# RETHINKING MOBILITY IN A POST-COVID CHICAGO REGION

**Tasks 4 and 5 *Modeling Summary: Scenarios and Travel Demand***

**Prepared by AECOM for the Chicago Metropolitan Agency for Planning**

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# 1.0 INTRODUCTION

This technical memorandum documents the processes and assumptions that defined the post-pandemic scenarios and travel demand modeling analysis undertaken as part of the *Rethinking Mobility* project.

## 1.1 Purpose of Travel Demand Modeling

CMAP uses a complex Travel Demand Model (TDM) to predict transportation system use under a variety of socioeconomic conditions and public policy scenarios. The CMAP region, for analysis purposes, includes the counties of Cook, DuPage, Kane, Lake, McHenry, Will, Kendall, in Illinois and other parts of Illinois, Indiana and Wisconsin counties buffering the region. The CMAP travel demand models represent a classical "four-step" process of trip generation, distribution, mode choice, and assignment, with considerable modifications used to enhance the distribution and mode choice procedures. This model is supported by other sub-models that calculate specific types of assumptions or parameters, including trip generation and mode share. When transportation programming opportunities or choices are considered for analysis of impacts, key inputs to the model include changes to land use and economic parameters. For the Rethinking Mobility project, the project team prepared a range of scenarios for evaluation using the Travel Demand Model to demonstrate the various impacts that a range of pandemic-influenced behaviors might have by regional residents and employees, in terms of where they might choose to live, work and how they might move around in the post-COVID region.

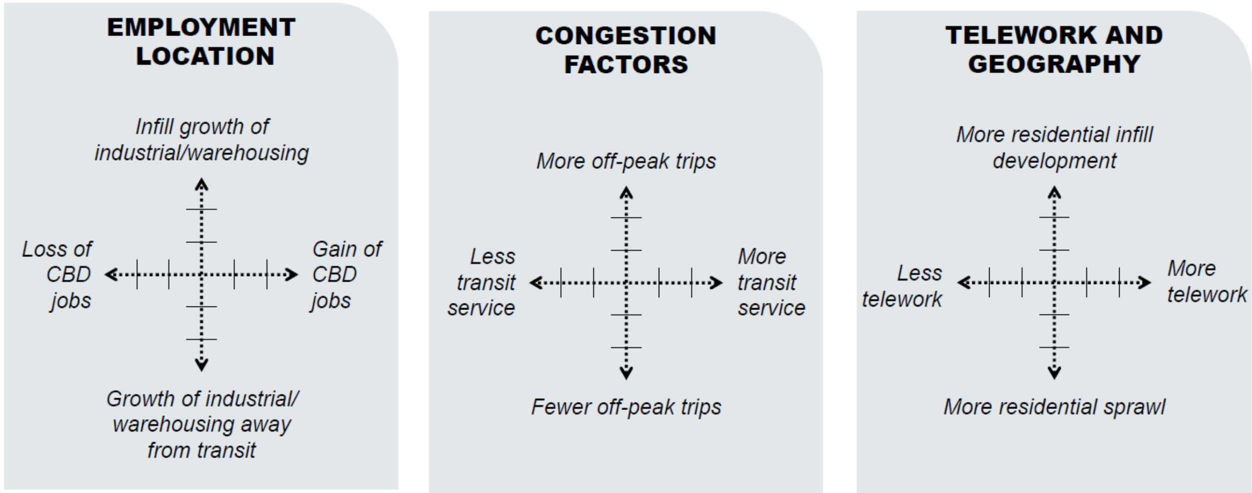
## 1.2 Scenario Modeling

***Background & Process***

Building on research completed in prior tasks, four post-pandemic scenarios were developed by the project team. These draft scenarios were shared with the Transportation Equity Network (TEN) group on November 2, 2021, and with participants of the Stakeholder Meeting on November 16, 2021, to validate that they were representative of how the pandemic has impacted and is expected to continue to impact communities across the Chicago metro area.

CMAP settled on six key parameters to use as levers to model varying impacts in the travel demand model, which are illustrated below in three sets of axes: employment location, congestion factors, and telework and geography.

**Figure 1 Scenario Definition and Modeling Parameters**




**Employment location** considers the change in the number of jobs in Chicago's central business district (CBD) and whether the expected growth of industrial/warehousing jobs occurs in either infill locations or in more remote sites, away from existing transit services.

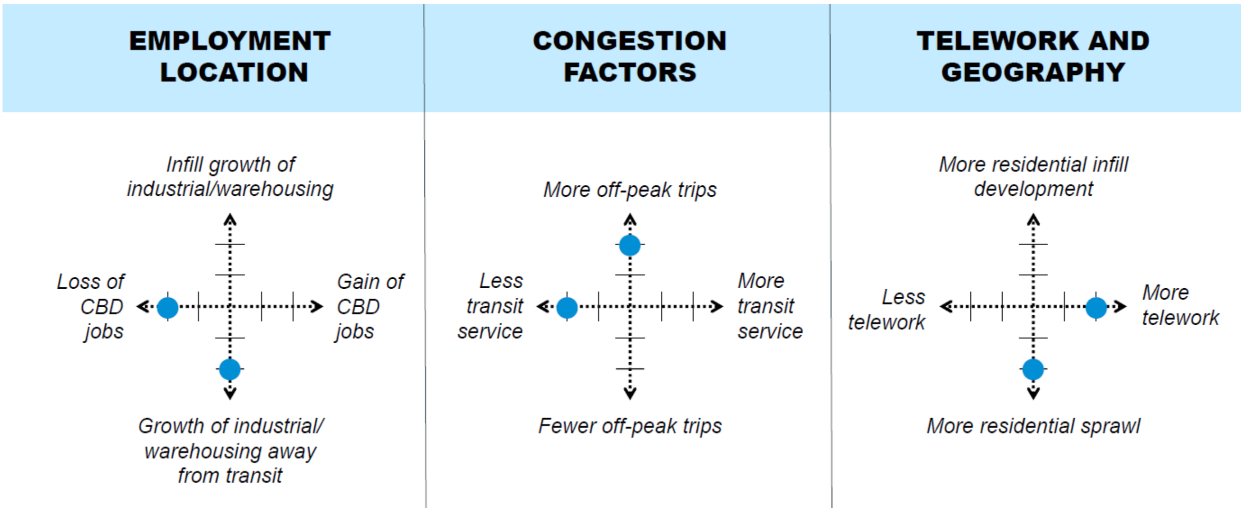
**Congestion factors** models the amount of transit service available in 2030 as a key factor influencing roadway congestion, as well as the distribution of trips across the day—i.e., whether the system will return to the pre-pandemic norm of a concentrated weekday peak travel period, rather than continue with a larger share of off-peak trips.

**Telework and Geography** reflects two related trends about where people live and why, namely the potential for increased residential sprawl as a larger share of the workforce works from home and no longer values a short commute to the workplace. Further details about the range of values for each parameter are provided in a later section of this report.

# 1.3 Scenario Definitions and Narratives

***New Normal***

**Figure 2 New Normal Scenario Parameters**




Northeastern Illinois emerges from the COVID-19 pandemic with a fundamentally altered system of transportation and an acceleration of land use patterns that promote sprawl. In this scenario, many of the challenging trends that were accelerated by the pandemic remain and the region must contend with severe congestion, a crippled transit network due to lack of funding, and growth in employment and residences away from the existing transit network.

Many of the region's employees embrace additional telework options, especially those in professional services and other related occupations. Their employers downsize to smaller, more flexible office space in less expensive locations, while some employees move their home location outward in search of more space for home offices. As a result, the residences and jobs continue to disperse further from the urban core. In turn, longer commutes two or three days a week with more travel in the shoulder hours of the peak period make transit less attractive and driving more attractive. With fewer trips to and from work and more trips taken during the day from home, the share of off-peak trips increases.

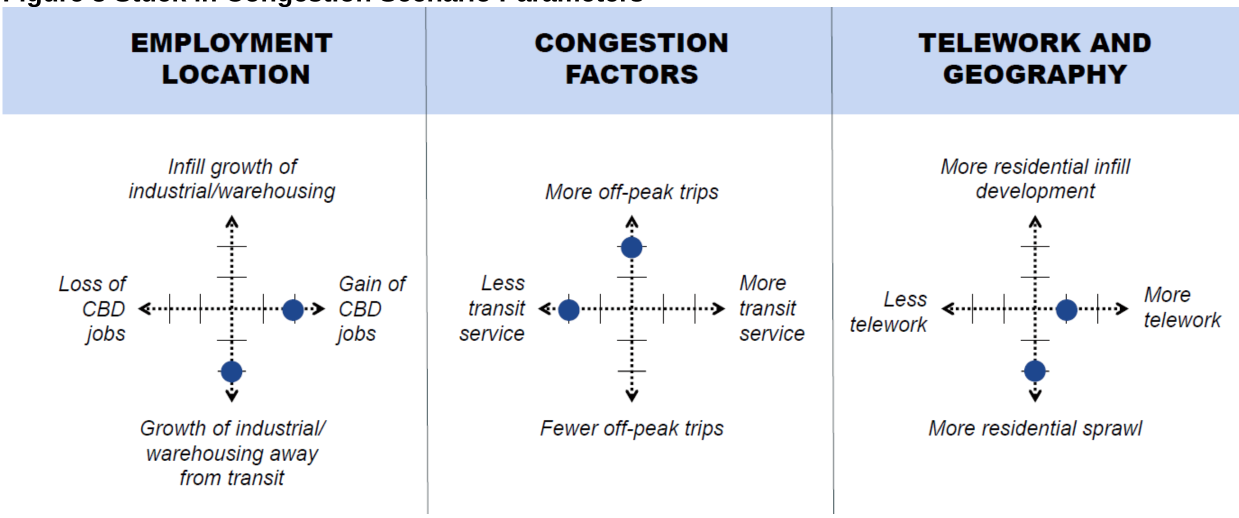
Even after public health restrictions are lifted, land use shifts continue to depress transit ridership and farebox revenues. Farebox revenues remain below 2019 levels for at least the next decade, leading to significant budget shortfalls across the region's transit service boards. Without supplemental funding from state or local governments, the service boards drastically reduce service, ultimately leading to a vicious circle of service cuts and declining ridership.

Widespread use of delivery services, made habitual during the pandemic, continues to grow. Non-work trips to shops and restaurants decrease and urban freight trips increase to accommodate the growth of ecommerce.

However, while many of the region's workers embrace remote work, the rest of the region's employees must continue to commute to and from a physical place of work each day. These essential workers, and others who cannot work remotely, must now navigate a region with fewer transportation options than existed before COVID-19. The shifts in residential and employment locations, such as the growth of industrial and warehousing jobs away from transit-served locations, also make it harder for the region's transit system to provide adequate access to opportunities. Unfortunately, this leaves many of the region's residents reliant on a transit system that takes longer to get to fewer places.

### *Stuck in Congestion*

**Figure 3 Stuck in Congestion Scenario Parameters**




Following the COVID-19 pandemic, northeastern Illinois sees a divergence in residential and employment locations. While residential sprawl accelerates, many employers, such as those in professional services and creative industries, increase their presence in the CBD. These employers, and others that rely on collaborative work, remain convinced of the importance of in-person work and the benefits of agglomeration effects. As a related consequence, while telework does grow, it is not as widespread as initial projections.

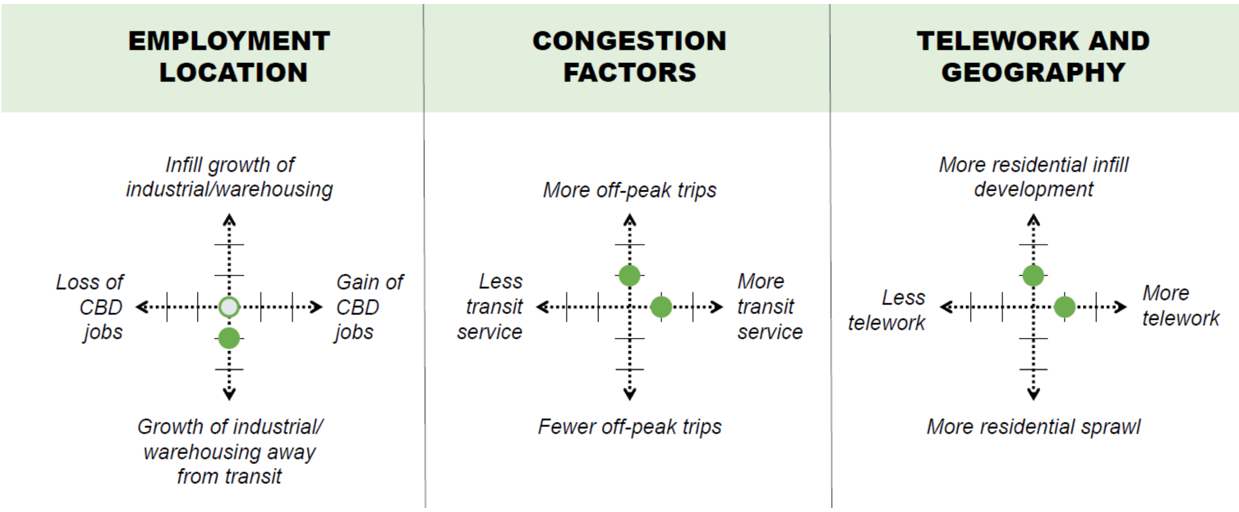
Despite the reemergence of jobs in the CBD, transit ridership remains depressed over the next decade in part due to the sustained increase in telework. Pre-COVID transit riders changed habits during the pandemic and do not return to their prior transit usage levels. New regional residents move to areas less well served by transit, prompting those with means to drive more and take transit less. Although ridership does begin to recover several years after the pandemic, the pace is too slow to make up for revenue shortfalls after federal aid expires. State and local governments fail to fill the gap, leading the region’s transit service boards to dramatically decrease service. This prompts a vicious circle of ridership declines and further service cuts and an associated increase in congestion.

Although still requiring some in-person work, many employers do provide greater flexibility for worker schedules, allowing travelers to take more of their trips during off-peak hours. However, with much of the region’s travel still concentrated in the CBD and with an increased share taken by car, there is extreme gridlock. Rather than rush hour traffic, the region now faces essentially permanent congestion, with miles-long backups from early morning through the late evening.

For the region’s residents without a personal vehicle, there are significantly fewer transportation options than before COVID-19. The shifts in residential and non-CBD employment locations, such as the growth of industrial and warehousing jobs away from transit-served locations, also make it harder for the region’s transit system to provide adequate access to opportunities. The region’s gridlock also has negative consequences for transit, making the region’s bus systems slower and less reliable. Unfortunately, this leaves many of the region’s residents reliant on a transit system that takes them longer to get to fewer places.

