

# ***Trend Accelerator***

**How COVID-19 Affects Major Trends and Forces  
Shaping The Future of Transportation**

**Report of the  
PennDOT Post-Pandemic Roundtable  
2020-2021**

***Office of the Secretary  
Yassmin Gramian, Secretary of Transportation***



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## Introduction

During the early days of the COVID-19 outbreak in America, Pennsylvania Secretary of Transportation Yassmin Gramian recognized the central importance of the transportation network in distributing the essential workers and supplies so critical to keeping people safe. In response, the Secretary directed the Department of Transportation to take extraordinary measures to transition operations to remote where possible and to adopt other COVID-safe procedures that enabled PennDOT to keep transportation in Pennsylvania close to fully functional.

Secretary Gramian also understood the consequential long-term aspects of the pandemic, and she instructed PennDOT planning staff to think about the various ways this global event could change transportation in the future, how such changes could affect Pennsylvania, and how PennDOT might prepare for and respond to them.

The PennDOT Post-Pandemic Planning Roundtable is one outcome of the Secretary's instruction. As detailed in this report, the Roundtable brought together (remotely) leading academic and practicing transportation planners and strategists to discuss with PennDOT staff a wide range of issues and trends that the pandemic has either caused or accelerated, and consider policy and program approaches to address these far-reaching changes.

Between June and December, 2020, more than 22 hours of Roundtable sessions were conducted, most of them well documented by minutes appended to this report, and these sessions were supplemented by weekly follow-up calls with the PennDOT staff to consolidate our learning and guide subsequent work.

This report is a record of that work.

## Roundtable Membership

- Prof. Michelle Beiler, Bucknell University
- Alison Premo Black, Chief Economist, American Road & Transportation Builders Association
- Prof. Stan Caldwell, Carnegie Mellon University
- Jody Holton, Assistant General Manager, Planning & Strategic Initiatives, SEPTA
- Prof. Megan Ryerson, University of Pennsylvania
- Steve Viselli, Faculty Fellow, University of Pennsylvania
- Jennifer L. Weeks, Sr. Program Officer, Planning and Travel Analysis, Transportation Research Board

## Support Staff

- Roger Cohen, PennDOT Office of the Secretary
- Leo Bagley, PennDOT Executive Deputy Secretary (Ret.)
- Andy Batson, PennDOT Bureau of Public Transportation

- Jessica Clark, PennDOT Planning Division
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- Ngani Ndimbie, PennDOT Policy Office
- Shane Rice, William Penn Fellow, PennDOT Policy Office
- John Romberger, PennDOT Bureau of Innovations (survey administration)
- Erick Shiring, Carnegie Mellon University Heinz School of Public Policy, MSPPM '21;  
Traffic 21 University Transportation Center intern

## Mission

*"The PennDOT Post-Pandemic Planning Roundtable will explore and assess various approaches that enable PennDOT to identify and understand the long-lasting and permanent effects of the pandemic on transportation demand and public travel behaviors of the post-COVID world, and to apply these scenarios to our strategic, business, program and project planning. In pursuit of this mission, we will give priority to advancing solutions that enhance equity for Pennsylvanians, build resilience into our infrastructure and services, improve safety on our network, and support financially and environmentally sustainable investment of PennDOT and other public resources."*

## Objectives

1. **Identify and evaluate potentially disruptive emerging trends and scenarios** to understand each one's probability, impact, opportunities, challenges and strategies either to promote or mitigate their development.
2. **Survey regional and local planning stakeholders** across the Commonwealth with the objective of learning how they view and think about the post-pandemic environment, and what about it concerns them most.
3. **Assess opportunities to pilot the application of sophisticated new planning tools**, such as dynamic/predictive modeling that makes use of real-time data.

## Work plan

The Roundtable's work was conducted in five phases:

1. Identification of trends that have observably emerged or quickened during the pandemic. These trends were the basis for the development of speculative scenarios for the period two-to-four years after the pandemic ends. (July-September 2020)
2. Survey of Pennsylvania's public-sector transportation planning community for their insights and perspectives regarding the scenarios and other issues they are observing. (September-October 2020).
3. Weekly Roundtable discussions exploring each scenario to better understand its possible effects on future transportation demand and travel behavior, and to identify policies and options to address such effects (August-November 2020).

4. Development of a preliminary draft report capturing the key elements of the Roundtable discussions. (December 2020-April 2021).
5. Development of recommendations to inform final report (April 2021).

## Summary of Key Findings

### **General & Cross-Cutting Issues**

- Most of the emerging developments and trends affecting the post-pandemic outlook for transportation intersect with one another, often amplifying their impact.
- The practice of transportation planning traditionally has rarely taken full account of this accelerating interaction of forces.
- Transportation agencies at all levels will need to adapt organizational structures, mindsets and practices to operate in a more integrated way of thinking about the systems they oversee and develop.
- Assumptions and projections that underlie many of the policies, plans and projects that make up PennDOT's and its constituent transportation agencies' programs may not hold up under the changed conditions of the post-pandemic world. Many should be reexamined in the face of these changes and altered as appropriate.
- New, technologically advanced tools and applications provide much more accurate and timely data regarding real-time system conditions and can more effectively predict the effects of changes across the system. We are only scratching the surface when it comes to tapping the potential of these technological breakthroughs.
- The skills required for an effective transportation workforce are growing more demanding. The role of the transportation sector in ensuring that its workforce is properly skilled will enlarge significantly.
- Several cross-cutting developments will deeply affect future transportation demand, decision-making and programs, notably: 1. climate change; 2. technological innovation; 3. workforce availability and skills; 4. equity and inclusion.
- Decision-making will grow increasingly complex as citizens and communities take on a more active role in shaping policies, plans and projects. Agencies that embrace these new voices will thrive and produce better results.
- The vision of a thriving transportation system that drives society forward toward a better future is possible and achievable, but only if it is supported by a sustained commitment at all levels to provide funding and resources to support substantial new investment.

