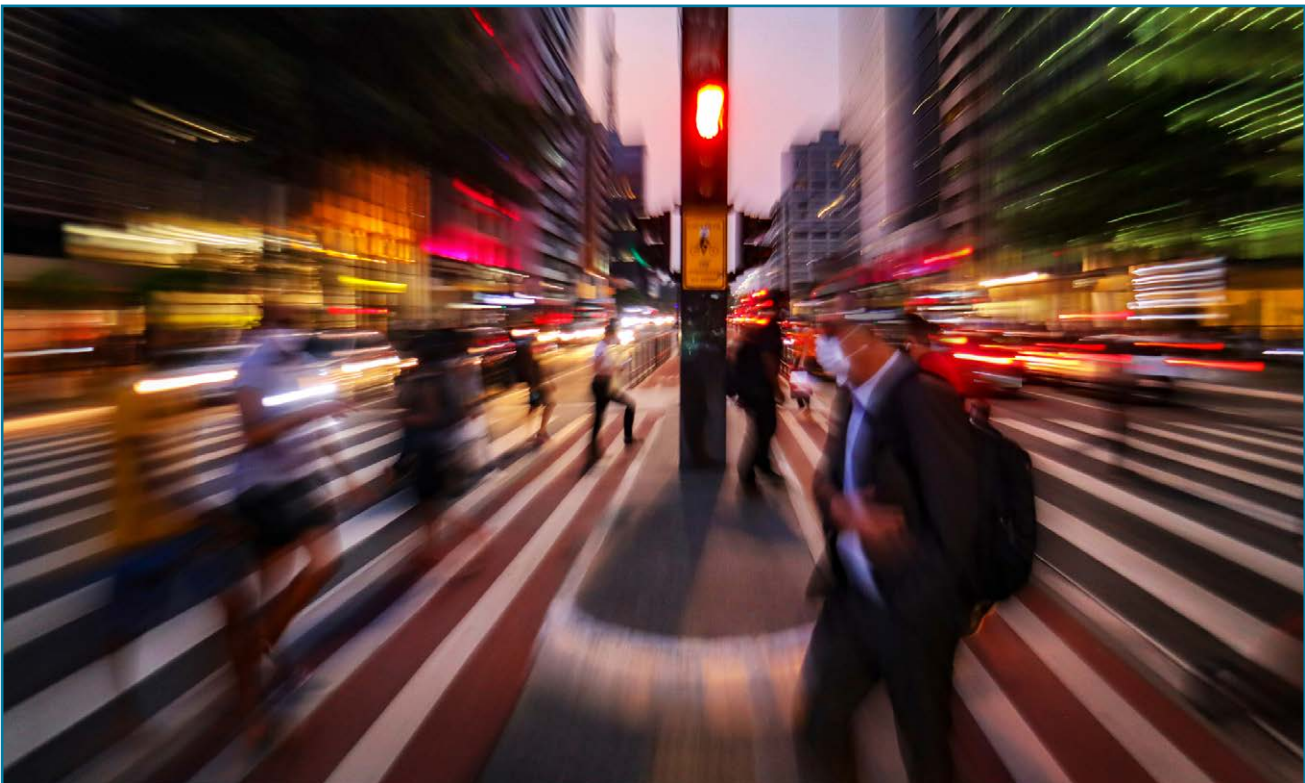
Table C-1-2

**Projected SED 2050 Forecast Total Employment and
Compound Annual Growth Rate by Subregion (2000–2050)**

*Source: Bureau of Labor Statistics' Current Employment Statistics and Quarterly Census of Employment and
Wages; American Community Survey; NYMTC 2055 SED Forecasts*

Employment Levels	2000	2005	2010	2015	2017	2020	2025	2030	2035	2040	2045	2050
New York City	4,559,706	4,398,674	4,527,230	4,850,126	5,114,624	5,144,775	5,242,883	5,395,105	5,520,271	5,641,547	5,752,434	5,891,763
Long Island	1,201,512	1,223,160	1,227,148	1,284,927	1,323,689	1,306,341	1,331,479	1,370,581	1,402,702	1,423,027	1,443,995	1,465,988
Mid-Hudson	977,923	1,013,155	962,390	999,460	1,033,596	1,025,285	1,045,470	1,068,666	1,090,356	1,107,431	1,126,252	1,140,394
New Jersey	3,458,913	3,477,018	3,348,908	3,432,786	3,522,011	3,492,615	3,561,715	3,669,570	3,758,047	3,821,323	3,890,618	3,965,369
Connecticut	1,030,405	997,322	954,854	993,924	1,014,561	1,000,740	1,019,479	1,045,057	1,067,216	1,083,152	1,100,113	1,118,120
31-County Totals	**11,228,459**	**11,109,330**	**11,020,530**	**11,561,224**	**12,008,481**	**11,969,756**	**12,201,027**	**12,548,980**	**12,838,591**	**13,076,480**	**13,313,412**	**13,581,633**

Avg. Annual Growth Rate		2000-2005	2005-2010	2010-2015	2015-2017	2017-2020	2020-2025	2025-2030	2030-2035	2035-2040	2040-2045	2045-2050
New York City		-0.72%	+0.58%	+1.39%	+2.69%	+0.20%	+0.38%	+0.57%	+0.46%	+0.44%	+0.39%	+0.48%
Long Island		+0.36%	+0.07%	+0.92%	+1.50%	-0.44%	+0.38%	+0.58%	+0.46%	+0.29%	+0.29%	+0.30%
Mid-Hudson		+0.71%	-1.02%	+0.76%	+1.69%	-0.27%	+0.39%	+0.44%	+0.40%	+0.31%	+0.34%	+0.25%
New Jersey		+0.10%	-0.75%	+0.50%	+1.29%	-0.28%	+0.39%	+0.60%	+0.48%	+0.33%	+0.36%	+0.38%
Connecticut		-0.65%	-0.87%	+0.81%	+1.03%	-0.46%	+0.37%	+0.50%	+0.42%	+0.30%	+0.31%	+0.33%
31-County Totals		**-0.21%**	**-0.16%**	**+0.96%**	**+1.92%**	**-0.11%**	**+0.38%**	**+0.56%**	**+0.46%**	**+0.37%**	**+0.36%**	**+0.40%**

From 2020 to 2050, employment gains will slow to moderate growth levels, reflecting less robust economic drivers.[3] Employment in the region is expected to grow at a rate of 0.42 percent per year, slightly less than New York City's rate of 0.46 percent per year. Of the 777,000 jobs projected to be added in New York City from 2017 to 2050, the largest number will be added in Manhattan (234,000), followed by Brooklyn (208,000) and Queens (210,000), reflecting recent growth in these boroughs' employment hubs. Though growth in Manhattan is anticipated to slow, it will retain the largest share of total employment in the region. Among the suburban subregions, the New Jersey subregion will add the largest number of jobs during this period (443,000), followed by Long Island with a gain of 142,000 jobs, the Mid-Hudson (106,000), and the Connecticut subregion (103,000).