### *Resilient Recovery*

**Figure 4 Resilient Recovery Scenario Parameters**



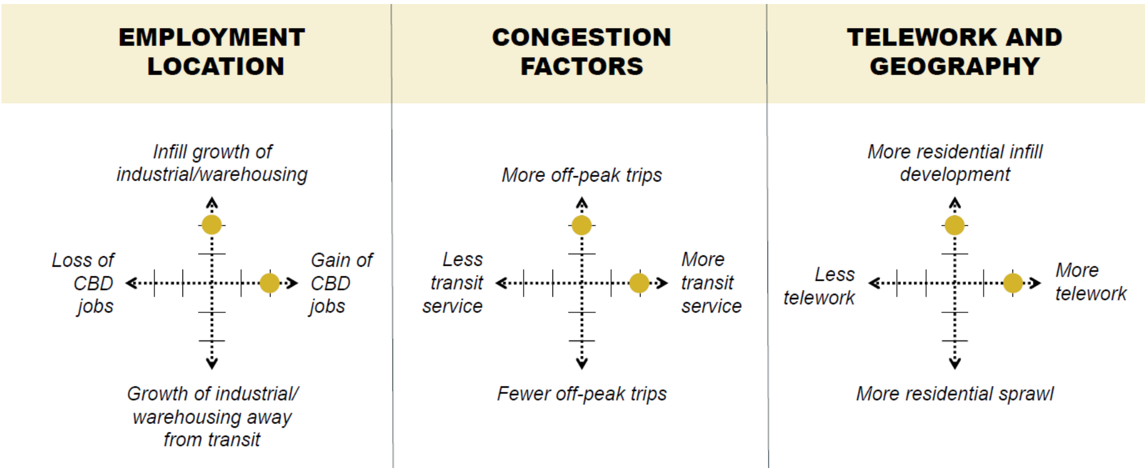

As northeastern Illinois recovers from COVID-19, it emerges with a changed reality—one with more telework and off-peak travel. However, unlike some other areas of the country that see downward spirals of transit service and ridership, the Chicago region invests in its transit system. State and local leaders more than offset the budget shortfalls prompted by temporary decreases in ridership, allowing for significant expansions in transit service, especially during off-peak times.

In turn, these increases in service prompt a stabilization of employment and a modest re-concentration of housing in the urban core. Rapid shifts are rare over the course of a decade, but these incremental improvements are significantly preferable to the extreme sprawl and gridlock that might otherwise have occurred. The service increases also provide greater access to the many regional residents without a vehicle, boosting economic, health, and educational outcomes.

Some challenges do remain. Many of the new warehousing jobs that facilitate e-commerce have emerged in parts of the region not well served by transit, and the growth in telework has undermined many of the businesses that relied on office workers five days a week. However, the region's commitment to transit mitigates the worst impacts of these changes, particularly by expanding the scope of opportunities.

### *Seize the Moment*

**Figure 5 Seize the Moment Scenario Parameters**




The COVID crisis becomes a pivotal moment for reinvestment in the transportation system of northeastern Illinois. Contrary to initial expectations, there is growth in the urban core and residents take advantage of walkable places even while they are working remotely. Employers also continue the pre-COVID trend toward shifting employment into the CBD. Many employees do work remotely some of the time and have flexible hours when they work in person. However, employers still gravitate toward the region's existing job centers, prizing in-person collaboration and the agglomeration effects that come from dense geographic concentrations of workers.

The region's elected leaders wholeheartedly support these changes, directing significant investment into transit service across the region. Chicago's transit network already confers unique benefits in terms of time and cost savings to the city's core area that few other metros can match—a reason why post-pandemic ridership rebounded more rapidly here than originally feared. Given the hard infrastructure already in place from its transit-rich history, the region focuses new resources on supporting a somewhat flattened demand curve post-pandemic. With less need to serve peak-period transit commutes, the service boards are able reroute resources to increase reverse/off-peak service. This, in turn, leads to a greater share of non-work trips taken by transit, and more opportunities for all those in the region who rely on transit to access them.

### *Scenario Summary*

The figure below summarizes the range of parameter values across the four post-pandemic scenarios for at-a-glance comparisons.

**Figure 6 Cross-Scenario Parameter Comparison**

| | CBD jobs | Industrial & warehouse jobs near transit | Transit service | Off-peak trips | Residential density | Telework |
|---|---|---|---|---|---|---|
| The "New Normal" | -- | -- | -- | ++ | -- | ++ |
| Stuck in Congestion | ++ | -- | -- | ++ | -- | + |
| Resilient Recovery | . | - | + | + | + | + |
| Seize the Moment | ++ | ++ | ++ | ++ | ++ | ++ |

# 2.0 Travel Demand Model Inputs

## 2.1 General Model Conditions

Aside from the assumptions for the six parameters outlined in the preceding section and described in greater detail below, there were two baseline datasets that undergird the scenarios: the revised 2030 baseline model run output from the CMAP ON TO 2050 travel demand model (TDM), and the 2030 employment growth estimates by 2-digit NAICS industry.

***Baselines for comparison***

*Methodology*

The original ON TO 2050 forecast of population and employment for the region for 2030 was overly optimistic. Information developed for ON TO 2050 representing 2015 conditions was also too optimistic compared to Census data. However, the socioeconomic and employment forecasts for the ON TO 2050 Plan update were in development and were not available for use in this project. Rather than use the ON TO 2050 forecast values, CMAP staff developed a partial, interim update to housing and employment values for 2030.

As part of a travel demand model update project, CMAP staff developed 2020 household, population, and employment values for the region based on data from the American Community Survey, the Census Bureau's Population Estimates Program and recent data on employment. Using these data as a revised 2020 baseline, the population and employment growth rates from 2020 to 2030 in the original ON TO 2050 forecasts were applied to the new baseline data to develop a revised 2030 forecast.

CMAP staff used these figures in all model runs for this project. In addition to the scenarios defined above, staff generated a "2030 Baseline" model run with no scenario assumptions and a "2030 Baseline + WFH" that only included the "high" telework scenario defined above. Both model runs provided comparison points for the scenario results.

***Employment Growth and Telework Estimates by NAICS Industry***

To robustly model expected employment changes across the region, the project team fitted different combinations of historic employment growth rates by industry. Employment data from EMSI was collected for all industries between 2001 and 2020. In most cases, the long run compound annual growth rate produced employment estimates with the smallest residual error and were thus the rates applied. Employment growth rates from 2001 to 2019 were used to avoid COVID-related employment impacts related to lockdowns and non-structural displacement. Growth rates falling outside of 3rd quartile were smoothed to the 3rd quartile growth rate between 2020 and 2030 for estimation purposes to eliminate incredible employment shifts due to high percent growth rates (e.g., if an industry exhibited a 25% compound annual growth rate between 2001 and 2019 because its employment increased from a small base, the growth rate was allowed to decay until the 25% matched the 3rd quartile growth rate of all industries). To produce the high growth scenario, the full employment growth rate was used. The low growth scenario involved halving the rate of the high growth scenario.

*WFH Methodology*

The average weekday WFH estimates build on the high and low 2030 employment estimates described above, using the following steps:

1. High and low 2030 employments forecasts were generated by county (and other geographies) and NAICS industry. In most cases the NAICS industry code was specified at the 2-digit level, but in the case of 61 and 90 (Educational Services and Public Administration), by 3- to 6-digit to better capture varying work-from-home practices in these groups.

2. A number of the workers in each location-industry combination were assigned a “WFH-friendly jobs” bucket, using the values developed in Task 3 of this project and shown in Table 1, and the remainder are in the “regular commuter” bucket (assumed to travel to work 95% of the time).
3. Average weekday commutes were calculated for the WFH-friendly jobs under two different scenarios: a high- and low-WFH prevalence in 2030:
    a. High-WFH assumed 40% would go to the workplace on a peak travel day and 0% would on Fridays;
    b. Low-WFH assumed that 80% would go in on peak travel days and 10% would on Fridays.
4. The travel demand model is not able to model mid-week separately from Friday, so to accommodate this, the peak travel day and Friday estimates were weighted 70:30 to generate average weekday commute rate for workers in WFH-friendly jobs.
5. The average weekday commutes for WFH-friendly jobs were added to the commutes for all other jobs in the industry (i.e., the inverse share of **Table 1**) to calculate the total percent commuting and total percent working from home on an average weekday for that growth scenario, WFH scenario, location, and industry.
6. A maximum and minimum % WFH are provided as a range to be applied in the travel demand model. Those figures are summarized in **Table 1**.

**Table 1 Share of Work-from-Home Jobs by Industry**

| NAICS Code | NAICS Description | % WFH-friendly |
|---|---|---|
| **11** | Agriculture, Forestry, Fishing and Hunting | 5% |
| **21** | Mining, Quarrying, and Oil and Gas Extraction | 21% |
| **22** | Utilities | 37% |
| **23** | Construction | 14% |
| **31-33** | Manufacturing | 23% |
| **42** | Wholesale Trade | 42% |
| **44-45** | Retail Trade | 11% |
| **48-49** | Transportation and Warehousing | 14% |
| **51** | Information | 62% |
| **52** | Finance and Insurance | 73% |
| **53** | Real Estate and Rental and Leasing | 31% |
| **54** | Professional, Scientific, and Technical Services | 76% |
| **55** | Management of Companies and Enterprises | 75% |
| **56** | Administrative, Support, Waste Management, Remediation Services | 28% |
| **6111, 902611, 903611** | Educational Services (Pre-K through High School) | 15% |
| **6112-6117, 902612, 902619, 903612, 903619)** | Educational Services (College / Other Education) | 60% |
| **62** | Health Care and Social Assistance | 19% |
| **71** | Arts, Entertainment, and Recreation | 16% |
| **72** | Accommodation and Food Services | 3% |
| **81** | Other Services (except Public Administration) | 25% |
| **multiple** | Federal, State, and Local Govt., excluding state and local schools | 36% |

*Source: The WFH-friendly percentages for all industries except Educational Services and Public Administration were sourced directly from Dingel, J.I. & B. Neiman, 2020. "How many jobs can be done at home?," Journal of Public Economics, vol. 189. The remaining industries were separated into four- to six-digit NAICS codes to better represent the WFH capability of education jobs in primary through tertiary institutions (i.e., more WFH at higher education (60%), and less in primary and secondary schools (15%). The removal of education jobs from Public Administration yielded a WFH rate of 36%.*

## *Results*

A summary at the regional level is shown in **Table 2**, and the range of work-from-home shares is summarized in **Table 3**. Notes about the application of these results in the travel demand model are provided in section **2.2 Scenario Levers**.

**Table 2 Regional Work-from-Home Rates**

| Employment Growth | WFH Scenario: Low | WFH Scenario: High |
|---|---|---|
| **Low** | 13% | 22% |
| **High** | 12% | 22% |

**Table 3 Work-from-Home Rates by Location and Industry**

| Area | 2 Digit | WFH Min | WFH Max |
|---|---|---|---|
| *Model Region* | 11 | 2% | 4% |
| *Model Region* | 21 | 9% | 15% |
| *Model Region* | 22 | 15% | 27% |
| *Model Region* | 23 | 6% | 10% |
| *Model Region* | 31 | 9% | 17% |
| *Model Region* | 42 | 17% | 30% |
| *Model Region* | 44 | 5% | 8% |
| *Model Region* | 48 | 6% | 10% |
| *Model Region* | 51 | 26% | 45% |
| *Model Region* | 52 | 30% | 53% |
| *Model Region* | 53 | 13% | 23% |
| *Model Region* | 54 | 31% | 55% |
| *Model Region* | 55 | 31% | 54% |
| *Model Region* | 56 | 12% | 20% |
| *Model Region* | 61 | 20% | 36% |
| *Model Region* | 62 | 8% | 13% |
| *Model Region* | 71 | 7% | 11% |
| *Model Region* | 72 | 1% | 2% |
| *Model Region* | 81 | 10% | 18% |
| *Model Region* | 90 | 13% | 24% |
| | | | |
| *Chicago Central Area* | 61 | 23% | 41% |
| *Cook County* | 61 | 21% | 36% |
| *DuPage County* | 61 | 21% | 37% |
| *Lake County* | 61 | 19% | 34% |
| *McHenry County* | 61 | 15% | 27% |
| *Kane County* | 61 | 18% | 31% |
| *Will County* | 61 | 19% | 34% |
| *Kendall County* | 61 | 19% | 37% |
| | | | |
| *Chicago Central Area* | 90 | 22% | 40% |
| *Cook County* | 90 | 13% | 24% |
| *DuPage County* | 90 | 12% | 21% |
| *Lake County* | 90 | 11% | 20% |
| *McHenry County* | 90 | 10% | 18% |
| *Kane County* | 90 | 11% | 19% |
| *Will County* | 90 | 11% | 19% |
| *Kendall County* | 90 | 14% | 28% |

## 2.2 Scenario Levers

***Employment Location Variables***

*Central Area Employment*

The employment modeling described above yielded a high estimate of 4.78% growth in the Central Area (also known as Central Business District, or CBD) between 2020 and 2030. This was converted into an adjustment against the 2030 baseline by adjusting downward for the planned 1.14% growth rate over the same period (which was calculated using the 2020 and 2030 baselines from the travel demand model).

The decrease follows the expectation that there could be a combination of reduced service-sector/retail/food service jobs, based on a significant decline in the average number of workers present in the Central Area on an average day. This was calculated as a 20% reduction for jobs in Retail Trade, Arts/Entertainment/Recreation, Accommodation/Food Services, and Other Services. This would be accompanied by a smaller reduction in several other sectors (assumed at 5%), with the idea being that some firms would relocate out of the more expensive offices in the central area, particularly if the central area loses some of its attractiveness and/or if employees are only coming in once or twice per week. See **Table 4** below. While speculative, these reductions are supported by the magnitude of telework impacts (estimated at 19-33% on an average workday in the central area) and other recent analyses[1] of the pandemic's impacts in large urban centers.