## Major Trends

- **VMT & Travel Patterns** - Trip patterns have been changing, with more shorter trips less concentrated during the peak periods and more widely dispersed. These new patterns, if sustained, will make historic data on which travel projections are based less reliable or meaningful, and may warrant the reconsideration of projects, investment priorities and resource allocation decisions. Additionally, new tools, such as dynamic modeling, enable greater precision and timeliness in collecting and assessing data for the purpose of projecting future travel patterns and volumes.
- **Active Transportation & Safety** - Growth in numbers of cyclists and walkers also has accentuated the conflicts that invariably arise as competition for use of the existing infrastructure accelerates. Too often, this competition plays out in safety terms, with vulnerable users like cyclists and pedestrians suffering more injuries and deaths as they increase their mobility activities.
- **Micromobility** - Micromobility is a promising way to bring mobility to underserved and lower-income communities and travelers. Its appearance often brings conflicts over bikeway and sidewalk use, safety concerns and added complexity of management of the travel network. Transportation agencies, planners, and lawmakers must work with stakeholders to develop a framework for enabling micromobility to safely grow into a useful element of our mixed transportation system.
- **Transit uncertainties** - Covid-19 devastated public transit worldwide, both financially and ridership. Federal disaster assistance largely enabled transit agencies to ward off financial and operational catastrophes. Urban systems have recovered more fully than suburban and commuter services. Transit service demonstrated its indispensability in emergencies, particularly for ensuring essential workers can travel to and from their worksites. Many transit agencies are reevaluating routes, pricing and service levels to respond to lessons learned during COVID.
- **E-commerce & Supply Chains** - Recent trends in goods movement have been accelerated by COVID-19. The e-commerce explosion has particularly affected last-mile delivery systems. Freight networks were invaluable in the pandemic response. The demand has tested the network's resilience and capacity, from portside to curbside. Stresses on the logistics workforce have been acute. Automation is filling some gaps, but not necessarily meeting the needs of the workforce for higher skill levels and better working conditions.
- **Telemobility** - More than just "telework", the pandemic demonstrated that social, leisure, healthcare and commercial activities of many kinds can be carried on remotely. Behavioral changes have altered travel patterns by eliminating commutes during the daily peaks, while changing the hour, duration, distance and purpose of other trips. These changes are likely to continue, affecting not just transportation demand, but also land-use and housing patterns and the vitality of downtown business districts. Telemobility during COVID-19 underscored the gaps

and inequalities that obstruct opportunities for many Pennsylvanians.

- **Land-use, Development and Housing** – Lasting changes in land-use, development patterns and housing demand will have ramifications for the transportation network. Local and-use governance has traditionally bedeviled smart transportation planning and this disconnect may well intensify. Forecasts indicate that major central business districts may face some continuing period of moderation in congestion, with new vitality emerging in surrounding neighborhoods, suburbs and smaller hinterland cities. Less congestion in major downtown centers and their commuting arteries present opportunities to repurpose capacity, particularly to support enhanced transit services. But growing freight volumes and increasing supply-chain complexity suggest greater need for distribution facilities and logistics services, along with the intensive land-use they typically require.
- **Alternative uses of the right-of-way** - In many communities and urban neighborhoods, reduced traffic congestion enabled the streetscape to be reimagined and repurposed for new uses like outdoor dining and shopping. Other uses that remain popular after COVID\_19, , such as dedication of more capacity to meet increased demand for walking and cycling, as well as curbside pick-up and delivery, may create new stresses on existing capacity as recovery proceeds. This dynamic may prompt contention between competing interests. However, changing travel patterns could also present a unique opportunity to dedicate more roadway space to surface transit services and active transportation.
- **Aviation** – Air travel is evolving, but little focus is paid to how changes affect surface transportation. Medium-distance intercity could shift toward road and rail modes. This trend has serious implications for small-city airports, their workers and the role they play in local and regional economies. Dedicated air-freight service could present a strategy to address those shifts in demand, though the economic structure of aviation strongly militates toward centralization and agglomeration.

## Trend identification/Scenario development

The Roundtable’s work commenced in July 2020, by identifying major observable trends in transportation demand and traveler behavior that were attributable to the pandemic and were deemed by the members to have potentially lasting effects after the pandemic. In all, 11 key trends were identified, and each one subject to assessment to understand the potential lasting impacts, and to identify strategies and options that PennDOT could consider to best adapt to these changes.

- **Altered Demand for Public Transit:** Public anxiety about crowding causes fall-off in ridership, especially in the densest, most transit dependent urban centers.
- **Increased Bicycle and Pedestrian Activity:** Active transportation for shorter commutes grows, especially during mild weather months.
- **Increased micromobility:** Public acceptance, low cost drives growth in the use of micromobility devices, such as electric scooters. A growing adoption of micromobility options fills transit deserts, while presenting sidewalk and safety issues.

- **Altered Urban/Suburban Land Use Patterns and Real Estate Demand:** Young urban professionals seek lower density, more space for telework, driving development outward.
- **Growing Telework:** More residents teleworking results in fewer commutes and a reduced need to congregate in central business districts.
- **E-commerce and Delivery Growth:** Increased growth puts more small- mid trucks on road and curbside, placing pressure on brick-and-mortar downtown and mall retail outlets.
- **Shift from Air to Vehicle Miles:** Travelers avoid plane travel, resulting in the increased use of personal automobiles for leisure travel.
- **Reconfiguration of Supply Chain:** Growing US-China tension, trade protectionism and supply anxiety cause producers and distributors to build supply-chain redundancy, especially domestically.
- **Demand for Alternate Use of Rights-of-Way (ROW):** Use of ROW for pedestrians, cyclists, outdoor dining and other outside uses increases, creating congestion, contention and safety issues.
- **Change in Vehicle Miles Traveled (VMT) Across the Roadway Network:** Persistent economic weakness puts downward pressure on overall transportation demand, causing a decrease in VMT.
- **Increase in Aggressive Driving Behavior:** Despite a reduction in Vehicle Miles Traveled, aggressive driving and crash rates increase.

## Survey results and analysis

In collaboration with PennDOT's Bureau of Innovation (BOI), the Roundtable developed a survey to solicit input from our planning partners and stakeholders across the commonwealth on trends emerging from the COVID-19 pandemic. Approximately 120 partners were invited to participate and 64 responded.