The distribution of employment throughout the region is forecasted to change little from 2020 to 2050, with the subregions outside New York City decreasing in share by fractions of a percent over the 35-year period. New York City will maintain the largest share of employment with 43.0 percent in 2020, increasing to 43.5 percent by 2050. *Table C-1-2* shows the distribution of

employment and the average annual growth rate for each forecast period. It shows that regional employment is forecast to grow at a rate of 0.42 percent each year, with New York City having a higher average rate at 0.46 percent, and the Mid-Hudson having a lower rate at 0.34 percent.

REGIONAL EMPLOYMENT BY INDUSTRY

Growth trends by industry in the 31-county forecast region are detailed for 2010 and 2050 in *Table C-1-3*. The region's strongest growth is projected in industries with high levels of national growth, primarily industries driven by consumer demand and protected from automation or outsourcing, as well as those industries where the region has a competitive edge over the nation as a whole and serve regional, national, or global demand. The region exhibits a competitive advantage in professional, scientific, and technical services; education services; and accommodations and food services. Growth in health care and social assistance, administrative support and waste management, and construction are largely driven by local demand although supported by national growth and stable labor productivity with little risk from outsourcing or automation.

Table C-1-3

Projected SED 2050 Forecast Payroll Employment Growth by Industry, 31-County Forecast Region

Source: Bureau of Labor Statistics' Current Employment Statistics (CES) and Quarterly Census of Employment and Wages (QCEW); American Community Survey (ACS); NYMTC 2055 SED Forecasts

NAICS Industry	Levels		Avg. Annual Change, 2010-2050		Industry % of Total Growth
	2010	2050	Levels	%	
11-Agriculture	16,532	21,964	136	0.8%	0.2%
21-Mining	2,552	4,593	51	2.0%	0.1%
22-Utilities	42,626	46,533	98	0.2%	0.2%
23-Construction	357,623	568,370	5,269	1.5%	8.5%
31-33-Manufacturing	528,017	391,624	-3,410	-0.6%	-5.5%
42-Wholesale Trade	443,004	461,915	473	0.1%	0.8%
44-45-Retail Trade	1,012,225	1,117,718	2,637	0.3%	4.3%
48-49-Transportation & Warehousing	310,032	359,938	1,248	0.4%	2.0%
51-Information	291,979	324,657	817	0.3%	1.3%
52-Finance & Insurance	609,989	654,460	1,112	0.2%	1.8%
53-Real Estate, Rental & Leasing	205,321	207,929	65	0.0%	0.1%
54-Professional, Scientific & Technical	731,476	1,050,855	7,984	1.1%	12.9%
55-Management Of Companies & Enterprises	175,487	257,012	2,038	1.2%	3.3%
56-Administrative, Support, Waste Management	549,060	943,410	9,859	1.8%	15.9%
61-Educational Services	379,589	609,464	5,747	1.5%	9.3%
62-Health Care & Social Assistance	1,422,426	1,941,153	12,968	0.9%	20.9%
71-Arts, Entertainment & Recreation	157,929	210,367	1,311	0.8%	2.1%
72-Accommodation & Food Services	649,414	1,018,962	9,239	1.4%	14.9%
81-Other Services	511,749	597,039	2,132	0.4%	3.4%
92-Government	1,587,442	1,676,253	2,220	0.1%	3.6%
Total-All Industries	**9,984,474**	**12,464,216**	**61,994**	**0.6%**	**100.0%**

Note: Sectors with projected growth greater than 10 percent are highlighted in darker blue; sectors with growth between 5 percent and 10 percent in lighter blue. Sectors with projected job loss are highlighted in pink.

The 2050 SED forecast projects sharper growth in the sectors of accommodation and food services; administrative support and waste management; government; management of companies and enterprises; professional, scientific and technical services; and retail trade.

Regionally, the manufacturing industry is expected to continue losing jobs on the scale of 3,400 per year throughout the forecast period.

1.5.2   POPULATION

OVERVIEW OF POPULATION TRENDS

The Forecast Update shows population growing at an annual average rate of 0.3 percent for the 31-county forecast region, reaching a total of 25.5 million by 2050. Reflecting growth constraints and an aging population in a mature region, the forecast rates of growth slow in later years of the projection.

REGIONAL POPULATION MODEL RESULTS

POPULATION MODEL OUTPUTS: 2050 SED FORECAST

As shown in , between 2017 and 2050, the 31-county forecast region is projected to increase from 22.86 million to 25.50 million residents. This growth considers recent past trends in natural increases and net migration coupled with a downward trajectory in the long-term rate of employment growth.

Table C-1-4

Total Population 2010–2050

Source: NYMTC 2055 SED Forecast

Year	New York City	Long Island	Mid-Hudson	New Jersey	Connecticut	Region
2010	8,242,624	2,832,882	2,290,851	6,946,420	1,969,233	22,282,010
2015	8,425,820	2,855,985	2,317,433	7,058,225	1,988,511	22,645,974
2017	8,562,760	2,860,664	2,329,583	7,122,398	1,993,909	22,869,314
2020	8,604,697	2,855,585	2,332,682	7,147,224	1,986,897	22,927,086
2025	8,883,946	2,879,080	2,364,487	7,265,611	2,002,475	23,395,599
2030	9,063,001	2,918,808	2,407,004	7,392,309	2,026,183	23,807,305
2035	9,171,311	3,034,344	2,478,645	7,642,310	2,079,395	24,406,004
2040	9,261,465	3,112,567	2,532,847	7,842,026	2,113,718	24,862,623
2045	9,349,430	3,146,580	2,564,513	8,002,046	2,130,631	25,193,199
2050	9,418,457	3,194,151	2,593,639	8,158,355	2,143,689	25,508,292

1.5.3   LABOR FORCE

Labor force refers to the residents of a location that are over the age of 16, civilian, and are attached to the labor force (employed or unemployed and actively searching for work). Like population, labor force is a place-of-residence factor, with the results driven by county-specific population and labor force participation rates applied by sex and age cohort at the county level. The labor force forecasts that follow are derived from the labor force submodel with the Forecast Update Population Model as of August 20, 2020.