**Table 4 Central Area Jobs Reduction by Industry**

| NAICS | Industry | Central Area Jobs | Reduction | Reduction Factor |
|---|---|---|---|---|
| **11** | Agriculture/Forestry/Fishing/Hunting | 55 | | 0% |
| **21** | Mining/Quarrying/Oil and Gas | 946 | | 0% |
| **22** | Utilities | 2,309 | | 0% |
| **23** | Construction | 13,398 | | 0% |
| **31-33** | Manufacturing | 7,111 | | 0% |
| **42** | Wholesale Trade | 14,971 | | 0% |
| **44-45** | Retail Trade | 24,868 | -4,973 | 20% |
| **48-49** | Transportation/Warehousing | 8,789 | | 0% |
| **51** | Information | 31,354 | -1,568 | 5% |
| **52** | Finance/Insurance | 106,993 | -5,350 | 5% |
| **53** | Real Estate/Rental/Leasing | 17,994 | -900 | 5% |
| **54** | Professional/Scientific/Technical Services | 139,834 | -6,992 | 5% |
| **55** | Management of Companies | 12,576 | -629 | 5% |
| **56** | Admin./Support/Waste/Remed. Services | 55,524 | -2,776 | 5% |
| **61** | Educational Services | 27,943 | | 0% |
| **62** | Health Care/Social Assistance | 54,268 | | 0% |
| **71** | Arts/Entertainment/Recreation | 13,782 | -2,756 | 20% |
| **72** | Accommodation/Food Services | 75,226 | -15,045 | 20% |
| **81** | Other Services (excl. Public Admin.) | 42,738 | -8,548 | 20% |
| **92** | Public Admin. | 112,959 | | 0% |
| | **Total** | **763,638** | **-49,537** | **7%** |

[1] https://www.chicagobusiness.com/opinion/big-cities-are-holding-back-us-jobs-recovery

Total reallocation ranges from a 4% increase in CBD jobs to a 7% decrease. Jobs are uniformly redistributed to/from the Central Area and reallocations use the existing industry mix of the CBD.

For each non-CBD zone, a scaling percentage was required. In essence, this scaling percentage needs to capture the share of "CBD-like" employment present in this zone, as a percentage of all non-CBD zones. It was created by calculating the percentage of total employment outside the CBD, by NAICS code, by zone. Those NAICS code percentages were then combined using a weighted average, weighting by the NAICS breakdown of total employment within the CBD.

When moving jobs to/from the CBD, all employment was uniformly increased/reduced by the designated scenario percentage. To offset this change, employment outside the CBD decreased/increased, with employment changes allocated according to the zonal weighting percentages defined above.

The range of values applied to different growth scenarios is defined as follows:

- High increase: 3.6%
- Low increase: 1.1%
- Neutral: No change.
- Low decrease: No scenarios
- High decrease: 6.9%

This reallocation was performed before the reallocation of industrial/warehousing jobs, described below.

### *Industrial / Warehousing Employment*

One possible consequence of the COVID-19 pandemic will be a rise in e-commerce, with its accompanying warehousing and distribution center needs. There may be countervailing forces at work in the development of this trend, with large new facilities in greenfield sites and/or new facilities closer to existing population centers to minimize delivery times. It is expected that the new distribution of e-commerce jobs will include both movement from one community to another within a given county, as well as from one county to another.

To explore the possible implications of different scenarios, the project team chose a redistribution figure to shift jobs within counties, with a maximum of 10% in the sprawl direction and 5% in the densification direction, as a high but potentially plausible shift in the footprint of jobs in this sector within a particular county. The 5% "low" threshold for sprawl was chosen as half of the "high" threshold.

County-level redistributions were derived from consultant forecasts of different growth scenarios. The "Low" and "High" scenarios were both based on recent growth trends, with the "High" scenario having a greater relative shift toward Will County. These figures, normalized to a market share, are shown in **Table 5**.

**Table 5 Market Share**

| | Low 2030 | High 2030 |
|---|---|---|
| **Cook County** | 55.1% | 54.0% |
| **DuPage County** | 14.4% | 14.4% |
| **Kane County** | 6.5% | 6.6% |
| **Kendall County** | 1.0% | 1.1% |
| **Lake County** | 10.4% | 10.4% |
| **McHenry County** | 2.8% | 2.7% |
| **Will County** | 9.9% | 10.8% |

The process by which the above rationale was implemented is as follows. Industrial and warehousing jobs (NAICS 31-33 and 48-49) were reallocated in two stages. First, jobs were reallocated at a regional scale between counties, with sprawl-type scenarios largely shifting jobs away from Cook County and toward Will County. After this regional reallocation, jobs were reallocated within counties based on transit availability.

Zones with a nonzero number of NAICS 31-33/48-49 jobs were divided into quartiles based on transit availability scores, weighted by employment (so each quartile has the same number of jobs). For infill scenarios, the "Dense/Sprawl adjustment factor" percentage of the lowest quartile is reallocated into the highest quartile, with jobs reallocated based on the existing weight of jobs in each zone (so the zones with the greatest number of jobs today become targets for the greatest amount of redistribution). For sprawl scenarios, the inverse was performed. Because the movement only affects the top or bottom quartiles, in effect, this moved up to 10% of roughly 25% of relevant county jobs, which is equal to a total shift of 2.5%.

The range of values that were applied to different industrial/warehousing distribution scenarios is defined as follows:

- High infill/dense development: Use existing 2030 projection as baseline. Only redistribute jobs within counties, using an adjustment factor of 10% when shifting jobs from the bottom transit availability quartile to the top.
- Low infill/dense development: No scenarios
- Low sprawl development: Use consultant-proposed “Low” scenario, which principally shifts jobs out of Cook County and into Will County. Then redistribute 5% of jobs from top transit availability quartile zones to the lowest transit availability quartile zones.
- High sprawl development: Use consultant-proposed “High” scenario, which shifts jobs even more aggressively from Cook County into Will County. Then redistribute 5% of jobs from top transit availability quartile zones to the lowest transit availability quartile zones.

As noted above, this was completed after the CBD job reallocation. It also required subsequent adjustments to heavy truck origin-destination pairs to account for the changes in job locations.

### ***Congestion Factors***

#### *Off-Peak Trips*

Analyses based on historical Replica data show that during the pandemic, peak travel went from 41% to 37% of total trips. However, almost all of this is due to a reduction in morning trips that fell from 18% to 14% of trips. PM peak declined from 23 to 22% (note that trip purposes may have changed).

For scenario modeling purposes, it was assumed that the current changes for off-peak travel (i.e., four percentage point reduction in AM Peak trips and one percentage point reduction in PM peak trips) should remain indefinitely in the "high increase" scenarios. In "low increase" scenarios, the current changes were expected to be half as large during the AM peak (i.e., two percentage point decrease). The decrease in peak period trips was distributed across the other non-overnight periods of the day. In the low-increase scenario (where there is no reduction in PM peak trips), the increase in off-peak trips was limited to between 6am and 2pm.

- High increase: 4pp reduction of AM peak trips, 1pp reduction of PM peak trips
- Low increase: 2pp reduction of AM peak trips, no change to PM peak trips
- Low decrease: No scenarios
- High decrease: No scenarios

These values are stored in the table below for easy visualization, along with the correlating increases in change in share across other time periods. Time-of-day trip share changes were applied to all home-work, home-other and nonhome-based trips.

**Table 6 Change in Share of Trips by Time of Day**

| Time Period | High Increase in Off-Peak Share | Low Increase in Off-Peak Share |
|---|---|---|
| **1: 8 pm – 6 am** | 0.0% | 0.0% |
| **2: 6 am – 7 am** | 0.5% | 0.3% |
| **3: 7 am – 9 am** | -4.0% | -2.0% |
| **4: 9 am – 10 am** | 0.5% | 0.3% |
| **5: 10 am – 2 pm** | 2.0% | 1.3% |
| **6: 2 pm – 4 pm** | 1.0% | 0.0% |
| **7: 4 pm – 6 pm** | -1.0% | 0.0% |
| **8: 6 pm – 8 pm** | 1.0% | 0.0% |

#### *Transit Service Levels*

Headway frequencies were adjusted for different service types, with variations based on how "downtown-focused" a given service is. The proposed cuts are in line with (or even less aggressive than) the current scope of ridership declines, which could prompt cuts of this magnitude if no supplemental funding is provided to the transit service boards.

Service increases were designed to be roughly symmetrical with service cuts. However, peak hour rail service did not see service increases due to existing system capacity constraints. The maximum headway threshold for Metra is meant to reflect a shift toward a "regional rail" type system; note that this is likely to be implausible on at least some existing Metra lines due to freight rail conflicts, but it was applied uniformly for simplicity.

For high transit service increases, service was made more frequent by decreasing headways as follows:

**Table 7 High Transit Service Increase, Frequency Assumptions**

| *Category* | *Peak* | *Off-peak* |
|---|---|---|
| ***Metra*** | No change | 25% with 20-minute maximum headways |
| ***CTA rail*** | No change | 25% |
| ***CTA bus*** | 40% | 40% |
| ***Pace (feeder & downtown)*** | 25% | 25% |
| ***Pace (other)*** | 25% | 25% |

For low transit service increases, service was made more frequent by decreasing headways as follows:

**Table 8 Low Transit Service Increase, Frequency Assumptions**

| *Category* | *Peak* | *Off-peak* |
|---|---|---|
| ***Metra*** | No change | 10% with 30-minute maximum headways |
| ***CTA rail*** | No change | 10% |
| ***CTA bus*** | 25% | 25% |
| ***Pace (feeder & downtown)*** | 10% | 10% |
| ***Pace (other)*** | 10% | 10% |

For high transit service cuts (note there are no "low" cut scenarios), service was made less frequent by increasing headways as follows:

**Table 9 High Transit Service Decrease, Frequency Assumptions**

| *Category* | *Peak* | *Off-peak* |
|---|---|---|
| ***Metra*** | 40% | 25% |
| ***CTA rail*** | 40% | 25% |
| ***CTA bus*** | 25% | 25% |
| ***Pace (feeder & downtown)*** | 40% | 40% |
| ***Pace (other)*** | 25% | 25% |

### *Telework and Geography*

#### *Average Weekday Work-from-Home Estimates*

As described above in the **Travel Demand Model Inputs** section, regional average weekday work-from-home estimates ranged from a high of 23% and a low of 13%, in comparison to the 2030 benchmark of 6% to 8%. When considering the impacts of work-from home on regional travel patterns, it is important to remember that it is not only commute trip-making that is affected. Analysis of the My Daily Travel (MDT) survey data found that households with at least one worker who works from home make 0.44 additional home-based other trips and 0.14 fewer non-home-based trips than households without WFH workers.

Using the telework figures by NAICS code, the team generated a zone-level propensity to telework figure which is applied to uniformly reduce work trips to the destination zone.[2] After reducing work trips, the team also reduced non-home-based trips in the destination zone and increased home-based trips

[2] The impact of WFH is applied to the trip purpose demand tables following Trip Distribution (so that it will not alter Trip Distribution). NAICS work from home rates developed from My Daily Travel are applied to the subzone-level NAICS employment information to develop a weighted average work trip reduction rate for each zone.

in the origin zone, based on the WFH propensity of the zone and the differences in average trips from the travel survey.[3]

Implementing the scenario parameters resulted in the following changes in trips in the CMAP region compared to the Baseline scenario:

- Baseline + WFH: 13.0% decrease in HBW trips, 4.2% increase in HBO trips, 1.3% decrease in NHB trips
- New Normal: 12.2% decrease in HBW trips, 4.8% increase in HBO trips, 0.8% decrease in NHB trips
- Stuck in Congestion: 3.2% decrease in HBW trips, 1.5% increase in HBO trips, 0.7% decrease in NHB trips
- Resilient Recovery: 3.7% decrease in HBW trips, 0.7% increase in HBO trips, 0.9% decrease in NHB trips
- Seize the Moment: 13.2% decrease in HBW trips, 3.5% increase in HBO trips, 2.2% decrease in NHB trips

### *Residential Sprawl Estimates*

Residential sprawl rates due to COVID-19 impacts were estimated using Census data on household and housing trends (2000-2020), demographic characteristics by age of householder, and moving behavior over time. This analysis yielded an estimate of 13.4% of people moving to less dense locations.[4] This figure is based on population rather than households due to the nature of the source Census data; it may be overly aggressive. To provide a more conservative estimate, this figure was adjusted downward to a maximum of 10% as a high estimate and 5% as a low estimate.

- High sprawl increase: 10% of households relocate to less dense locations
- Low sprawl increase: 5% of households relocate to less dense locations
- Low density increase: (no scenarios)
- High density increase: 10% of households relocate to more dense locations

To apply these residential relocation factors, each zone in the region is sorted into a residential density quartile (weighted by households, so each quartile has the same number of households). When selected for relocation, households were moved into a zone either one quartile above or one quartile below. The target relocation zone was partially randomly assigned within the universe of zones that are one quartile above or below. To maintain some connection to the existing physical development footprint, the likelihood of relocation into a particular zone was weighted based on the zone's existing population such that the likelihood of relocation was based on the population of the zone as a share of all target relocation zones (population weighted assignment).

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[3] To account for the increase in HBO trips due to remote work, the demand for these trips was multiplied by 1+(0.44*overall WFH rate). To account for the decrease in NHB trips due to remote work, the demand for these trips was multiplied by 1+(-0.14*overall WFH rate).

[4] This analysis assumed that for 1.5 years regional residents move at the same rate as national averages during 2006-2010, apart from those in prime home-buying age (25-39 years old), who move at twice the national average due to pent-up demand between 2010 and 2019; half of these moves are assumed to be destined for lower density areas where there is more supply available.

One consequence of this approach is that in sprawl scenarios, households in the lowest density areas did not move, and vice versa for households in the highest density areas in densification scenarios. Another consequence is that, although large numbers of regional households were moving, the net shift in any scenario will only be a third of the total magnitude, with the densest zone and the least dense zone either gaining or losing that amount. Other shifts altered the demographic makeup of intervening zones, hence the shifts, but did not alter the total number of households for zones in quartiles 2 and 3.

Based on MDT analysis, targets for relocation in increased sprawl scenarios driven by telework should be households that meet at least two of the following criteria:

- At least one household member with >$100,000 earnings
- At least one household member in an industry with high telework propensity
- At least one employed household member age 30 or older
- At least one employed household member with bachelor’s degree or above

If more households located in zones targeted for outward relocation meet the criteria, an appropriate number were randomly assigned to be relocated.

Since densification scenarios do not rely on increased telework as the causal factor, all households except those already in the highest density zones were uniformly likely to be selected for relocation.

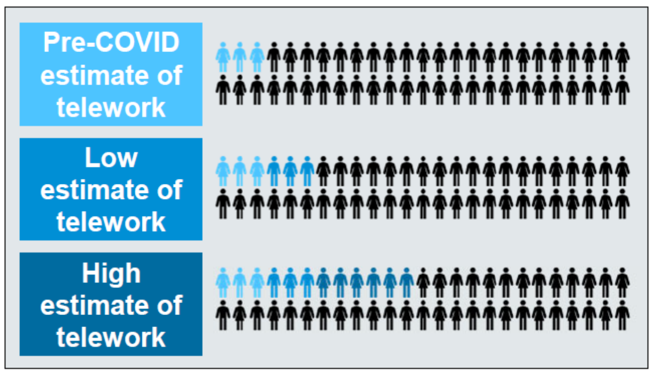
# 3.0 Travel Demand Model Outputs

## 3.1 Summary of Baseline Changes

CMAP staff generated a total of six different travel demand model scenario outputs for the four post-COVID scenarios described in Section 1, plus a 2030 Baseline under “normal” (i.e., pre-pandemic) assumptions, as well as 2030 baseline with only the high telework assumption applied (referred to here as “Baseline (WFH)”). These results were analyzed, and a summary of the findings are reported here.