Responses by type of organization are as follows:

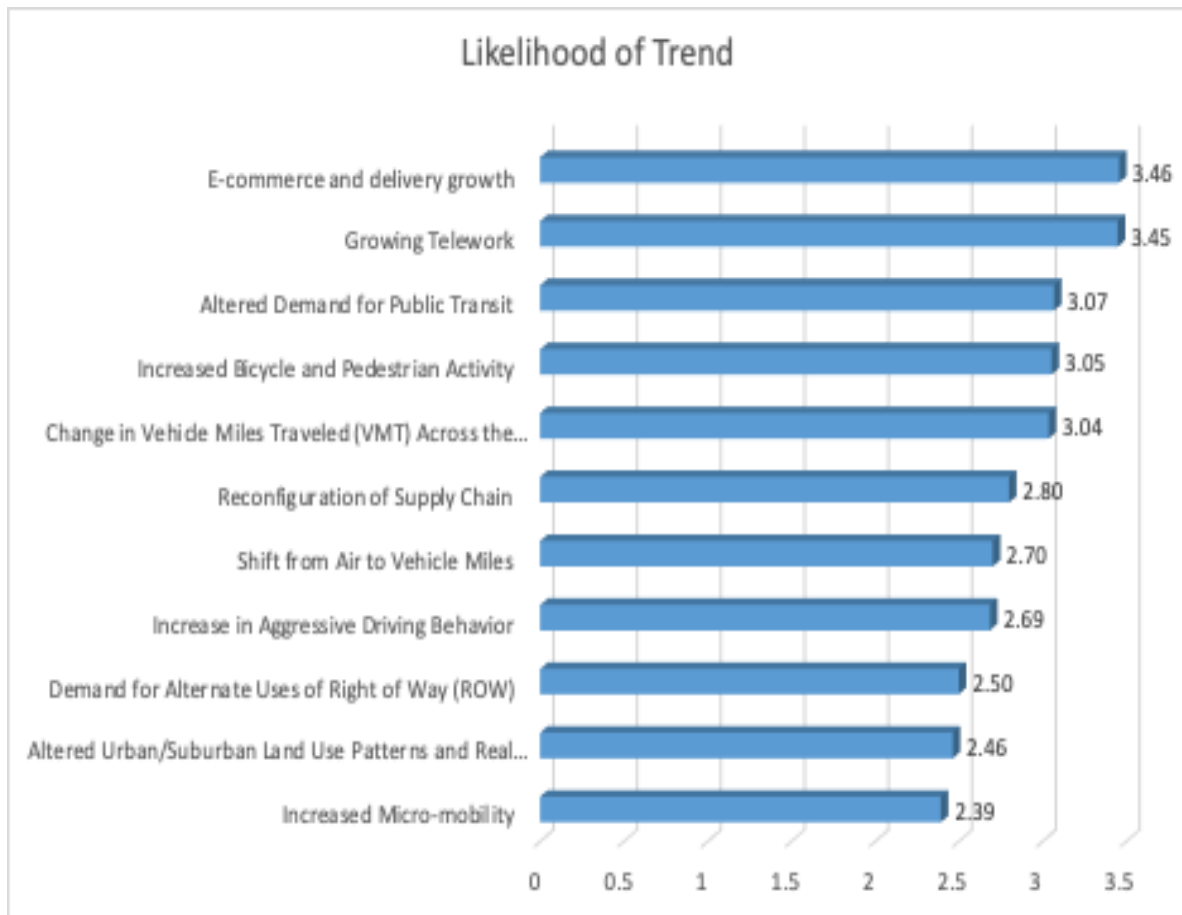
Metropolitan Planning Organization (MPO)	35.71%
Rural Planning Organization (RPO)	4.76%
City Planning Department/Agency/Organization	2.38%
County Planning Department/Agency/Organization	26.19%



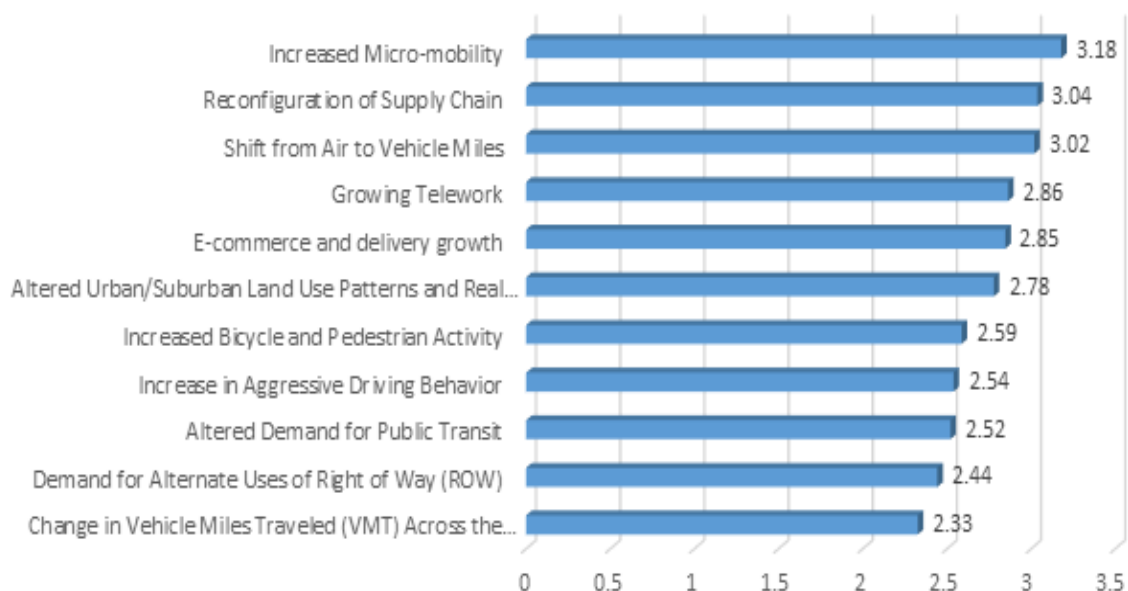
Public Transit Agency/Authority/Organization	23.81%
Other (please specify)	7.14%

The first two questions of the survey asked respondents to rate each trend based on the perceived probability and impact to their geographic region over the next 24-48 months. The responses were then used to populate a probability/impact matrix tool in order to determine which trends were viewed as highest priorities and identify strategies to address them.