CIVILIAN LABOR FORCE

Figure C-6 shows the makeup of the regional labor force in terms of working age category from 2010 to 2050. The labor force is aging throughout the region. The retiring and post-retirement age groups are increasing in share (from 15.3 percent to 16.6 percent and from 4.6 percent to 7.6 percent, respectively), while all other working age categories decline through 2050. The young, prime and mature labor force categories shift from an aggregate share of 68.3 percent in 2010 to 65.3 percent in 2050.

1.5.4   HOUSEHOLDS

The New York City Department of City Planning prepares the household forecasts for New York City separately. This section describes the results for both the New York City and non-New York City subregional household forecasts.

The 31-county region is forecasted to add 1.2 million households between 2017 and 2050. Of these, New York City will add the largest share at 37.1 percent, most of which are expected in Brooklyn. The New Jersey subregion will add 36.7 percent of the share in particular in Hudson, Ocean, Essex, and Bergen counties. The Long Island, Mid-Hudson, and Connecticut regions follow with 10.6 percent, 9.0 percent, and 6.4 percent, respectively. See *Table C-1-5*.

As expected, given lower fertility rates, average household size declines in every county in the 31-county region between 2017 and 2050. By 2050, the regional average household size will be 2.61. Long Island has the highest average at 2.89 persons per household followed by the Mid Hudson (2.64) and New Jersey (2.64), New York City (2.53), and Connecticut (2.47). See *Table C-1-6*.

Figure C-1-6

Regional Labor Force by Working Age Category from 2010–2050: SED Forecast Update

Source: NYMTC 2055 SED Forecast

Forecast Region	2010	2015	2020	2025	2030	2035	2040	2045	2050
■ Post Retirement Workers (65+)	4.6%	5.5%	6.5%	7.5%	8.0%	8.2%	8.1%	7.8%	7.6%
■ Retiring Labor Force (55-64)	15.3%	16.3%	17.3%	17.4%	16.1%	15.0%	15.0%	15.7%	16.6%
■ Mature Labor Force (45-54)	23.9%	22.9%	21.0%	19.5%	19.6%	20.6%	21.6%	21.8%	21.1%
■ Prime Labor Force (35-44)	22.4%	21.3%	20.9%	21.8%	23.1%	23.5%	22.7%	22.1%	21.9%
■ Young Labor Force (25-34)	22.0%	22.5%	23.3%	23.5%	22.9%	22.5%	22.4%	22.2%	22.3%
■ Recent Graduates (20-24)	8.8%	8.6%	8.3%	7.8%	7.9%	7.8%	7.8%	7.9%	8.0%
■ Teen Workers (16-19)	3.0%	2.9%	2.7%	2.5%	2.4%	2.4%	2.5%	2.5%	2.5%

Table C-1-5

31-County Forecast Region Households 2010–2050

Source: NYMTC 2055 SED Forecast

Year	New York City	Long Island	Mid-Hudson	New Jersey	Connecticut	Region
2010	3,135,092	948,450	816,593	2,531,911	746,687	**8,178,733**
2015	3,201,675	954,652	836,055	2,577,382	764,292	**8,334,057**
2017	3,258,852	957,332	840,585	2,604,038	767,518	**8,428,326**
2020	3,273,074	968,788	852,376	2,636,167	776,283	**8,506,688**
2025	3,414,993	989,590	872,869	2,704,875	794,136	**8,776,463**
2030	3,492,393	1,007,832	891,382	2,766,332	809,071	**8,967,010**
2035	3,541,486	1,039,087	914,788	2,857,308	827,927	**9,180,596**
2040	3,577,295	1,059,691	929,229	2,921,917	836,272	**9,324,405**
2045	3,613,105	1,068,506	936,777	2,970,460	838,937	**9,427,784**
2050	3,648,913	1,083,563	944,709	3,020,141	842,320	**9,539,646**

Table C-1-6

Average Household Size 2010–2050

Source: NYMTC 2055 SED Forecast

Year	New York City	Long Island	Mid-Hudson	New Jersey	Connecticut	Region
2010	2.57	2.93	2.70	2.69	2.57	**2.66**
2015	2.57	2.94	2.67	2.68	2.54	**2.66**
2017	2.57	2.93	2.67	2.68	2.53	**2.66**
2020	2.57	2.89	2.63	2.66	2.49	**2.63**
2025	2.55	2.86	2.61	2.63	2.46	**2.61**
2030	2.54	2.84	2.60	2.62	2.44	**2.60**
2035	2.54	2.86	2.61	2.62	2.45	**2.60**
2040	2.54	2.88	2.62	2.63	2.46	**2.61**
2045	2.54	2.89	2.63	2.64	2.47	**2.61**
2050	2.53	2.89	2.64	2.64	2.47	**2.61**

1.6 NYMTC PLANNING AREA FORECASTS

The NYMTC planning area is a subset of the larger 31-county forecast region that includes all five counties in New York City, two counties in Long Island, and Putnam, Rockland, and Westchester counties of the Mid-Hudson Region. In this section, analysis of trends in the NYMTC planning area will be presented. To distinguish the subset of the Mid-Hudson Region that falls within the NYMTC planning area, the subset will be referred to as the Lower Hudson Valley.

1.6.1 NYMTC PLANNING AREA EMPLOYMENT

Employment in the NYMTC planning area is expected to grow through the forecast period. In New York City, the Forecast Update projects stronger growth over each five-year forecast period as a result of the significant growth seen since 2010. Growth rates in the Forecast Update are strongest in the 2025–2030 and 2030–2035 recovery years and moderate somewhat in later years. Of the 777,000 jobs projected to be added in New York City from 2017 to 2050, the largest number will be in Manhattan (234,000), followed by Queens (210,000) and Brooklyn (208,000) reflecting recent growth in these boroughs' employment hubs. Though its growth is anticipated to slow, Manhattan will retain the largest share of total employment in the region.