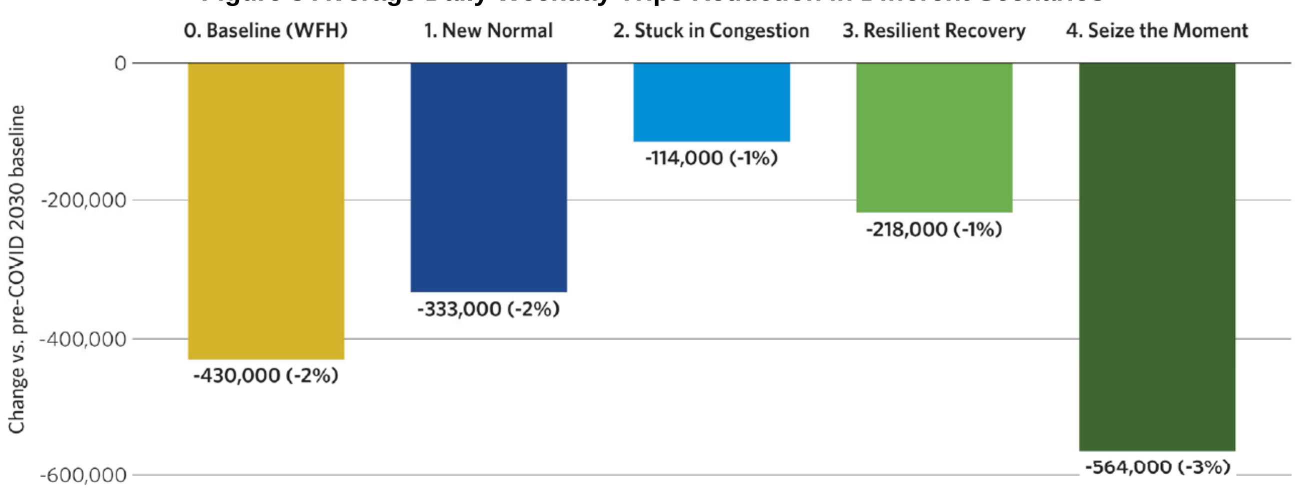
A primary finding is that a high level of telework can be expected to dramatically transform the transportation system in the Chicago region (**Figure 7**). In fact, model results show that telework can have an impact even greater than all the other changes described above (job growth and location, transit service levels, peak vs. off peak travel, and residential sprawl) combined.

**Figure 7 The Adoption of High Levels of Remote and Hybrid Work**




This drop in the number of trips being taken to and from work means that there will likely be fewer trips overall (**Figure 8**). While model results suggest that we can expect nonwork trips to tick up slightly (around 2%) as people use the extra hour or two in their schedule to run errands and pursue recreational or social activities, that was not nearly enough to offset the roughly 13% drop in commutes that is estimated.

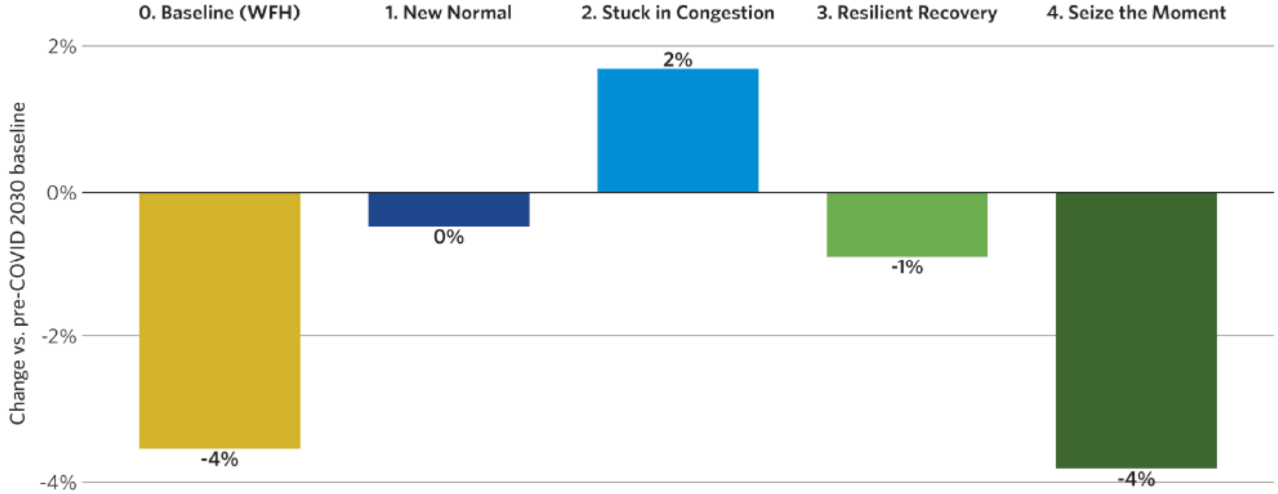
**Figure 8 Average Daily Weekday Trips Reduction in Different Scenarios**




*Note: Includes trips made in personal vehicles and on public transit, but does not include trips made by walking, bicycle, or other modes.*
*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

Fewer trips also mean fewer vehicle miles traveled (VMT, **Figure 9**), but this impact is also influenced by some of the other scenario parameters, such as the geographic location of homes and jobs, their distance from each other, and their proximity to transit infrastructure. For this reason, we may see an increase in VMT (or at least a very minimal decrease compared with the decrease in trips) in the New Normal and Stuck in Congestion scenarios, likely due to other features present in these scenarios, such as increasing residential sprawl, more industrial and warehouse jobs away from transit, and lower transit service (and thus fewer people on buses and trains).

**Figure 9 VMT Changes in Different Scenarios**



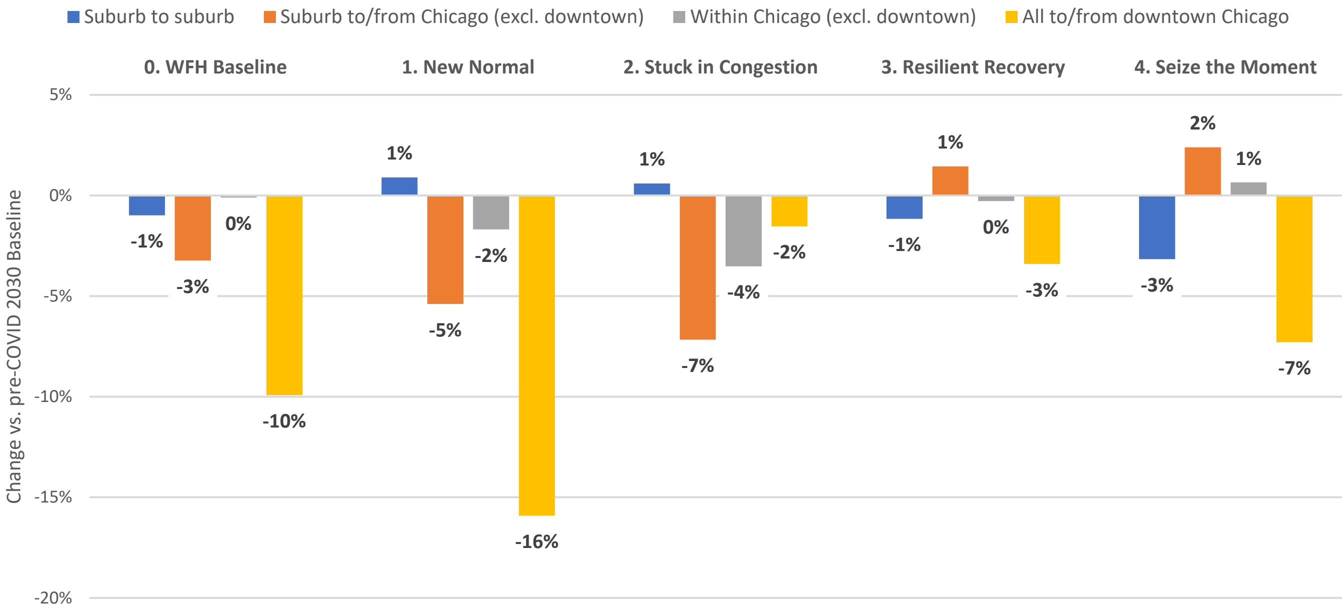

*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

Model results about the distribution of trips between origins and destinations were analyzed and trips were divided into four basic markets to better understand how travel patterns may change.

- **Suburb-to-suburb**, which include all trips that start and end outside of Chicago (in either suburban or rural locations).
- **Suburb to/from Chicago (excluding downtown)**, which includes all trips between suburban/rural locations and Chicago neighborhoods
- **Within Chicago (excluding downtown)**, which includes all trips that start and end in Chicago neighborhoods.
- **All trips to/from downtown Chicago**, which includes all trips that start and/or end in downtown Chicago (the opposite end may be anywhere in the region—suburban, rural, or Chicago)

Generally, trips that either start or end in downtown Chicago fall more dramatically than any other travel market (**Figure 10**). Trips between the suburbs and non-downtown Chicago decrease significantly in the New Normal and Stuck in Congestion scenarios (amplifying the WFH Baseline trend) but rise in Resilient Recovery. Similarly, trips within Chicago neighborhoods fall in the two pessimistic scenarios but are roughly steady in Resilient Recovery and Seize the Moment. These trends in trip-making to, from, or within the Chicago neighborhoods potentially indicates greater economic resilience in the Chicago neighborhoods because of the policy choices reflected in the parameters of the Resilient Recovery and Seize the Moment scenarios. Finally, suburb-to-suburb travel increases slightly in the New Normal and Stuck in Congestion scenarios and decrease in Resilient Recovery and Seize the Moment; this is consistent with the anticipated sprawl of housing and industrial and warehouse jobs in these scenarios.

**Figure 10 Change in average weekday trips by market and scenario**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

As shown above, the model results illustrate how the COVID-19 related shifts in telework, travel preferences, and the location and concentration of homes and jobs can combine with longstanding issues like climate change and social equity to yield a range of challenges and opportunities. Some shifts are related to COVID-19, including sustained increase in telework, shift of economic activity away from traditional hubs, and changed travel and housing preferences; other challenges are more long-term, resulting from longstanding issues such as climate change and equity. The following related challenges and opportunities can be witnessed from these shifts and challenges:

- Economic shifts may enable community reinvestment and a more polycentric region
- COVID-19 worsened many existing inequities
- Transit trips and transit's share of travel may not recovery in the near- to medium-term
- Existing funding models may not provide transit with enough funds to operate effectively
- Changed travel demands may reduce total congestion but cause new strains, e.g., due to freight
- Solutions to these problems must support sustainability goals

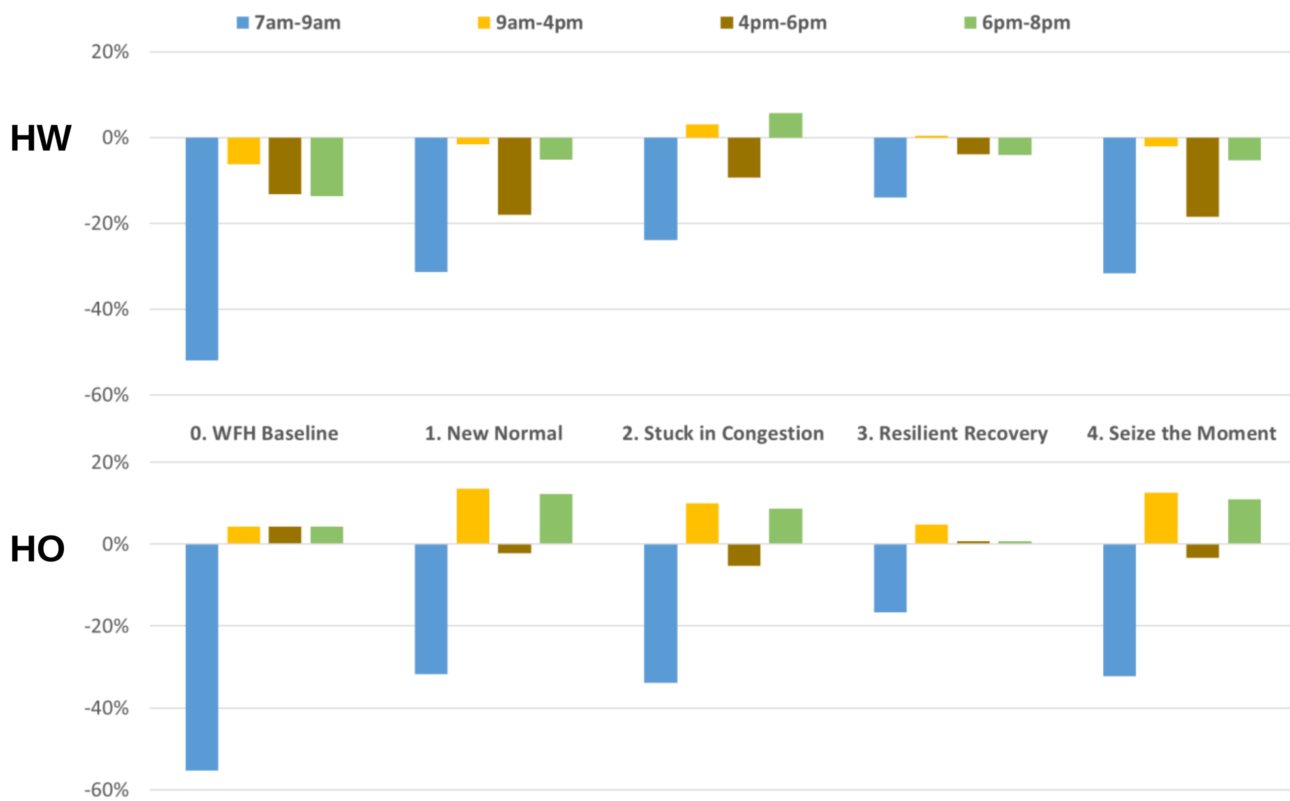
The region anticipates that new travel patterns will lead to economic shifts and new opportunities for investment, and that the demands on the region's public transit network may shift in durable ways. For CMAP, these changes present an opportunity to reduce congestion, improve air quality and more. However, the outcome and the level of success remain to be seen. The following subsections discuss the projected trends and changes through lenses of telework, trip trends, geographies, transit, congestions, equity, and emissions.