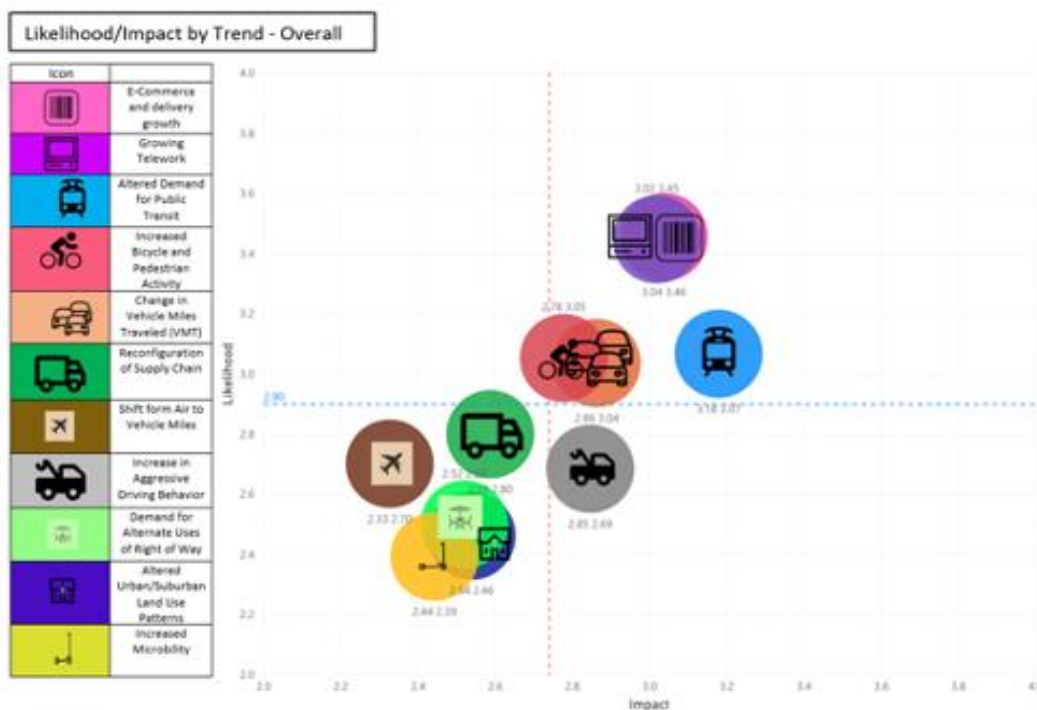
Survey results are provided in the following charts:



## Impact of Trend



When combined and weighted for cumulative likelihood and impact, e-commerce growth and increased telework stood out equally among the survey respondents above all other scenarios.

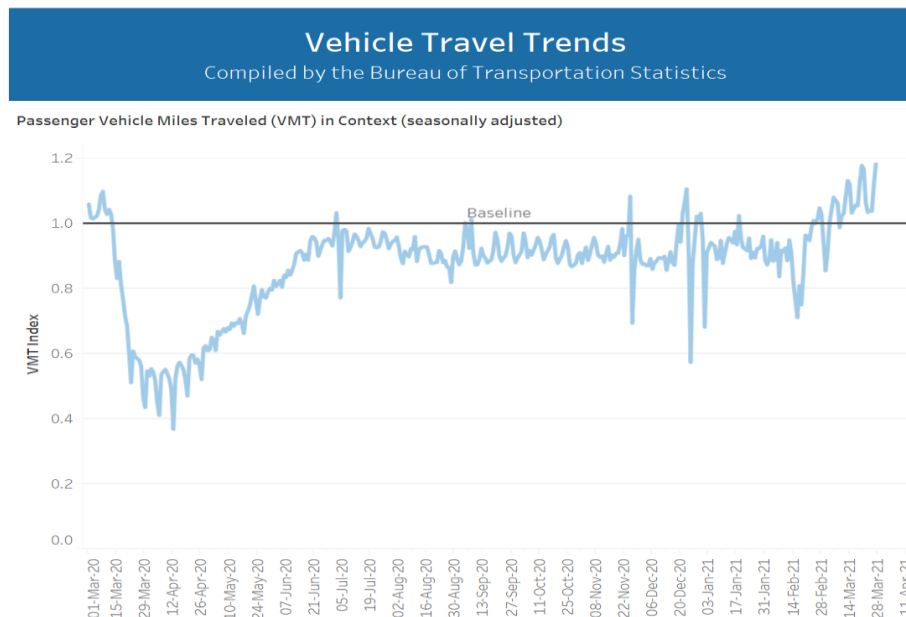


## Trend and scenario observations

Informed by the survey results and other data, the Roundtable discussed each trend in depth to better understand its impacts, likelihood of having lasting effects, and policy options to address their continuing emergence. Highlights of those discussions follow below.

### **Scenario: Shifts in Passenger Vehicle Miles Traveled and Trip Patterns**

**Summary:** Future passenger vehicle travel volumes and patterns are yet unknown, subject to a multiplicity of forces (of which some of the major ones were examined by the Roundtable). Moreover, these conditions continue to evolve in complex and various directions. However, more clarity and understanding of the possible trends gradually emerged over the course of the pandemic, as society adjusted to the altered conditions brought on by the public health emergency. Following the initial phase of lockdowns, resulting in deep reductions in volumes, VMT recovered nationally at between 80-to-90 percent of the pre-pandemic normal. Significantly, trip patterns have been changing, with more shorter trips less concentrated during the peak periods and more widely dispersed. These new patterns, if sustained, will make historic data on which travel projections are based less reliable or meaningful, and may warrant the reconsideration of projects, investment priorities and resource allocation decisions. Additionally, new tools, such as dynamic modeling, enable greater precision and timeliness in collecting and assessing data for the purpose of projecting future travel patterns and volumes. Project plans should be assessed in light of these advances.



#### **Discussion highlights:**

- Based on MPO data on VMT, state traffic counts dropped sharply in March and April but largely recovered by August (about 85% of pre-COVID volumes), but patterns are different. Downtowns

are not experiencing the same traffic congestion as many trips are made at different times than in the past.