In the long term, both Nassau and Suffolk counties in Long Island are anticipated to experience steadily rising job growth, adding 142,000 jobs from 2017 to 2050. Several factors will contribute to an expansion of employment growth in Nassau County, including increased local multi-family housing development and the completion of major transportation investments such as East Side Access and the Metropolitan Transportation Authority (MTA) Long Island Rail Road (LIRR) Expansion Project (which includes a third track between Floral Park and Hicksville), which are both expected to result in reverse commute benefits as well as commuting ease from Long Island to New York City.

As shown in *Table C-1-7*, the Forecast Update projects increasing employment in all counties of the Lower Hudson Valley subregion with gains of 68,000 jobs from 2017 to 2050. Over that period, Westchester County will add nearly 43,000 jobs, and Rockland County will add another 22,000 jobs. New office development activity anticipated to drive employment growth in future years is expected to be concentrated in downtown New Rochelle, White Plains, and other urban centers in Westchester County.

Table C-1-7

Total Employment 2010–2050

Source: NYMTC 2055 SED Forecast

	2010	2015	2017	2020	2025
NYMTC Planning Area Forecast	**6,344,290**	**6,753,731**	**7,083,375**	**7,090,003**	**7,225,874**
Bronx	380,497	401,055	413,186	417,798	431,985
Kings	822,989	902,713	940,561	942,296	973,658
New York	2,488,607	2,654,265	2,832,457	2,860,002	2,890,278
Queens	708,868	753,622	787,733	784,163	803,143
Richmond	126,268	138,472	140,688	140,516	143,819
New York City Total	**4,527,230**	**4,850,126**	**5,114,624**	**5,144,775**	**5,242,883**
Nassau	590,583	613,419	631,261	625,398	639,641
Suffolk	636,565	671,508	692,427	680,943	691,838
Long Island Total	**1,227,148**	**1,284,927**	**1,323,689**	**1,306,341**	**1,331,479**
Putnam	28,439	29,425	29,905	29,199	29,752
Rockland	116,538	122,345	129,310	130,745	134,817
Westchester	444,936	466,908	485,847	478,943	486,943
Lower Hudson Valley Total	**589,913**	**618,678**	**645,062**	**638,887**	**651,512**

Table C-1-7

Total Employment 2010–2050, Cont'd

Source: NYMTC 2055 SED Forecast

	2030	2035	2040	2045	2050
NYMTC Planning Area Forecast	**7,431,356**	**7,602,032**	**7,755,496**	**7,900,890**	**8,071,215**
Bronx	447,381	462,173	474,822	487,684	508,232
Kings	1,013,634	1,049,302	1,084,437	1,116,162	1,149,201
New York	2,942,140	2,983,210	3,010,676	3,038,684	3,066,962
Queens	841,130	869,613	911,686	945,622	998,497
Richmond	150,820	155,973	159,926	164,282	168,871
New York City Total	**5,395,105**	**5,520,271**	**5,641,547**	**5,752,434**	**5,891,763**
Nassau	664,509	684,065	697,286	710,328	723,942
Suffolk	706,072	718,637	725,741	733,667	742,046
Long Island Total	**1,370,581**	**1,402,702**	**1,423,027**	**1,443,995**	**1,465,988**
Putnam	30,534	31,202	31,442	31,728	32,020
Rockland	138,803	142,832	145,832	148,717	151,766
Westchester	496,332	505,026	513,648	524,016	529,678
Lower Hudson Valley Total	**665,669**	**679,060**	**690,922**	**704,461**	**713,464**

1.6.2   NYMTC PLANNING AREA POPULATION

The population of the New York City subregion is projected to reach 9.41 million by 2050, an increase of 855,000 people between 2017 and 2050. *Table C-1-8* includes New York City's population by county, which shows large increases from 2010 to 2025 as a result of significant increases in the number of housing units in the prior decade and expected in the early part of this decade. After this period, the population of all boroughs in New York City are still forecasted to grow but at a decreasing rate.

The Long Island subregional forecast shows a gain of 333,000 residents between 2017 and the 2050 forecast year. Long Island's population forecast by county shows flat growth in both counties through 2025, before increasing after 2030, in part supported by infrastructure investment on the MTA LIRR, including the LIRR Expansion Project, and East Side Access. Population growth throughout Long Island is slower in the 2017 to 2030 period because of an aging population and a slowed economy.

The Lower Hudson Valley subregional population will grow by 122,000 between 2017 and the 2050 forecast year, largely as a result of anticipated labor-induced migration.

Table C-1-8
Total Population 2010–2050
Source: NYMTC 2055 SED Forecast

	2010	2015	2017	2020	2025
NYMTC Planning Area Forecast	12,436,016	12,669,296	12,823,236	12,849,362	13,163,495
Bronx	1,385,108	1,423,160	1,443,220	1,454,816	1,515,667
Kings	2,552,911	2,593,655	2,650,441	2,647,112	2,760,391
New York	1,585,873	1,636,537	1,663,244	1,668,548	1,698,050
Queens	2,250,002	2,294,943	2,323,062	2,349,324	2,418,636
Richmond	468,730	477,525	482,793	484,897	491,202
New York City Total	8,242,624	8,425,820	8,562,760	8,604,697	8,883,946
Nassau	1,339,532	1,354,612	1,363,069	1,354,852	1,363,996
Suffolk	1,493,350	1,501,373	1,497,595	1,500,734	1,515,084
Long Island Total	2,832,882	2,855,985	2,860,664	2,855,585	2,879,080
Putnam	99,710	99,488	99,464	98,919	99,187
Rockland	311,687	320,688	325,027	321,338	332,006
Westchester	949,113	967,315	975,321	968,823	969,277
Lower Hudson Valley Total	1,360,510	1,387,491	1,399,812	1,389,080	1,400,469
	2030	**2035**	**2040**	**2045**	**2050**
NYMTC Planning Area Forecast	13,401,882	13,665,588	13,865,243	14,003,785	14,134,562
Bronx	1,548,245	1,573,786	1,595,881	1,616,845	1,633,550
Kings	2,820,822	2,860,506	2,894,388	2,928,160	2,956,932
New York	1,735,482	1,754,534	1,768,412	1,781,885	1,791,292
Queens	2,463,405	2,483,716	2,500,457	2,517,076	2,528,763
Richmond	495,047	498,769	502,327	505,464	507,920
New York City Total	9,063,001	9,171,311	9,261,465	9,349,430	9,418,457
Nassau	1,383,374	1,440,708	1,479,799	1,493,007	1,520,308
Suffolk	1,535,434	1,593,636	1,632,768	1,653,573	1,673,844
Long Island Total	2,918,808	3,034,344	3,112,567	3,146,580	3,194,151
Putnam	101,005	104,221	106,526	107,614	108,090
Rockland	343,484	360,101	376,095	390,377	405,819
Westchester	975,585	995,611	1,008,590	1,009,785	1,008,044
Lower Hudson Valley Total	1,420,073	1,459,933	1,491,210	1,507,775	1,521,953