# 3.2 Trip Trends

An initial observation is that, with more telework, fewer trips to and from work and more of other types of trips will be seen. While it some characteristics of these trips remains unknown, it is anticipated that they will be different from the kinds of trips that came before. Additionally, the non-work trips are expected to come at different times of day, centered around the home, with fewer trips centered around a place of work. Similar reductions have been seen in work trips for the other “high” telework scenarios, with lower reductions in scenarios two and three. These changes are mirrored with other trips – which are expected to grow most in high telework scenarios and are based on the latest understanding of how travelers who telework behave.

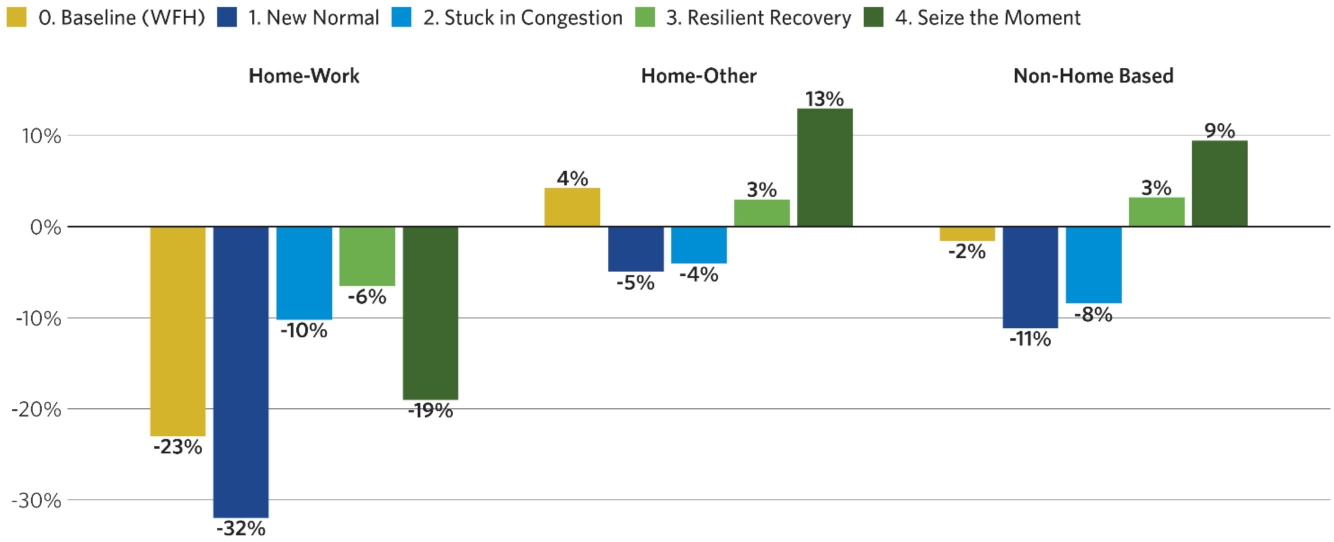
Ever since COVID-19, more and more employers started to offer work from home (WFH) options for employees, and these shifts impact commute (i.e., Home-Work, or HW) travel all day, particularly during AM peak periods. Additionally, apart from the AM Peak periods, fewer work (HW) trips tend to coincide with a modest increase in non-work (HO) trips: in the scenarios, the impact of other post-COVID scenario assumptions can be seen; also, there is a larger increase in home-based other trips across all non-peak time periods for all four scenarios (**Figure 11**). For work trips, there are more muted (and sometimes positive) impacts in moderate scenarios, more proportional impact on work trips is larger in denser areas (such as Chicago, Suburban Cook and DuPage). However, non-work trips see more divergent impacts (**Figure 12**).

**Figure 11 Average Daily Home-Work and Home-Other Trips by Time Periods**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

**Figure 12 Average Weekday Transit Trips by Trip Purpose**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

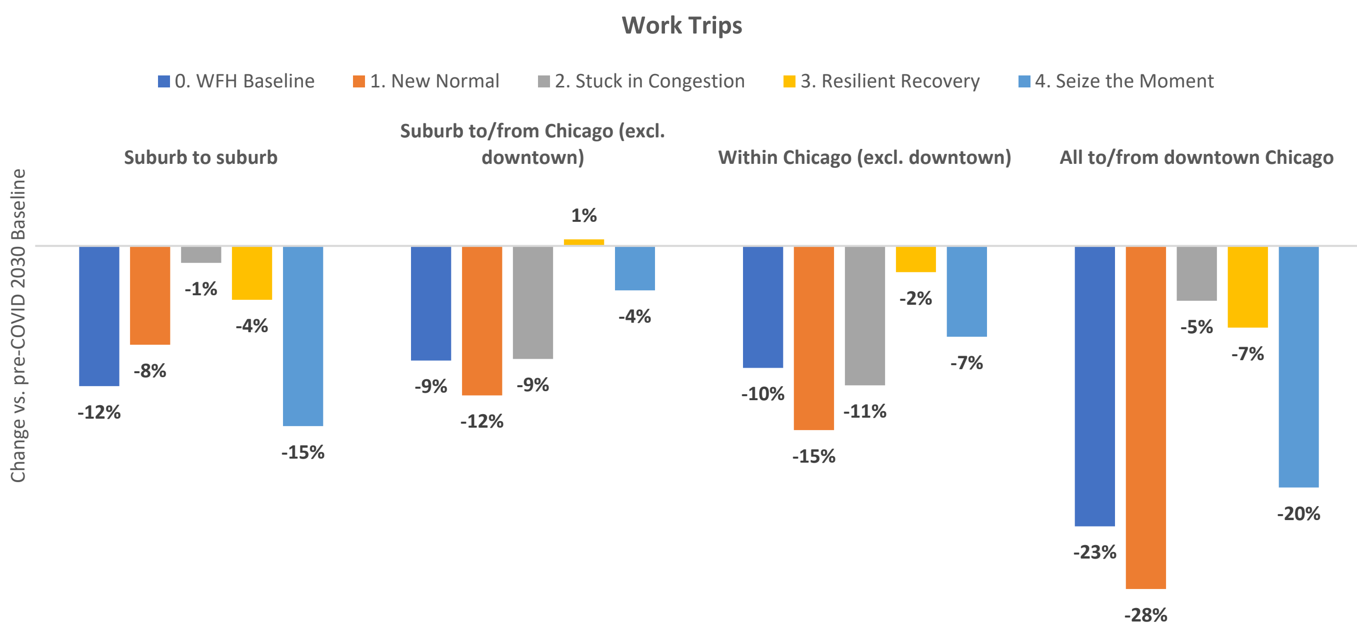
# 3.3 Directional Travel Markets

Origin-destination data was divided into four basic markets to better understand how trip-making is changing across locations (see **2.2 Scenario Levers**). The most common type of trip in the region both starts and ends outside of Chicago (referred to here as "suburb to suburb"), making up about 70% of all trips. The remaining 30% are roughly equally divided across the three remaining markets: suburb to/from Chicago (excluding downtown), within Chicago (excluding downtown), and all trips to/from downtown Chicago.

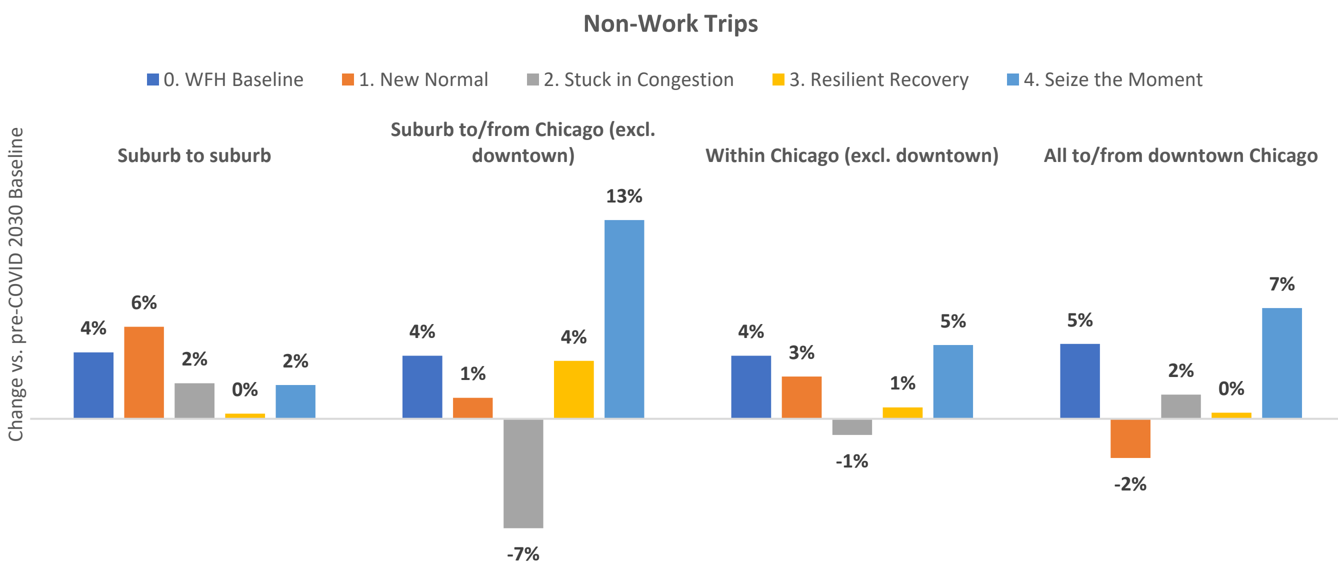
As noted in the summary, the largest percentage decreases in trip-making are seen in the downtown Chicago travel market. For the New Normal and Stuck in Congestion scenarios, the suburb-to-suburb market grows slightly—consistent with the modeled decrease in residential density and more dispersed industrial and warehouse jobs—while all Chicago-based trip-making falls. In the remaining scenarios (Resilient Recovery and Seize the Moment), both suburb-to-suburb and downtown Chicago-oriented travel decreases while non-downtown Chicago trip-making either holds steady or increases.

The resilience of the Chicago neighborhood-oriented travel market in Resilient Recovery and Seize the Moment is due to both more modest declines in commute trips and larger increases in non-work trips in comparison with New Normal and Stuck and Congestion (**Figure 13**). For example, in Resilient Recovery, work trips in these locations fall by an average one percent, compared to double digit decreases in New Normal or Stuck in Congestion. Resilient Recovery non-work trips increase by an average two percent and are even more pronounced in Seize the Moment.

**Figure 13 Change in Average Weekday Trips by Purpose and Market**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*



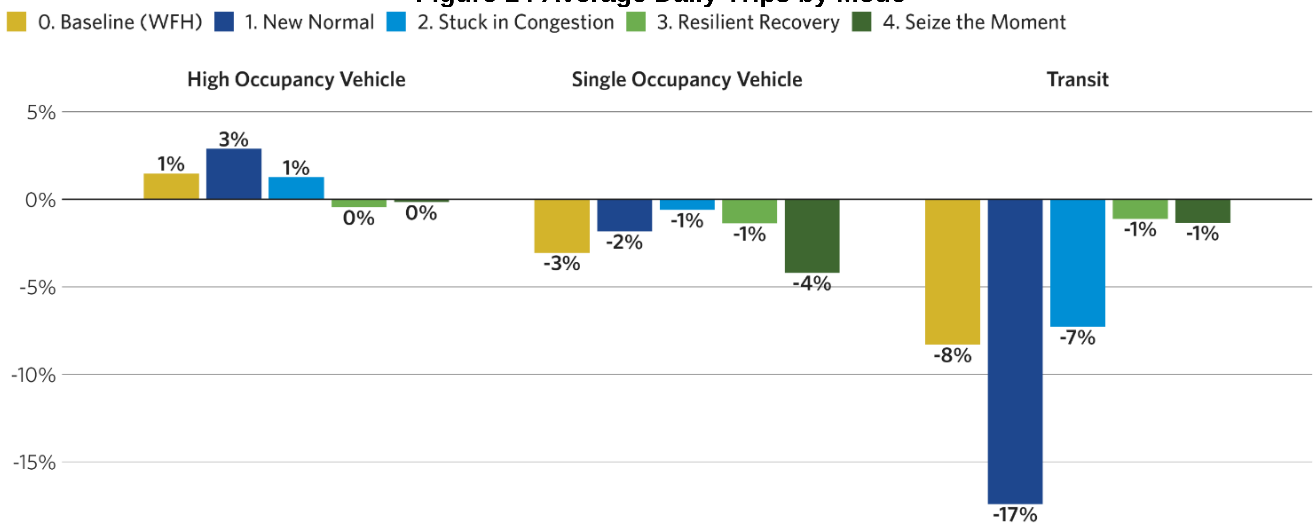

*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

More detailed analysis of the origin-destination data by mode and rider income level is included in subsequent sections of this report.

## 3.4 Transit

Overall, transit is projected to be hit the hardest since COVID-19 compared to automobiles in all scenarios except Seize the Moment, likely due to that scenario's increase in transit service quality and share of jobs sited near transit (**Figure 14**). Compared to the 2030 Pre-COVID Baseline conditions, the New Normal is expected to experience a 17% percent reduction in transit trips, while single-occupancy vehicle (SOV) trips will decrease less than 5% for all scenarios and high-occupancy vehicle (HOV) trips show moderate increases for certain scenarios.

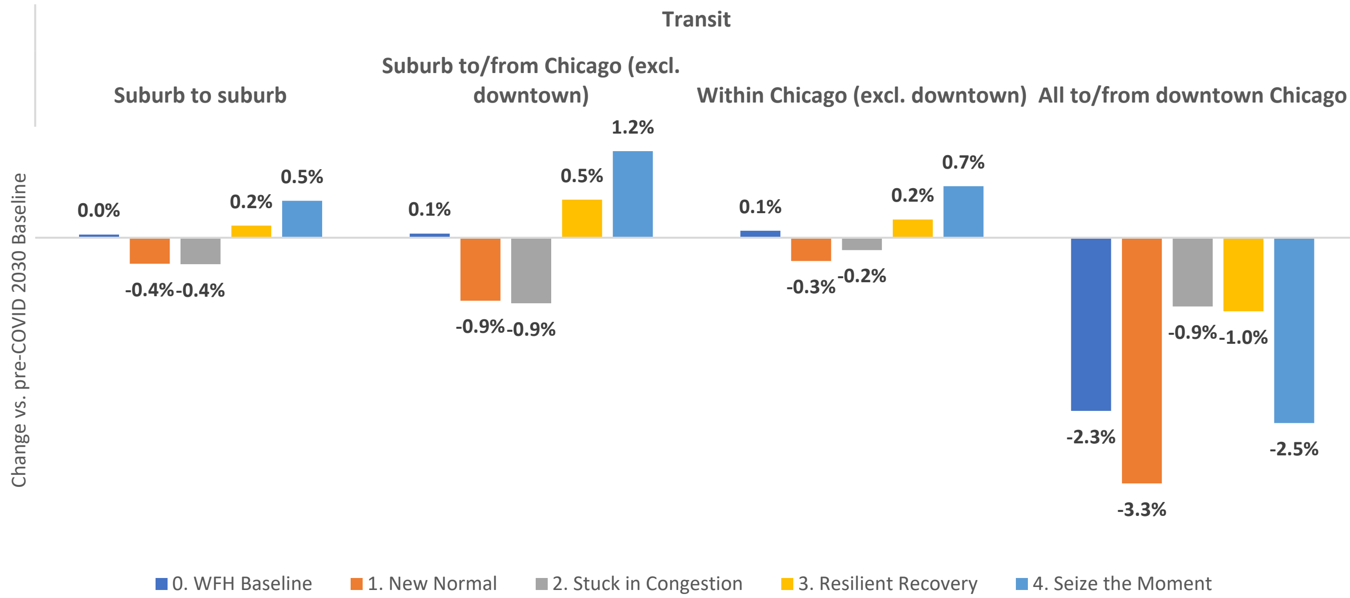
**Figure 14 Average Daily Trips by Mode**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

Among all the modes and markets, transit to and from downtown Chicago area was hit the hardest of all: in all scenarios, transit mode share in this market decreases by one to three percent (**Figure 15**). All other markets see varying impacts to transit mode share. The next largest decline in transit mode share is trips made between suburban locations and Chicago neighborhoods (down one percent) in New Normal and Stuck in Congestion, whereas there is an increase in transit mode share for this market in Resilient Recovery and Seize the Moment. The same is true to a more modest extent for the Within Chicago and suburb-to-suburb market.