- Telemobility – and the work-and-lifestyle changes it enables – may have greater effect on trip-making patterns, without affecting VMT in the aggregate. People may make shorter trips, yet make them more frequently and at all hours.
- Continued explosive growth of e-commerce, with its replacement of shopping trips with last-mile delivery trips will put more delivery vehicles on residential streets, while relieving congestion around retail hubs.
- For major corridors feeding large downtowns, these shifting patterns may beneficially affect operations and asset management. Impacts on congestion and capacity designed for peak loads that now exceed actual volumes warrant deeper study, better data and new modeling tools to be better understood.
- There are uncertainties with respect to how VMT changes may affect revenue from the gas tax and tolling, and what that might mean for alternative revenue-generation strategies, including the phased elimination of the gas tax.
- For example, if reductions in peak-hour flows to and from major downtowns are sustained, cordon-based pricing (as in London or proposed for New York City) would be less effective, either for congestion management or revenue generation, while simultaneously drawing ridership off transit in favor of faster, less congested auto commutes.
- Similarly, customary peak-period bottlenecks may be less intense, forestalling the need for expensive capacity expansion.
- Even moderate reductions in peak-period volumes may warrant planning organizations to reassess projects in light of shifting mobility demand.
- Performance metrics relying on historic data now of dubious predictive value should also be reexamined. New patterns of travel demand present opportunities to move from primary reliance on traditional mobility performance measures, such as level-of-service (LOS), to accessibility measures that reflect the effect of travel on markets.
- For example, maintaining the LOS standard calculated for peak volumes no longer present would create obstacles to emerging mobility solutions like transit prioritization, bike lanes or pedestrian safety enhancements that reflect changes in how users view their mobility preferences, options and decisions.

- Shorter, more frequent trip-making could be enhanced and fostered by the increasing use of alternative modes like cycling, walking and micromobility, when seasonable, and transit year-round.
- Trip dispersion also could mean increased car dependence, with all the sustainability and equity impacts that are inherent in the existing car-centric transportation model.

#### **Recommendations:**

1. Major projects based on historic traffic data should be evaluated to determine if change conditions warrant rescoping.
2. New predictive and dynamic modeling tools should be adopted by PennDOT and its regional planning partners to ensure timely and relevant data regarding volumes, trip times, frequency and distance is being collected and is applied to better understand how factors interrelate and changes affect outcomes.
3. PennDOT should engage with FHWA, AASHTO, NACTO, planning partners and local officials and citizens to reassess key performance measures in light of changed and evolving conditions. Specifically, traditional measures such as Levels of Service should be reviewed and rebalanced in relation to new patterns or roadway use, new demands on the right-of-way, and emerging priorities such social equity, climate mitigation and resilience.

#### **Scenario: Active Transportation growth**

**Summary:** Cycling and walking have long been favored mobility options for their affordability, flexibility, and positive effects on health and wellbeing. During the Covid-19 pandemic, both cycling and walking reconfirmed their lasting societal and personal value, providing travel options that are relatively safe and available to people of all ages and economic status. During 2020, both walking and cycling grew vigorously. In the case of one popular Philadelphia bike corridor, recorded use grew almost five-fold. As the nation's ninth "oldest" state by median age, Pennsylvania stands to capture valuable mobility benefits by ensuring that this trend is supported by continuing investments and policies that promote active transportation. With almost half of all car trips less than three miles -- hence within cycling or walking distance -- increased Active Transportation can help reduce traffic volume. Even small marginal reductions at the peak have potential to obviate the need for costly capacity expansions.

However, the growth in numbers of cyclists and walkers also has accentuated the conflicts that invariably arise as competition for use of the existing infrastructure accelerates. Too often, this competition plays out in safety terms, with vulnerable users like cyclists and pedestrians suffering more injuries and deaths as they increase their mobility activities. This negative trend has been amplified during the pandemic as reduced traffic volumes have been accompanied by increases in driving speeds.

### Percentage of Americans with drivers' licenses by age

AGE GROUP	% LICENSED DRIVERS
All ages	84.1%
16 to 19	34.8%
20 to 24	80.8%
25 to 49	90.1%
50 to 69	93.5%
70 to 84	84.9%
85 and older	60.1%

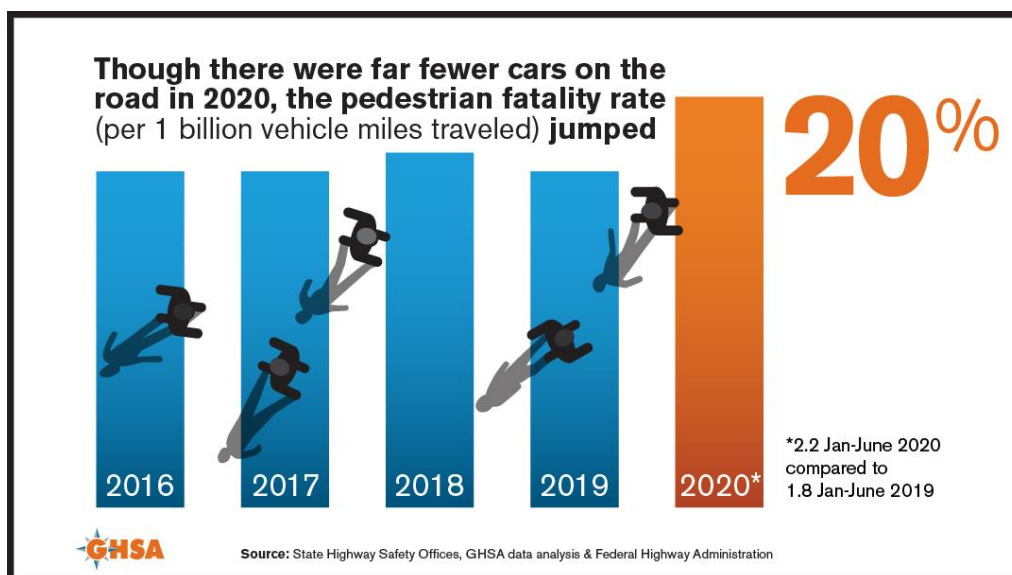
Source: [https://hedgescompany.com/blog/2018/10/number-of-licensed-drivers-usa/#percentage\\_of\\_americans\\_with\\_drivers\\_licenses\\_by\\_age](https://hedgescompany.com/blog/2018/10/number-of-licensed-drivers-usa/#percentage_of_americans_with_drivers_licenses_by_age)