1.6.3 NYMTC PLANNING AREA TOTAL LABOR FORCE AND EMPLOYED LABOR FORCE

In the planning area, the Forecast Update shows a slight dip in the labor force in 2020, followed by an increase in 2025. Throughout the NYMTC planning area, the labor force is aging, which limits the ability of the labor supply (workers) to meet demand (jobs) as labor force participation rates decrease as the population ages.

As shown in *Table C-1-9*, New York City will add about 488,491 participants from 2017 to 2050. Long Island will add close to 180,000 participants,

followed by the Lower Hudson Valley, which will add approximately 74,000 participants during the forecast period. In total, the NYMTC planning area is expected to have more than 7.2 million labor force participants.

The employed labor force refers to residents of a geographic location who are employed regardless of employment location. For the NYMTC planning area in 2050, the employed labor force is projected to total 6.8 million people, an increase of over 853,000 participants from 2017 to 2050 (*Table C-1-10*). The employed labor force will continue to grow during the 2020–2050 forecast term.

Table C-1-9

Labor Force 2010–2050

Source: NYMTC 2055 SED Forecast

	2010	2015	2017	2020	2025
NYMTC Planning Area Forecast	**6,355,638**	**6,551,178**	**6,506,474**	**6,432,046**	**6,721,939**
Bronx	617,531	664,751	664,284	662,777	718,970
Kings	1,236,176	1,281,742	1,269,138	1,247,724	1,339,322
New York	921,966	961,362	949,425	929,097	985,368
Queens	1,185,673	1,205,994	1,198,856	1,185,994	1,254,207
Richmond	217,944	226,088	224,525	221,910	227,394
New York City Total	**4,179,290**	**4,339,937**	**4,306,228**	**4,247,502**	**4,525,261**
Nassau	688,439	709,511	704,762	697,444	702,747
Suffolk	784,674	785,860	783,049	778,294	778,939
Long Island Total	**1,473,113**	**1,495,371**	**1,487,811**	**1,475,738**	**1,481,686**
Putnam	54,348	53,667	53,310	52,980	52,434
Rockland	150,999	159,108	157,934	156,027	160,902
Westchester	497,887	503,094	501,191	499,800	501,656
Lower Hudson Valley Total	**703,234**	**715,869**	**712,435**	**708,807**	**714,993**

Table C-1-9
Labor Force 2010–2050, Cont'd
Source: NYMTC 2055 SED Forecast

	2030	2035	2040	2045	2050
NYMTC Planning Area Forecast	**6,782,343**	**6,925,964**	**7,054,471**	**7,146,944**	**7,221,599**
Bronx	730,985	743,520	757,398	769,790	777,721
Kings	1,360,341	1,383,128	1,403,816	1,415,189	1,418,039
New York	999,514	1,012,384	1,027,168	1,039,221	1,041,058
Queens	1,266,892	1,274,800	1,284,862	1,292,907	1,296,473
Richmond	226,278	227,167	229,767	232,850	234,843
New York City Total	**4,584,011**	**4,640,999**	**4,703,011**	**4,749,957**	**4,768,134**
Nassau	706,793	751,139	778,830	791,362	812,586
Suffolk	770,720	794,941	815,840	834,344	854,418
Long Island Total	**1,477,514**	**1,546,080**	**1,594,670**	**1,625,706**	**1,667,004**
Putnam	52,029	52,791	54,095	55,205	56,259
Rockland	166,260	175,566	184,627	193,322	202,345
Westchester	502,529	510,528	518,066	522,754	527,857
Lower Hudson Valley Total	**720,818**	**738,885**	**756,789**	**771,281**	**786,461**
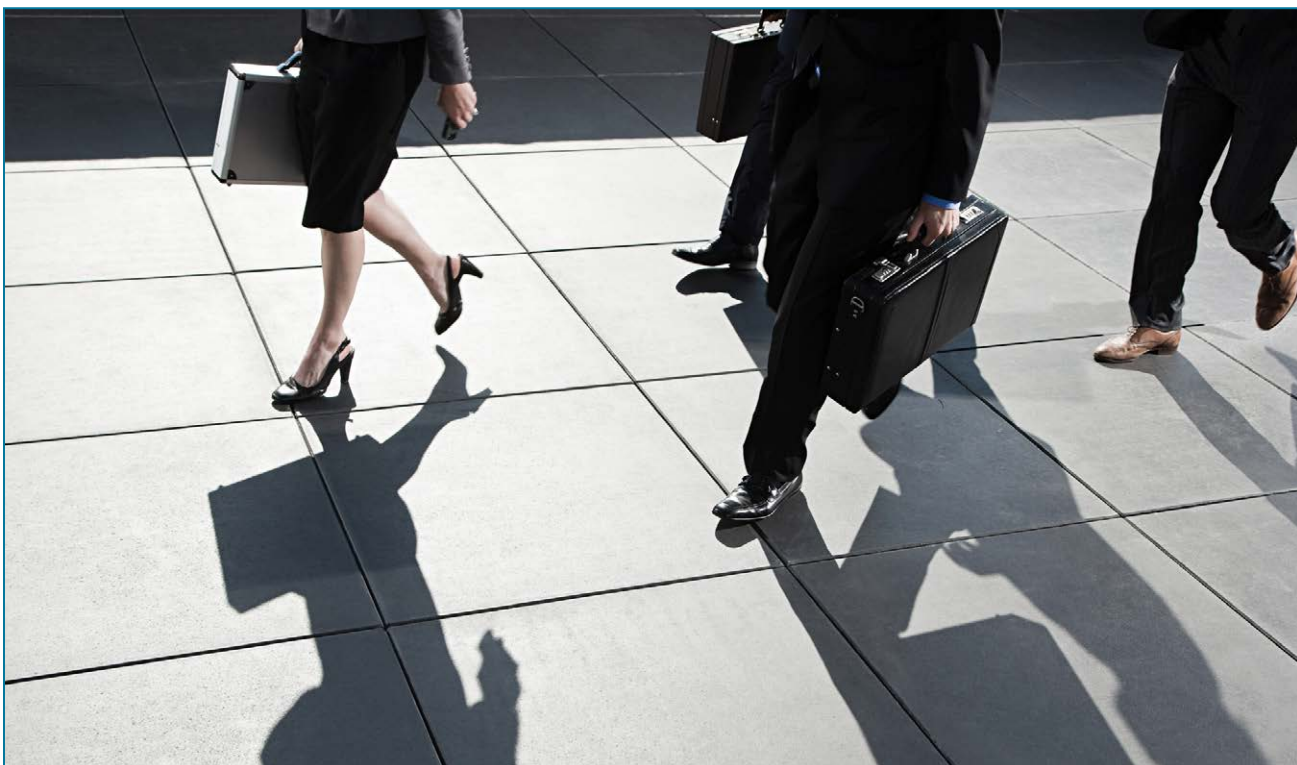
Table C-1-10