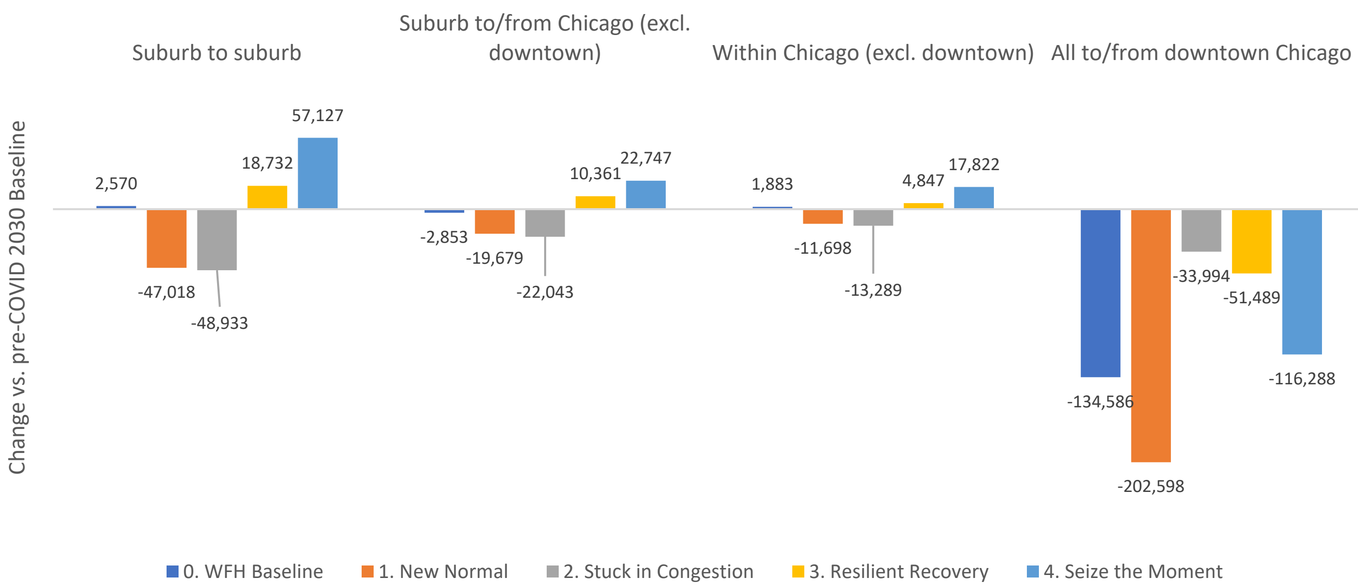
**Figure 15 Change in transit mode share by market**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

**Figure 16** shows the change in the number of average weekday transit trips by scenario, compared to the 2030 baseline scenario. The patterns are reflective of the trends in the mode share data from **Figure 15**, but highlight the fact that even small shifts in mode share mean large changes in the actual number of transit trips being conducted. For example, the New Normal scenario can expect to see the loss of about 200,000 downtown transit trips each day, versus about 50,000 in Resilient Recovery. Additionally, this chart highlights that the small increases in the suburb-to-suburb transit mode share in Resilient Recovery and Seize the Moment could mean tens of thousands of new transit riders in Chicagoland, given the absolute size of the market.

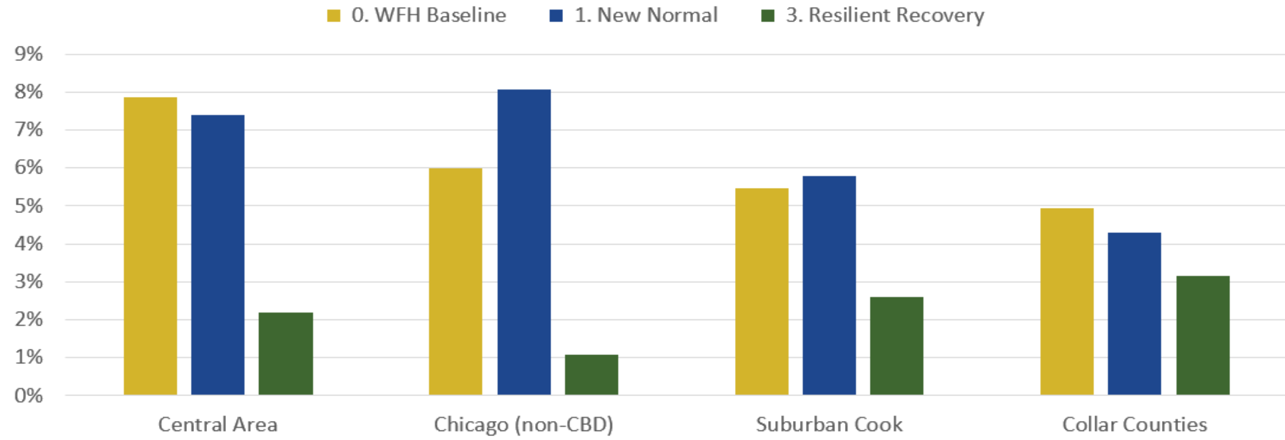
**Figure 16 Change in Number of Transit Trips by Market (versus 2030 Baseline)**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

Attributable largely to telework, transit sees about a 23% reduction for work-related trips and roughly 3% increase for all other purposes, and in all WFH Baseline, New Normal and Resilient Recovery scenarios, there will be larger share of non-work-related transit trips (**Figure 17**).

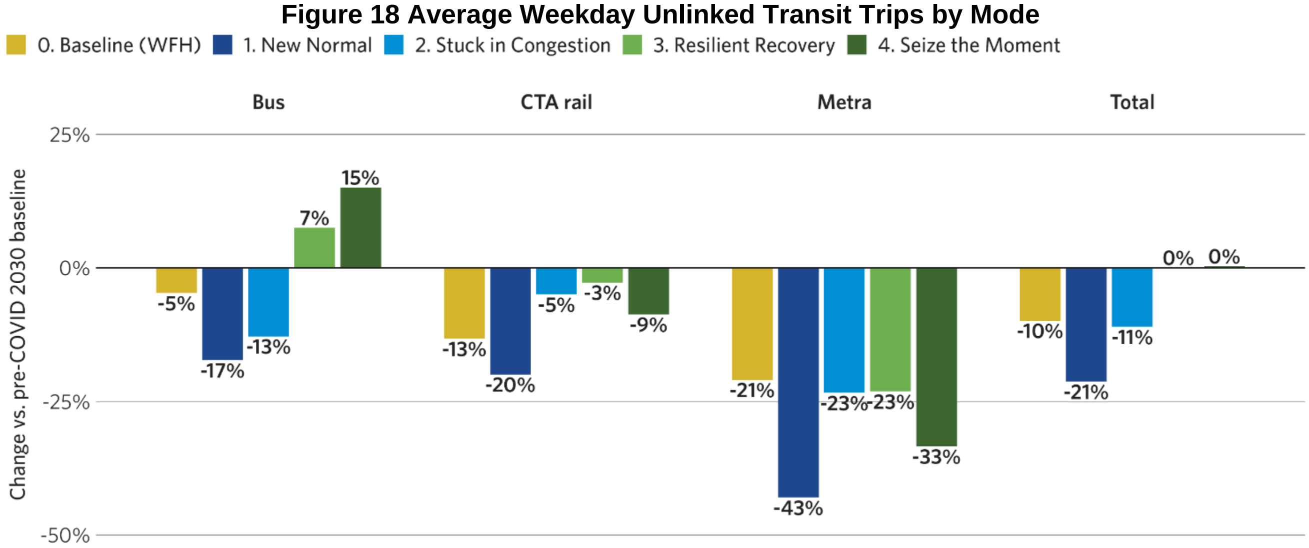
**Figure 17 HO and NH Share of Transit Trips (Compared to 2030 Baseline Conditions)**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

The impacts on transit vary across different transit agencies. Bus ridership, which includes both Pace and CTA bus service, retains the greatest share of riders. In the third and fourth scenarios, bus ridership even grows. These scenarios feature significant investments in increased transit service, with a particular focus on improved bus frequencies. Rail transit in general sees more ridership losses than buses in all scenarios, and Metra's ridership is projected to fall much farther than CTA rail's ridership (**Figure 18**). Overall, the growth in bus ridership is expected to counterbalance the fall in rail ridership to net zero in Resilient Recovery and Seize the Moment, whereas transit ridership overall will fall by 10% to 21% in Stuck in Congestion or New Normal scenarios.

**Figure 18 Average Weekday Unlinked Transit Trips by Mode**

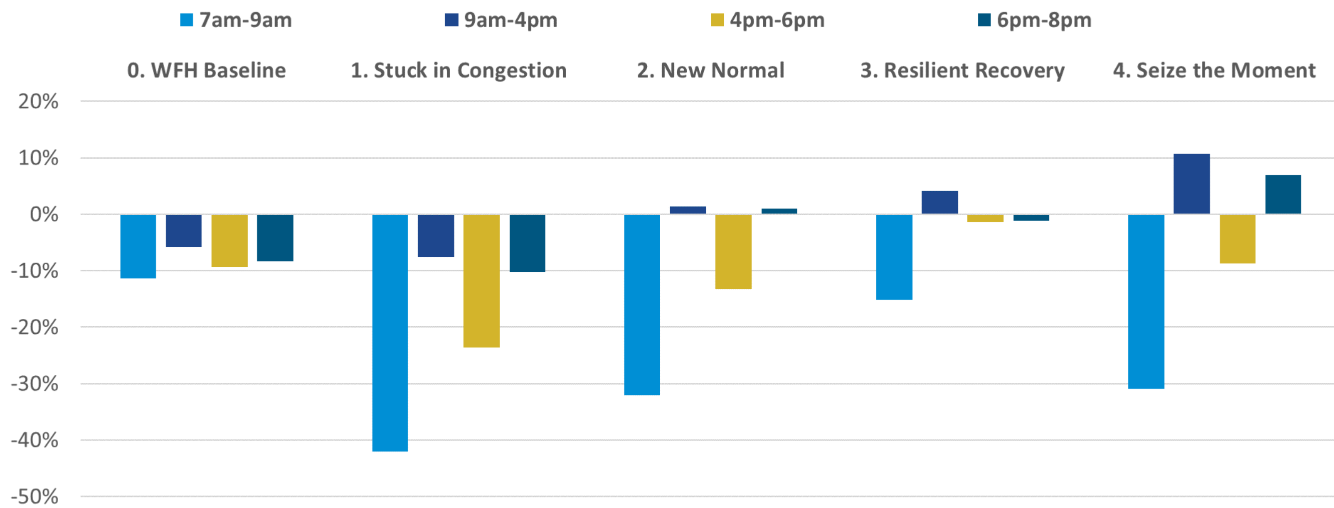



*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

CTA rail service sees greater declines than bus service, but in some scenarios maintains ridership levels nearing the pre-COVID 2030 baseline. Metra ridership sees the most significant impacts across scenarios. The WFH Baseline scenario implies a potential decline of 21%, with greater impacts possible depending on shifts in population, employment locations, and service levels throughout the region.

The most significant impacts are seen at AM peak (between 7 and 9 AM) for transit trips. There is also some increase in midday transit use in the New Normal, Resilient Recovery and Seize the Moment scenarios. Especially under the Seize the Moment scenario, daytime transit usage is expected to increase more than 10% compared to 2030 Pre-COVID Baseline conditions (**Figure 19**).

**Figure 19 Average Daily Transit Trips by Time Periods**

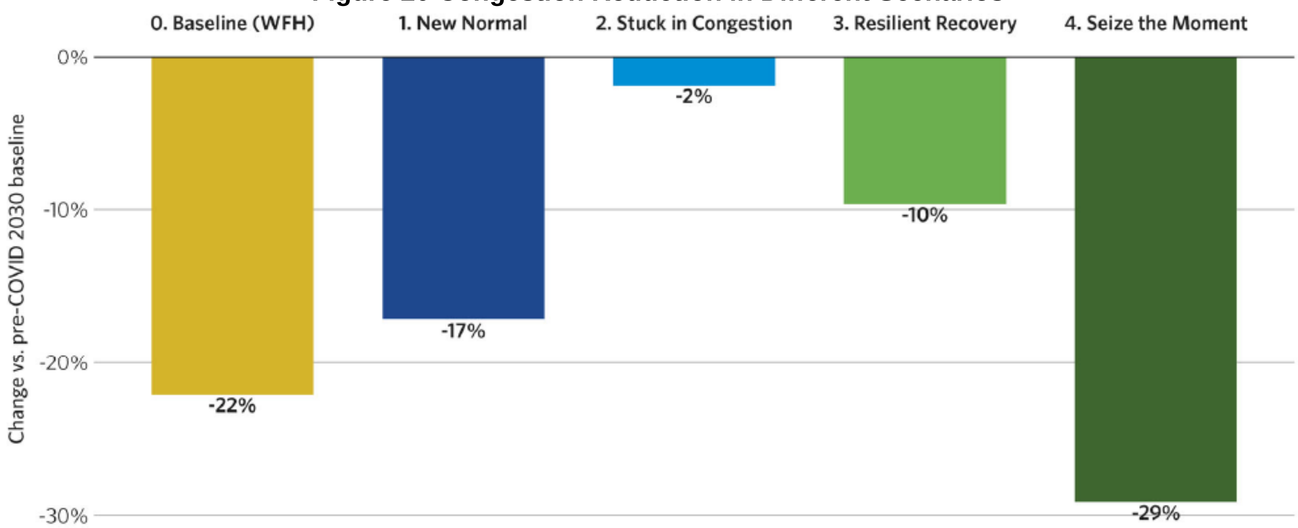



*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

## 3.5 Congestion

Fewer trips means fewer cars on the road and potentially significant drops in congestion (**Figure 20**), and the impacts vary by scenario and by region. The Seize the Moment scenario will see the largest reduction of congestion (29%) compared to the 2030 Pre-COVID Baseline conditions, followed by the WFH Baseline (22%) and New Normal (17%) scenarios. Congestion falls in all scenarios, but not uniformly. In some scenarios, significant reductions are seen, while in others, the reductions are more negligible. This overall shift masks some variation – for example, relatively less congestion during the AM and PM rush hours, and more during midday have been witnessed from the modeling results.