### Discussion highlights:

- Large share (about one-eighth) of driving-age Americans is unlicensed to operate a motor vehicle. Their mobility is uniquely dependent on three particular travel modes: transit, ride hail and active mobility, eg, cycling and walking. This cohort will grow as the Baby Boom generation grows elderly.
- Partially as a result of these transportation users paying little toward the capital, operating and maintenance costs of the systems they use, their influence in shaping the infrastructure and investment decisions has been historically diluted. Although their increasingly effective advocacy has begun to redress that imbalance, these users' claims on access to the right-of-way have been treated by decision-makers as secondary to other vehicular uses.
- Wide and growing recognition of the individual, community and public health benefits of active mobility: 1. Biking and walking are amenable to solo or socially-distant practice; 2: The documented advantages of biking and walking for heart, vascular, respiratory and mental health strengthen individual and community resistance to future airborne viral outbreaks; 3. Active mobility supports neighborhood vitality; 4. Reduction in vehicular trips reduces congestion and emissions.
- Increased cycling, in combination with a rapidly diversifying profile of vehicle types -- from larger passenger vehicles to new micromobility devices -- on the roadways create growing conflict with

vehicles and safety hazards. Increase in walking creates conflict and safety issues with both motor vehicles and (much less in magnitude) bikes.

- PA Environmental Commission notes that trail usage is up by between 100-200%, DCNR says state park usage is up by 130% in 2020. Bike sales through the roof. Bike share and city bike demands are exceeding supplies during seasonable weather.
- Bike/ped growth can positively affect low-income communities: health; access to education, employment, economic opportunity; connections to transit to support ridership recovery
- Changing trip patterns – shorter, more frequent, off-peak – and development patterns centered on neighborhood shopping could further increase walking activity.
- Cycling trails are well-suited to address some of the mobility needs that are particular to rural dwellers.
- PennDOT has made great progress in fostering active transportation: Bike/ped coordinator; AT Plan; PennDOT Connects; collaborations with sister agencies, including the departments of Conservation & Natural Resources, Health, and Community & Economic Development.
- Connected vehicle and smart roadway technologies offer potential to improve safety of cyclists and walkers, through sensors and applications such as forward collision warning.
- Challenges include frustrations of local authorities to lower speeds; cyclist/pedestrian conflicts; Major challenge of bike lane maintenance; new and additional uses of Right-of-Way squeeze capacity available to allocate for bike lanes, sidewalks and crossings.
- Active transportation growth during pandemic focuses attention on the conflicts surrounding new and diverse uses of the roadway, and the competing interests and influence of new users relative to incumbents. (These issues were also discussed in depth in the section below dealing with the scenario of growing demand for alternative uses of the right-of-way.)
- Cyclist and pedestrian fatalities and injuries have grown over the last decade; pedestrian deaths have increased nine times faster than all other traffic fatalities -- and this trend has accelerated during the pandemic.



Source: Governor's Highway Safety Association, 2021

### Recommendations:

1. PennDOT should expand and build upon the successes of the PennDOT Connects initiative.
2. PennDOT should increase the resources and assistance to localities to implement proven strategies to reduce conflicts between motorized and non-motorized users of the roadway, including speed-reduction measures.
3. Trails and bikeways that connect neighborhoods and communities, both in rural and urban settings, should be developed and improved in collaboration with the sister Commonwealth agencies (Departments of Conservation & Natural Resources (DCNR) and Community & Economic Development), local government and community-based organizations.
4. PennDOT and localities should explore innovative funding mechanisms to enable users of Active Transportation facilities to contribute to their development, operation and maintenance, thereby amplifying such users' stake and voice in resource allocation decision-making.
5. PennDOT should encourage Connected Vehicle and Smart Infrastructure applications targeted to protecting the safety of non-motorized travelers.

### Scenario: Micromobility

**Summary:** Micromobility -- electric scooters, e-bikes and other small devices designed for personal use - burst upon the roadways of North American cities during the last decade and proved useful as a flexible mobility option during the pandemic. These devices have expanded the travel range of users who may not have means or access to vehicle or transit services. Micromobility is particularly promising as a way to bring mobility to underserved and lower-income communities and travelers. Their



appearance, largely unregulated and of uncertain legality in many jurisdictions, including Pennsylvania, often brings with it conflicts over bikeway and sidewalk use, safety concerns and added complexity of management of the travel network. Their popularity with people who cannot or choose not to drive a car suggests that the issues they present cannot be ushered away, and transportation agencies, planners, and lawmakers must work with stakeholders to develop a framework for enabling micromobility to safely grow into a useful emerging element of our mixed transportation system.



*Signage posted in Arlington, VA, limits sidewalk riding.*

#### **Discussion highlights:**

- Significant growth during the pandemic in the use and variety of micromobility for personal mobility
- Reliable data is hard to come by, but technology can be used to collect data regarding how these new devices are being used.
- Some communities see potential electric scooter and e-bike sharing as having potential as a COVID recovery strategy and a resiliency strategy to address future disruptions.
- Major unsolved challenges include liability, safety, user training/certification, conflicts with other vulnerable users of the right-of-way.
- E-scooters are not legal in PA. There is proposed legislation to permit certain micromobility devices, but insurance is a significant barrier. The General Assembly is looking to require scooter companies to carry insurance to protect people or property that are injured or damaged in a crash.

- Connected vehicle technology linking devices to the infrastructure and other road users may improve safety significantly and potentially smooth over conflicts.
- Accommodating new mobility devices imposes maintenance requirements that must be identified, and their costs understood and accounted for. Maintenance responsibilities can impose additional liability on infrastructure owner-operators.
- PennDOT is not of one mind regarding growth of this new mode. PA communities are also divided. Pittsburgh is more welcoming; Philadelphia strongly opposed. Unknown, smaller cities and communities across the Commonwealth?
- With nearly half of all trips using micromobility devices three miles or less, micromobility technologies represent a strategy to reduce short car trips.
- Micromobility can feed transit by connecting to stops and stations, serving as a first/last mile solution.
- Promising potential to fill mobility gaps in underserved communities and transit deserts. It is a uniquely affordable, albeit seasonal, mobility solution.
- Micromobility also extends beyond the urban core in PA to rural areas, where ATV use is popular. More data and better understanding is needed as to how ATVs are being used and on what infrastructure are they permitted: bike lanes, roadways, bike trails? What safety and mobility issues arise through wider ATV use?