Employed Labor Force 2010–2050

Source: NYMTC 2055 SED Forecast

	2010	2015	2017	2020	2025
NYMTC Planning Area Forecast	**5,706,447**	**5,880,155**	**5,958,569**	**6,069,270**	**6,339,864**
Bronx	520,228	560,007	572,450	590,394	640,450
Kings	1,101,924	1,142,541	1,153,492	1,167,569	1,253,282
New York	837,475	873,261	876,614	879,351	932,609
Queens	1,054,073	1,072,139	1,093,929	1,124,569	1,189,250
Richmond	198,188	205,594	208,391	212,328	217,575
New York City Total	**3,711,889**	**3,853,542**	**3,904,875**	**3,974,212**	**4,233,167**
Nassau	631,146	650,464	659,965	674,027	679,151
Suffolk	719,152	720,239	731,369	747,548	748,168
Long Island Total	**1,350,298**	**1,370,704**	**1,391,334**	**1,421,575**	**1,427,319**
Putnam	49,413	48,794	49,308	50,272	49,754
Rockland	139,826	147,335	147,983	148,816	153,467
Westchester	455,021	459,779	465,070	474,395	476,157
Lower Hudson Valley Total	**644,261**	**655,909**	**662,361**	**673,484**	**679,378**

	2030	2035	2040	2045	2050
NYMTC Planning Area Forecast	**6,396,156**	**6,532,486**	**6,654,100**	**6,741,445**	**6,812,446**
Bronx	651,153	662,319	674,682	685,720	692,785
Kings	1,272,952	1,294,274	1,313,633	1,324,276	1,326,943
New York	945,998	958,178	972,171	983,578	985,317
Queens	1,201,278	1,208,776	1,218,317	1,225,946	1,229,327
Richmond	216,507	217,358	219,846	222,795	224,702
New York City Total	**4,287,888**	**4,340,906**	**4,398,649**	**4,442,316**	**4,459,074**
Nassau	683,062	725,919	752,680	764,791	785,303
Suffolk	740,274	763,538	783,611	801,384	820,665
Long Island Total	**1,423,336**	**1,489,457**	**1,536,292**	**1,566,175**	**1,605,968**
Putnam	49,370	50,093	51,331	52,384	53,383
Rockland	158,577	167,453	176,095	184,388	192,994
Westchester	476,985	484,578	491,733	496,182	501,026
Lower Hudson Valley Total	**684,932**	**702,123**	**719,159**	**732,954**	**747,403**
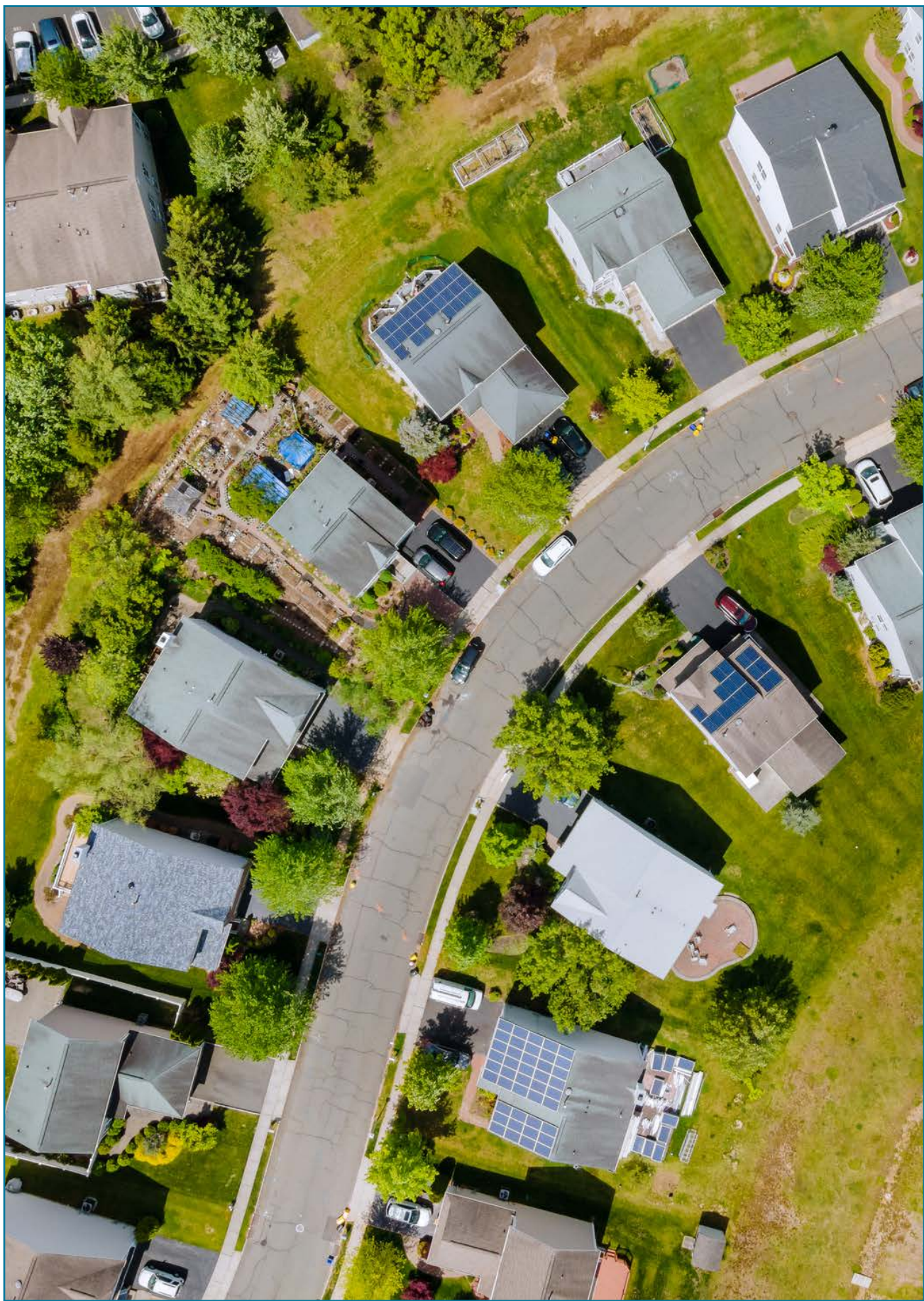
1.6.4 NYMTC PLANNING AREA HOUSEHOLDS AND AVERAGE HOUSEHOLD SIZE