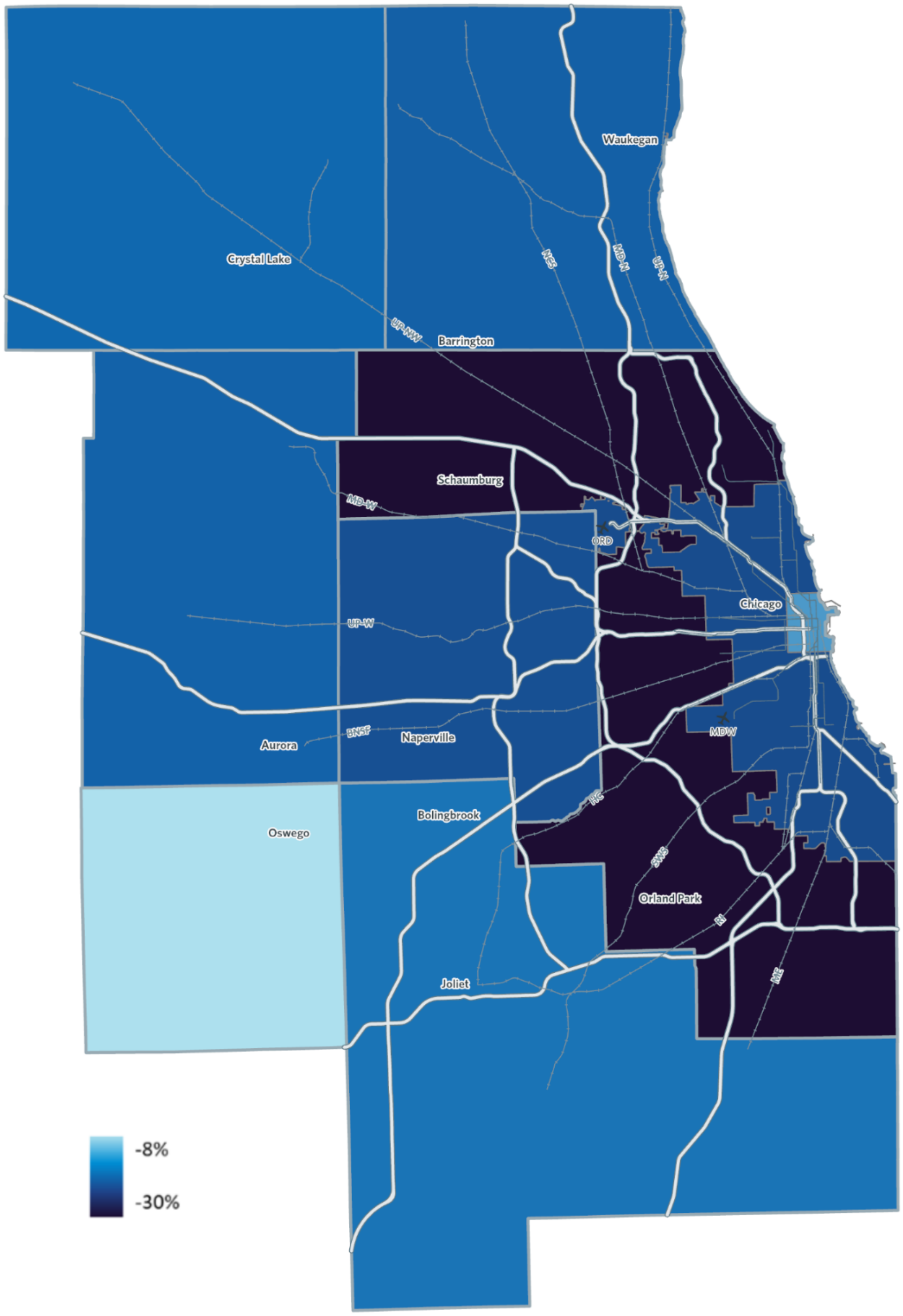
**Figure 20 Congestion Reduction in Different Scenarios**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

Geographic variation is also expected (**Figure 21**), with some places like Suburban Cook seeing the sharpest declines (30%), and others, like Kendall County and downtown Chicago, seeing significant but more modest declines (12% and 8%, respectively). In addition, Will County will see up to a 46% increase in congested VMT with new industrial and warehousing jobs. Chicago and suburban Cook see lower levels of congestion across scenarios, while Kendall, Lake, McHenry, and Will are expected to see mixed results in different scenarios.

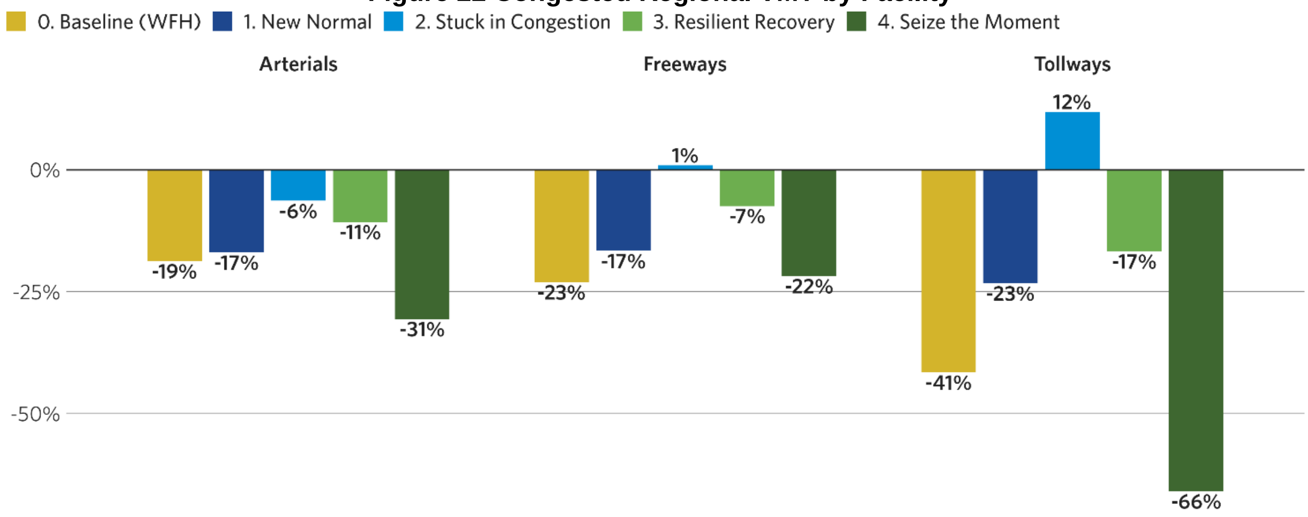
**Figure 21 Change in Congested Vehicle Miles Traveled for A High Telework Scenario**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

Congestion falls across most scenarios and facilities, largely driven by reduced WFH (yellow bar in **Figure 22** below). The only expected congested VMT increase (12%) will be under the Stuck in Congestion scenario in tollways, while under the Seize the Moment scenario, the tollway congested VMT is expected to drop more than 66%.

**Figure 22 Congested Regional VMT by Facility**

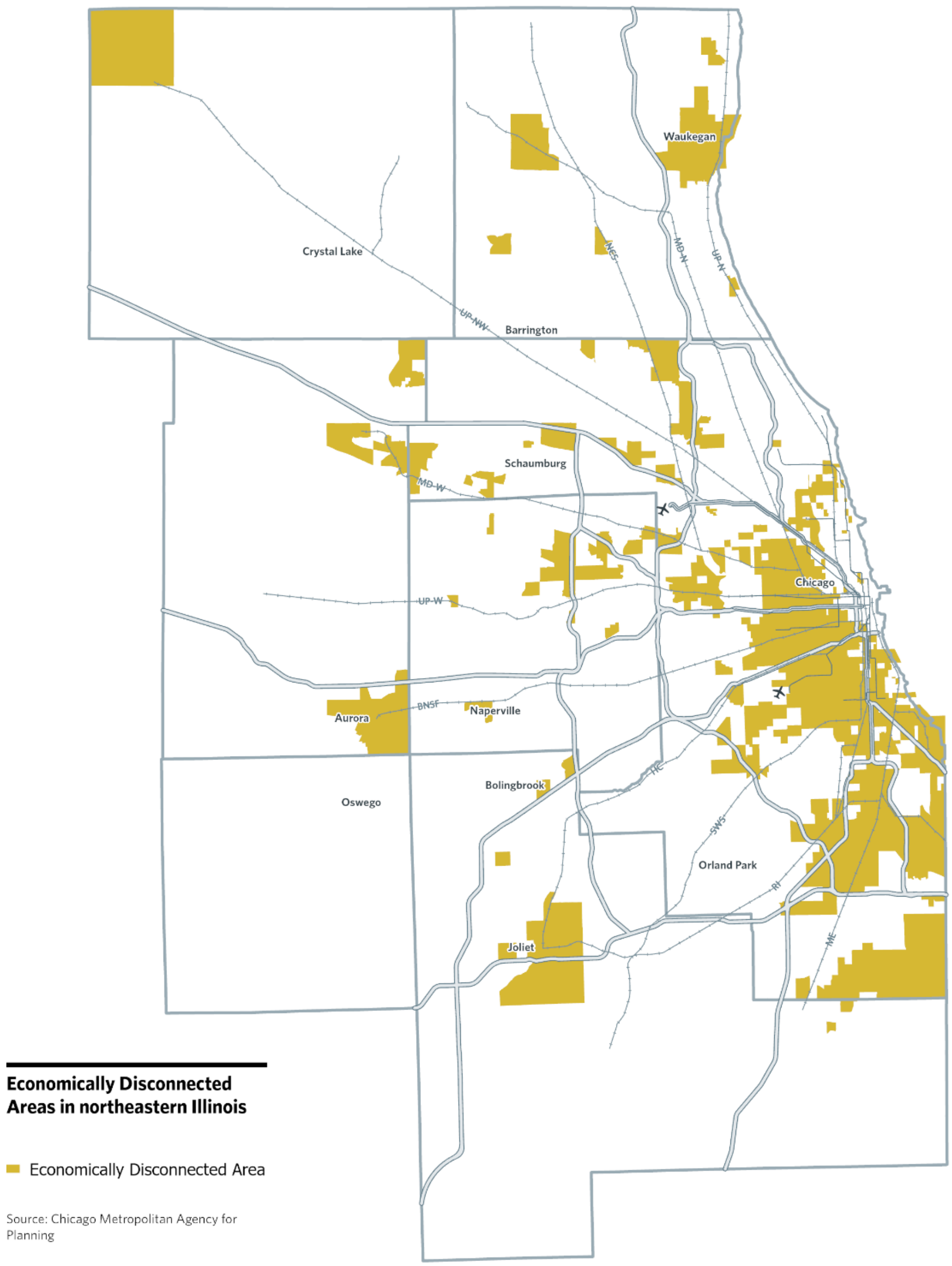



*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

# 3.6 Equity / EDA / Low Income Riders

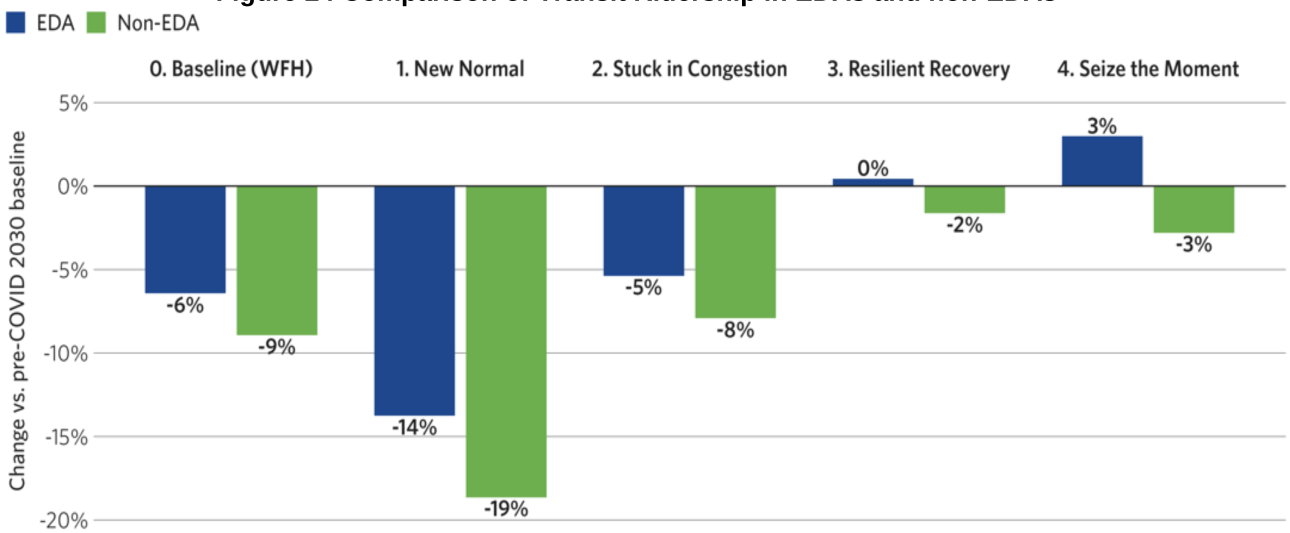
More than ever, transit is crucial to promoting a more equitable region. Transit ridership based in Economically Disconnected Areas (**Figure 23**) is less affected by telework shifts, both in Cook County and throughout the rest of northeastern Illinois. Across all scenarios, transit ridership originating in EDAs remains higher than transit ridership in the rest of the region and is projected to be more resistant to telework impacts (**Figure 24**). In the Resilient Recovery and Seize the Moment scenarios, transit ridership even grows, while overall transit ridership declines.