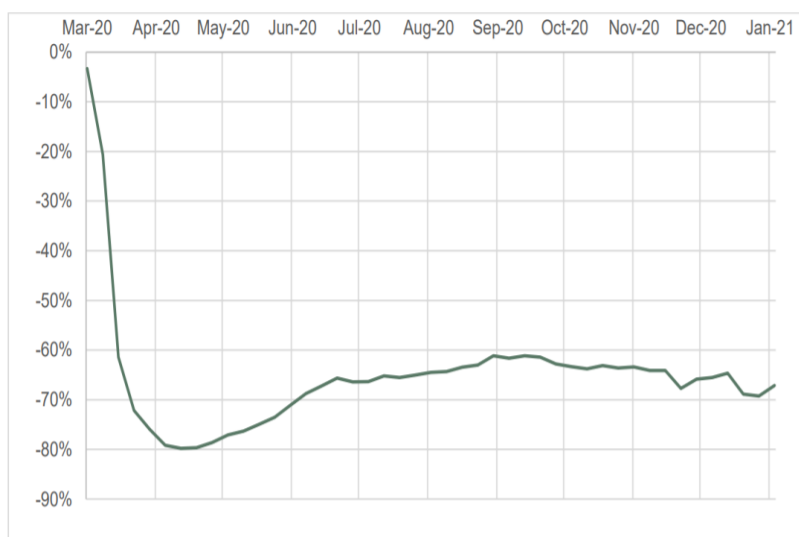
#### **Recommendations:**

1. PennDOT and the General Assembly should work with local government, the private sector and citizens to develop a legal framework that enables micromobility devices to be used legally and safely in Pennsylvania.
2. Opt-in/opt-out for localities
3. Safety standards and best usage practices for micromobility devices should be developed nationally.
4. Operators of fleets of public hire should contribute to the development, operation and maintenance of bicycle and pedestrian facilities.
5. Federal and state highway safety funding can be dedicated to education, enforcement and engineering solutions to improve safety for device users and others who are vulnerable.

## Scenario: Transit Uncertainty

**Summary:** COVID-19 devastated public transit worldwide, both financially and in terms of ridership. Pennsylvania's two major systems, SEPTA and Port Authority of Allegheny County, were still experiencing ridership declines of 61 and 67 percent, respectively, by year-end, 2020. These losses were felt immediately as the pandemic struck and lockdowns were implemented. In April 2020, SEPTA's transit network experienced temporary ridership declines of up to 90%. Ridership declined almost 99% on SEPTA's sprawling regional rail network, which has historically catered to traditional nine-to-five office jobs that were largely relegated to working-from-home. Buses, trolleys, and subways recovered more quickly - carrying essential workers and those who cannot work remotely. This recovery was not as did not as vigorous as other transportation modes. By April 2021, ridership recovery at SEPTA was approaching 40 percent, recording a daily operating loss to the system of about \$1million. At the same time, public transit demonstrated its indispensability and critical importance to public safety by ensuring that essential workers, including health-care providers, first responders and transit workers themselves, were able to get to work. Federal emergency aid largely ensured that the financial losses threatening the agencies were covered. Some transit systems have taken the opportunity to reevaluate routes and service levels to adapt to potentially lasting changes in ridership volumes and travel patterns, including the potential for permanently altered peak commuter periods. Better communication, including technology-enabled enhancements to customer service, such as contactless payment and boarding, and mobile apps giving users real-time locator and crowding information, offer opportunities for improved service quality and renewed user confidence in the safety, reliability and convenience of transit use, while making the systems more welcoming for new riders.

### US Public Transit Ridership During COVID-19



Source: APTA Ridership Trends Dashboard powered by Transit, January 2021, <https://transitapp.com/APTA>.

### Discussion highlights:

- Transit service proved indispensable in COVID response. For many urban essential workers – especially in health care – transit was often the only option for travel to work.
- Permanent telework and a slow or diminished return to downtown offices and quieter CBD would affect transit usage, both peak and total volumes.
- Rider perceptions regarding personal safety, in particular during low-volume periods, could affect transit recovery.
- Transit may be shifting from commuter based, peak oriented service to a more consistent schedule that spreads service more evenly across the day and night, which will more conveniently serve all types of trips - essential employers with a variety of shifts, grocery store visits, medical appointments, entertainment, etc.
- Regional rail as currently conceived – a major mode for peak commute-to-work trips between downtown and suburbs—will be vulnerable to changing trip patterns and increased full-time or partial work-at-home employment.
- New fare options including discount and multi-day ticketing plans are being reviewed and revised to reflect new patterns in worker schedules and work locations.
- Apps that enable contact-free boarding and fare-collection, on-board crowding and time-of-arrival information are valued by ridership, but also raise equity concerns regarding riders for whom these services are unaffordable or unavailable.
- PennDOT is developing its statewide trip planning app (SEPTA and Port Authority have existing stand-alone apps which will not be integrated into PennDOT) which will allow for real-time service information (e.g., where is my bus and when will it arrive) across the Commonwealth.
- SEPTA, Port Authority and other major metropolitan systems are reviewing changes in demand and planning service adjustments to meet emerging needs. Third shift workers are especially transit dependent, and likely to be affected by service adjustments.
- SEPTA effort underway to identify potential for additional dedicated bus lanes.
- SEPTA's operating budget for FY-2022 extends fare relief programs enacted during the pandemic, including one free transfer per trip on rapid-transit modes, free rides for children 11

and under, and new three-day passes.