Table C-1-11 presents the household forecasts based on the Forecast Update's population projections for each subregion. The NYMTC planning area is projected to add more than 563,000 households from 2017 to 2050.

Households are expected to increase at a slightly higher rate in suburban subregions compared with New York City over the same period from. Most of the growth will occur in New York City, especially in Kings County. Long Island is expected to add 126,000 households, of which about 72,000 will be in Suffolk County. The Lower Hudson Valley will add slightly fewer than 48,000 households by 2050.

Table C-1-11

Households 2010–2050

Source: NYMTC 2055 SED Forecast

	2010	2015	2017	2020	2025
NYMTC Planning Area Forecast	**4,565,057**	**4,651,693**	**4,711,291**	**4,741,162**	**4,911,662**
Bronx	483,449	494,756	501,845	506,154	530,243
Kings	934,946	958,492	981,525	979,385	1,031,237
New York	763,846	778,952	793,410	795,367	826,742
Queens	787,335	801,735	812,485	821,820	853,420
Richmond	165,516	167,740	169,587	170,348	173,351
New York City Total	**3,135,092**	**3,201,675**	**3,258,852**	**3,273,074**	**3,414,993**
Nassau	448,528	451,250	449,798	453,801	460,933
Suffolk	499,922	503,402	507,534	514,986	528,657
Long Island Total	**948,450**	**954,652**	**957,332**	**968,788**	**989,590**
Putnam	35,041	35,598	35,847	36,302	37,039
Rockland	99,242	102,754	103,210	103,733	106,952
Westchester	347,232	357,013	356,049	359,265	363,088
Lower Hudson Valley Total	**481,515**	**495,365**	**495,106**	**499,300**	**507,079**

	2030	2035	2040	2045	2050
NYMTC Planning Area Forecast	**5,014,966**	**5,107,302**	**5,171,530**	**5,219,965**	**5,275,184**
Bronx	542,132	551,486	558,897	566,308	573,719
Kings	1,056,704	1,074,406	1,089,095	1,103,783	1,118,472
New York	845,984	855,913	861,581	867,248	872,916
Queens	872,590	883,105	889,983	896,860	903,738
Richmond	174,983	176,576	177,741	178,905	180,070
New York City Total	**3,492,393**	**3,541,486**	**3,577,295**	**3,613,105**	**3,648,913**
Nassau	468,197	481,493	490,765	494,027	503,443
Suffolk	539,635	557,594	568,926	574,479	580,120
Long Island Total	**1,007,832**	**1,039,087**	**1,059,691**	**1,068,506**	**1,083,563**
Putnam	37,885	38,723	39,070	39,208	39,182
Rockland	109,964	114,739	119,281	123,073	127,591
Westchester	366,892	373,267	376,192	376,073	375,935
Lower Hudson Valley Total	**514,741**	**526,729**	**534,544**	**538,355**	**542,708**

Table C-1-12 presents trends in average household size, showing a marginal decline in the NYMTC planning area from 2.77 persons per household in 2017, to 2.74 persons per household in 2050. Along with New York City, Westchester County in the Lower Hudson Valley will also see declining average household sizes through 2050. Long Island's average household size will decrease from 2.93 to 2.89 people from 2017 to 2050, but it will remain the highest of the subregions. Dutchess, Orange, and Putnam counties will see some decline from 2020 to 2030, but then an increase from 2040 to 2050, which reflects household turnover of older 1- and 2-person households in single-family homes to younger families. Average household sizes in Rockland County will expand during both periods.

Table C-1-12

Average Household Size 2010–2050

Source: NYMTC 2055 SED Forecast

	2010	2015	2017	2020	2025
NYMTC Planning Area Forecast	**2.78**	**2.77**	**2.77**	**2.74**	**2.71**
Bronx	2.77	2.78	2.78	2.78	2.77
Kings	2.69	2.67	2.66	2.67	2.64
New York	1.99	2.01	2.01	2.01	1.97
Queens	2.82	2.83	2.82	2.82	2.80
Richmond	2.78	2.80	2.80	2.80	2.79
New York City Total	**2.57**	**2.57**	**2.57**	**2.57**	**2.55**
Nassau	2.94	2.96	2.98	2.94	2.91
Suffolk	2.93	2.92	2.89	2.85	2.81
Long Island Total	**2.93**	**2.94**	**2.93**	**2.89**	**2.86**
Putnam	2.77	2.72	2.70	2.65	2.61
Rockland	3.07	3.05	3.08	3.02	3.03
Westchester	2.65	2.63	2.66	2.61	2.59
Lower Hudson Valley Total	**2.83**	**2.80**	**2.81**	**2.76**	**2.74**