**Figure 23 Economically Disconnected Areas in Northeastern Illinois**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

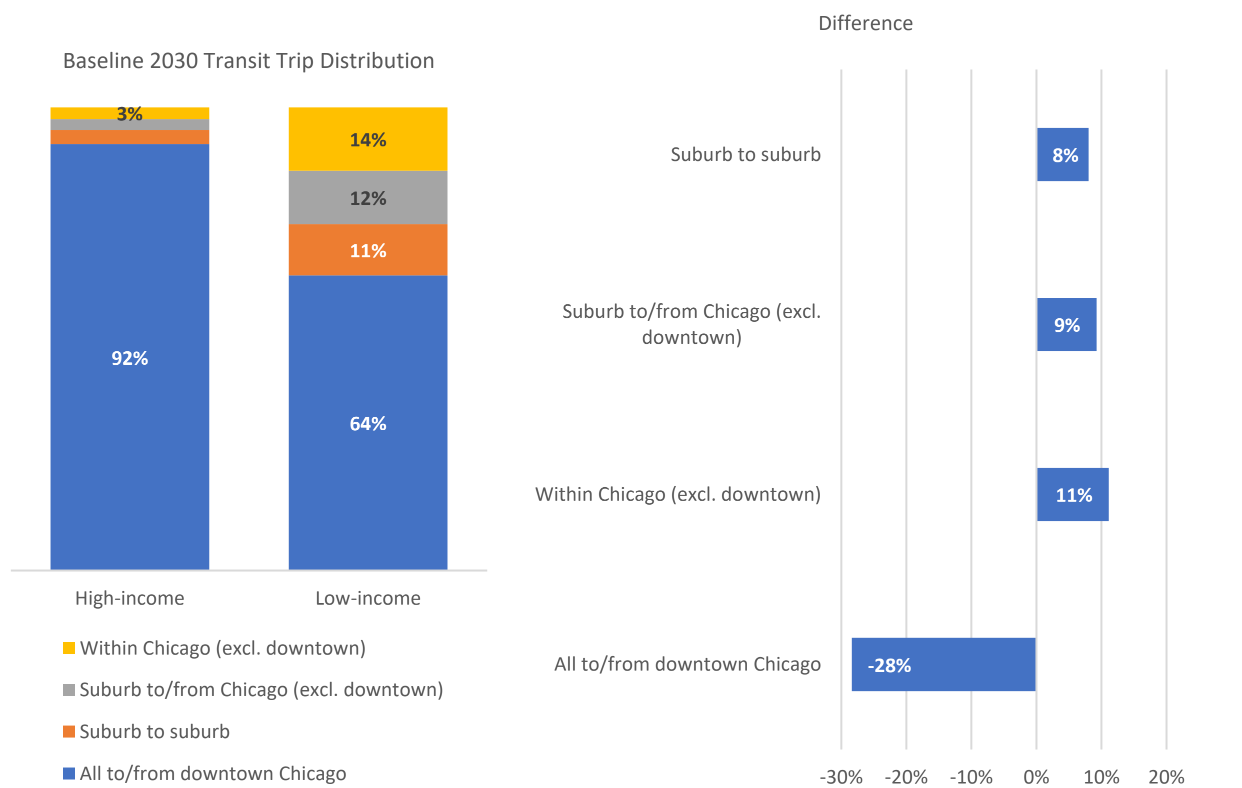
**Figure 24 Comparison of Transit Ridership in EDAs and non-EDAs**




*Note: Figures reflect linked transit trips and do not account for unlinked trips.*
*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

Low-income transit commuters are historically less CBD-centric (**Figure 25**, 64% vs. 92% for high-income riders). The 28% difference is roughly equally split over the remaining markets (suburban or Chicago-neighborhood trips).

**Figure 25 Share of Average Daily Transit Commutes by Income Level and Market**

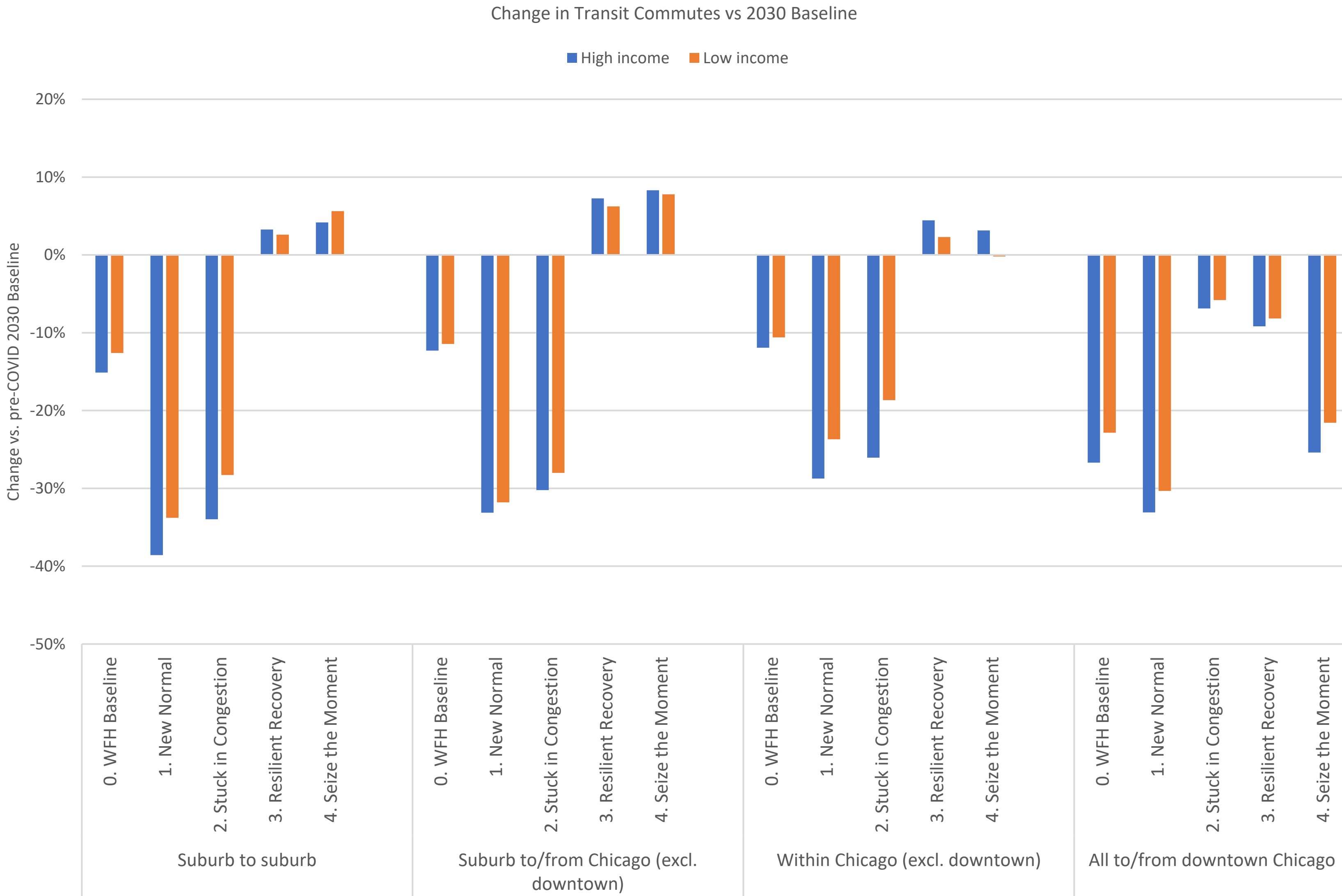



*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

Low-income transit riders are generally more likely to stick with transit than high-income passengers. For example, there is a smaller decline in trips to/from Chicago downtown for low-income riders than high income across all scenarios (**Figure 26**). One notable feature, however, is that in the non-downtown travel markets, low-income ridership is generally more resilient than high-income ridership in the pessimistic scenarios (New Normal and Stuck in Congestion) but the opposite in the optimistic scenarios (Resilient Recovery and Seize the Moment). In other words, in the pessimistic scenarios high-income rider trips fall farther, but they also grow faster in the optimistic scenarios. There are many factors influencing these changes, but one can interpret that the decreased quality of transit service in the pessimistic scenarios results in choice riders switching to other modes while lower-income riders remain dependent on transit, whereas in the positive scenarios the opposite occurs.

The share of commutes undertaken by low-income transit riders that do not include either a start or end in Chicago (i.e., transit trips on low-quality service) represents 11% of transit commutes, versus 3% for high-income transit riders in the 2030 Baseline scenario. This proportion remains the same in the WFH Baseline scenario.

**Figure 26 Change in Transit Commutes by Rider Income Level and Market, vs 2030 Baseline**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

**Figure 27** shows the change in absolute transit commutes between the 2030 Baseline and WFH Baseline (to isolate for WFH impacts) and illustrates a slightly smaller decrease in low-income transit commutes than high-income transit commutes (13% vs 15% fall). That change may not be significant enough to provide evidence of less teleworking due to lack of high-quality transit, given that there's also a smaller decrease of low-income trips to the CBD (23% vs 27%).

**Figure 27 Comparison of Change in Absolute Transit Commutes by Income, 2030 Baseline vs. WFH Baseline**

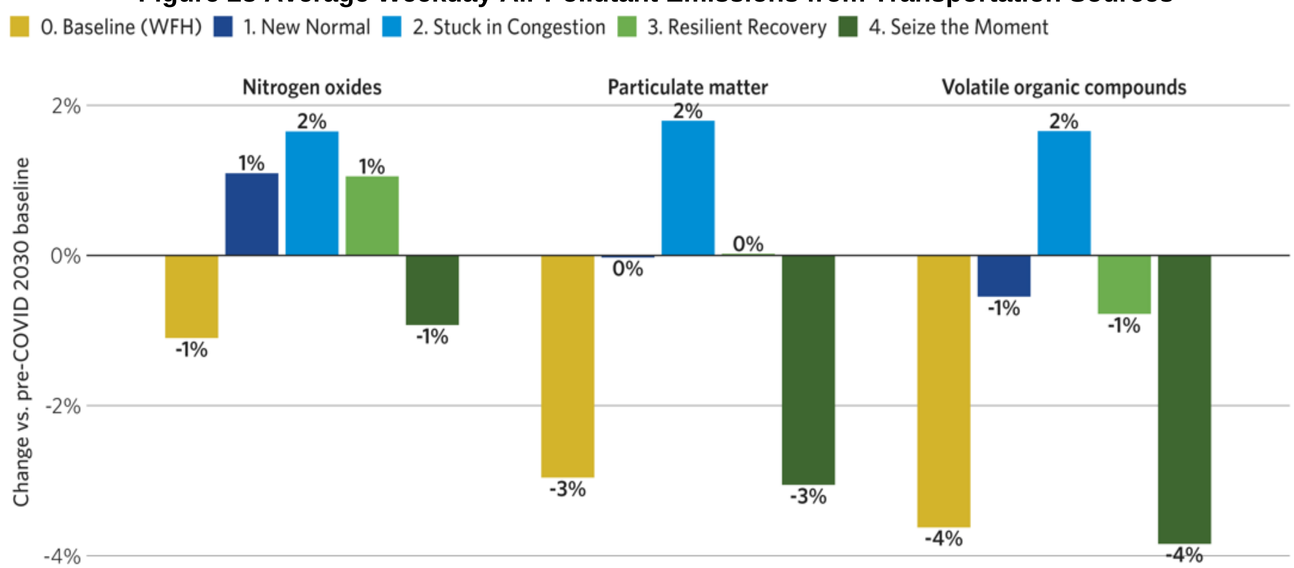
| | All to/from downtown Chicago | Suburb to suburb | Suburb to/from Chicago (excl. downtown) | Within Chicago (excl. downtown) | Grand Total |
|---|---|---|---|---|---|
| High-income | -27% | -15% | -12% | -12% | -26% |
| Low-income | -23% | -13% | -11% | -11% | -19% |

*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

## 3.7 Emissions

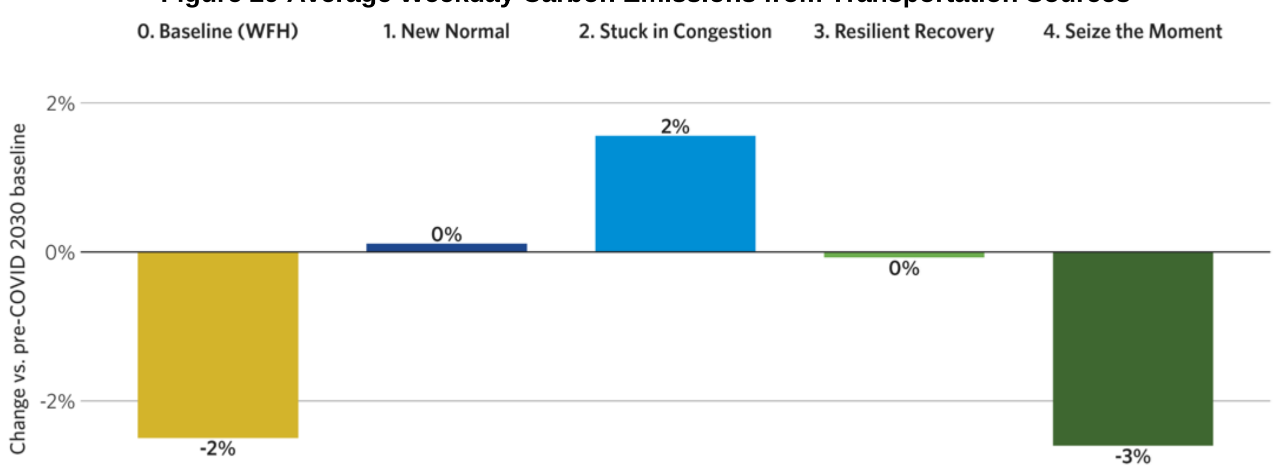
As mentioned previously, just as total VMT diverges across geographies and scenarios, air quality results also vary across scenarios (**Figure 28**). The Seize the Moment scenario will see the greatest decrease of all three kinds of air pollutant (nitrogen oxides, particulate matter, and volatile organic compounds) among all scenarios, followed by WFH Baseline scenario. The New Normal will result in a slight increase in nitrogen oxides, but also a minor decrease in volatile organic compounds. The Stuck in Congestion scenario is the only scenario that will see increases in all three types of air pollutant, all at around 2%. Similarly, WFH Baseline and Seize the Moment scenarios are both expected to see a reduction in average weekday carbon emissions from transportation sources, while Stuck in Congestion scenario will lead to a notable increase (**Figure 29**).

**Figure 28 Average Weekday Air Pollutant Emissions from Transportation Sources**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*

**Figure 29 Average Weekday Carbon Emissions from Transportation Sources**




*Source: CMAP Travel Demand Model Results, Mobility Recovery Scenarios*