	2030	2035	2040	2045	2050
NYMTC Planning Area Forecast	**2.71**	**2.72**	**2.73**	**2.74**	**2.74**
Bronx	2.77	2.77	2.77	2.77	2.77
Kings	2.64	2.63	2.62	2.62	2.61
New York	1.97	1.97	1.97	1.98	1.97
Queens	2.79	2.78	2.78	2.78	2.77
Richmond	2.78	2.78	2.78	2.78	2.78
New York City Total	**2.54**	**2.54**	**2.54**	**2.54**	**2.53**
Nassau	2.91	2.94	2.97	2.97	2.97
Suffolk	2.79	2.80	2.81	2.81	2.82
Long Island Total	**2.84**	**2.86**	**2.88**	**2.89**	**2.89**
Putnam	2.59	2.62	2.65	2.67	2.68
Rockland	3.04	3.06	3.07	3.09	3.10
Westchester	2.58	2.59	2.60	2.60	2.60
Lower Hudson Valley Total	**2.74**	**2.75**	**2.77**	**2.79**	**2.79**

2
NEW YORK BEST PRACTICE MODEL

NYMTC uses the New York Best Practice Model (NYBPM), an activity-based and tour-based travel demand model, to predict and simulate detailed travel patterns for every household in the 28-county study area, over a 24-hour weekday period, based on their travel behavior. Activity-based modeling is an approach that recognizes that people need or want to travel to perform activities that are part of daily life at different locations. The choices (such as whether to go out, when to go, where to go, how to travel, whether to travel with other family members, and how to combine trips) associated with the travel needed to complete the activities are simulated, and the results are summed to get the results needed for planning analyses.

The NYBPM simulates the daily activities (i.e., work, school, or leisure travel) of all individuals residing in a household using intra-household interactions that are constrained by choice of travel with regard to mode, cost, time, and space to predict the travel characteristics of that household. The model uses tours (travel between two primary locations including stops) as a unit of travel rather than just home-to-work trips. Geographic information system (GIS) software is used to map the existing and proposed transportation networks that are used by models to predict tour generation, destination and mode choice, time of day travel, and trip assignment/route choice to simulate travel patterns.

2.1   MODEL COMPONENTS

The NYBPM contains network files that represent the roadway and transit system in the area covered by the model. The roadway network file includes all freeways and major arterials, most minor arterials, and some local and collector roadways. The transit network representation integrates the many diverse transit services in New York City, Long Island, northern New Jersey, and five upstate New York counties into a single TransCAD (version 8.0) route system.

The activity-based model components of the NYBPM are CEMSELTS (Comprehensive Econometric Microsimulator of Socioeconomics, Land Use, and Transportation Systems) and CEMDAP (Comprehensive Econometric Microsimulator for Daily Activity-travel Patterns), which each consist of several components (submodels). The overall activity-based model system is defined by the integration of three key components:

- PopGen (Population Generator) generates the population and related socioeconomic attributes (i.e., age, sex) for the entire region by expanding the data from a known sample population, such as U.S. Census Bureau data.
- CEMSELTS is the component used to produce additional socioeconomic and demographic attributes for each person in the synthetic population to develop a rich set of input data for the activity-based microsimulation model system.
- CEMDAP is a microsimulation implementation of a continuous-time activity-travel modeling system.

Several auxiliary models are used in the NYBPM's transportation simulation, as outlined below:

- The Visitor Submodel is a visitor model that estimates the average weekday travel by people within the model region but who do not live in the region.
- Truck and Commercial Van Submodels estimate long distance and short distance truck trips and commercial vans trip tables outside the main model to create forecasts for future years.
- The External Auto Submodel accounts for trips leaving the study area, trips from the neighboring region coming into the study area, and through-trips passing through the study area, by using external trip tables based on data collected at the cordon lines and other resources.

2.2 THE NYBPM TRAVEL MODEL PROCESS

2.2.1 GENERATION OF A SYNTHETIC POPULATION FOR THE REGION

PopGen takes basic sociodemographic attributes that are available for a sample of the population and uses algorithms to predict these attributes for every person and household in the 28-county model area. This output is known as the synthetic population and is used as input into CEMSELTS, which is the next step in the NYBPM travel demand model process.

2.2.2 PREDICTION OF ADDITIONAL SOCIOECONOMIC CHARACTERISTICS

CEMSELTS is customized for the 28-county region to comprise approximately 20 submodels that take the synthetic population from PopGen as input to predict additional demographic characteristics, such as employment status, income, and car ownership for each person in the model region.

2.2.3 PREDICTION OF PERSON LEVEL DAILY ACTIVITY-TRAVEL PATTERNS

In the NYBPM, CEMDAP takes, as inputs, the person-level sociodemographic information from CEMSELTS, land use patterns (i.e., population density), transportation system level-of-service characteristics (i.e., travel time and cost), and model parameters and provides the detailed individual level daily activity-travel patterns as outputs. The final output of CEMDAP are individual trip rosters, which are combined into trip tables for use in aggregate highway and transit assignment processes.

ACRONYMS AND ABBREVIATIONS

CEMDAP	Comprehensive Econometric Microsimulator for Daily Activity-travel Patterns
CEMSELTS	Comprehensive Econometric Microsimulator of Socioeconomics, Land Use and Transportation Systems
COVID-19	Novel Coronavirus
FWG	Forecasting Working Group
GIS	Geographic Information Systems
LIMA	Labor Induced Migration Adjustment
LIRR	Long Island Railroad
MTA	Metropolitan Transportation Authority
NYBPM	New York Best Practice Model
NYMTC	New York Metropolitan Transportation Council
SED	Socioeconomic and Demographic
TAZ	Transportation Analysis Zone

ENDNOTES

1   Please note that payroll employment drawn from the Quarterly Census of Employment and Wages includes all jobs, both full- and part-time.

2   These forecasts do not attempt to predict the timing of business cycles but are driven by the long-term historical drivers as described in Technical Memorandum 1, inclusive of cycles, which moderate expansion.

3   NYMTC, Technical Memorandum 2: Baseline Model Update. July 2019, pp.9-12.