- Micromobility, ride-hailing, and mobility-on-demand services can be designed to supplement and support transit ridership and feed systems, by investing in secure bike parking and available charging facilities for electric-powered devices.
- New on-demand transit models are well suited to extend services to areas of limited service or low ridership.
- More research is necessary to understand intersections between these new models that can enhance transit service, and conversely what circumstances can undermine transit.
- Issues facing smaller systems and those serving rural regions are unlike those of the urban systems. Have curtailed services. More data is needed to understand these changes.
- Most rural systems – even those that have consolidated—typically do not cross county lines. Intercity bus travel remains inadequate and largely unaddressed.
- Challenge of enlisting transit workforce in developing and implementing new approaches and technologies.
- The traditional focus of measuring transit system performance is ridership, but this may change. – or at least be viewed in a wider context. There’s an opportunity for a more nuanced focus, as higher costs to carry fewer riders, yet they may be going more places and different times than in past. These changing patterns of use open opportunities for a more value-based and equity-based approach to performance measurement.
- making transit useful for "all types of trips", this entails retaining frequencies and all-day services, and avoiding the trap of pegging ourselves to peak commuter traffic. Successful transit provides flexible mobility no matter when. At SEPTA, this has been termed "lifestyle transit" and it is a primary goal of many of SEPTA projects of significance.
- APTA’s post-pandemic report offers useful guidance on best practices:
  - DATA TECHNOLOGY:
    - Use data and new technology for operators to track individual vehicle occupancy rates and adjust loading, as needed.
    - Incorporating occupancy data into apps and websites to inform riders of real-time crowding conditions.
  - RIDER COMMUNICATIONS:

- Communicating service changes, rider etiquette, and agency efforts regarding cleaning and prevention. This can be done through dedicated websites, press, tweets, and other social media posts.
- Encouraging riders to take responsibility for their own and others' health by wearing face coverings, cleaning hands, minimizing conversation while aboard transit, and avoiding transit if they are or suspect they are infected. [Face covering has since been mandated nationally for all transit vehicles for the duration of the pandemic]
- Restore rider confidence in the transit system by promoting the relative safety of transit and mitigation measures being instituted.
- Reach riders that have not yet returned to public transit via public service announcements.

**SERVICE ADJUSTMENTS:**

- Restoring service to modified pre-COVID levels, to meet increasing demand while allowing for limited passenger loads.
- On low-performing routes, shifting to demand response service or suspending service until conditions warrant reopening.
- Designating vehicles and operators on standby, to be dispatched per real-time feedback from the field about overcrowded vehicles and/or passengers who are left behind.

**Recommendations:**

1. Transit planning should focus on avoiding the trap of being viewed by the traveling public as being primarily oriented to serving the peak-commuter ridership and must work to make transit useful for "all types of trips" by retaining frequencies and round-the-clock service.
2. Transit agencies should partner with new mobility providers like ride-share, bike-share, micromobility and shuttle services to integrate traditional service into the "complete trip" experience.
3. Use new data and advanced analytics tools to better plan and modify routes and schedules to rider needs and preferences. In addition, real-time response to operating conditions can improve service reliability and adherence to schedules.
4. Provide service that is more evenly spread across the day and night, which will more conveniently serve all types of trips - essential employers with a variety of shifts, grocery store visits, medical appointments, entertainment, etc.

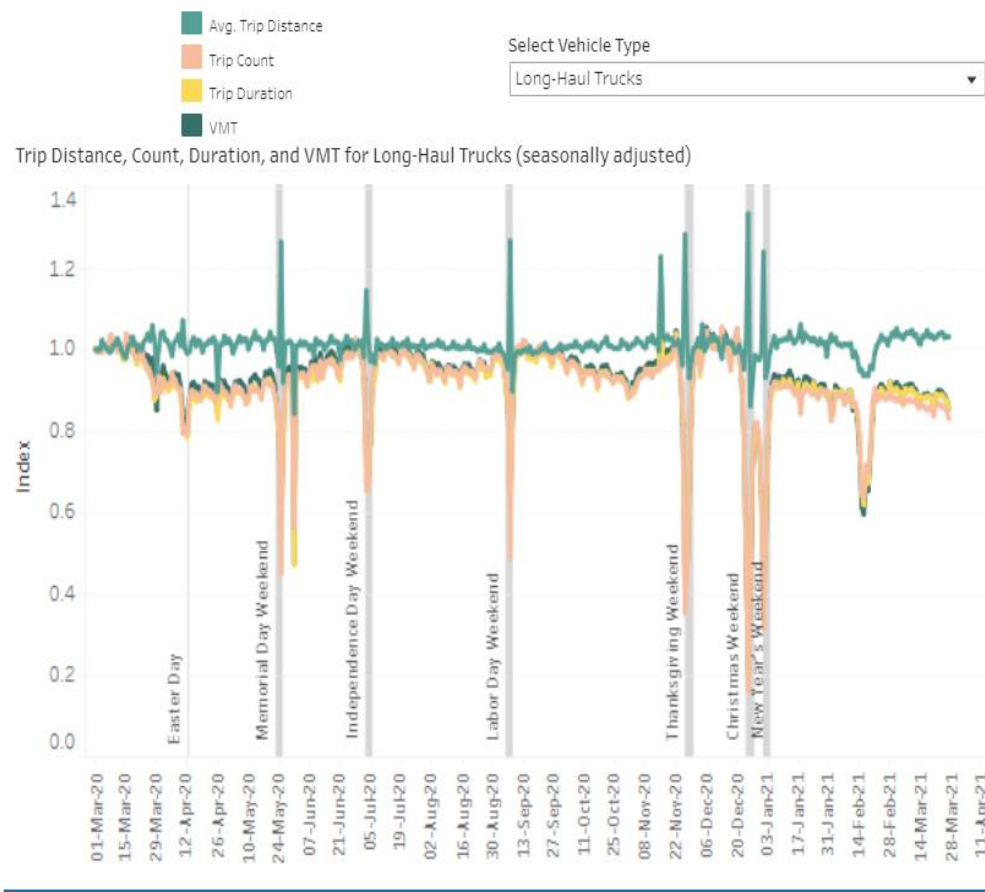
5. PennDOT should evaluate and support viable new city pairings for intercity bus services, beyond those now providing access to the major metropolitan centers.
6. New services that link different systems' territories should be considered.
7. Performance measures relying principally on ridership levels need to be supplemented by more nuanced measures that capture the enhanced value of transit service to communities, such as public-health, employment access, trip time to basic amenities and living essentials, equity impacts and reduced emissions.
8. Alternative fare structures and targeted reductions should be explored by transit providers and supported by PennDOT to enhance mobility and social equity.
9. Unified and contactless payment systems will enhance health and safety and public confidence, as well as support payments across modes and systems.
10. Utilize real-time information and data to enhance customer information.

### **Scenario: E-commerce and supply chains**

**Summary:** COVID-19 accelerated recent trends in goods movement, with particularly intense impact on last-mile delivery systems, as ecommerce filled the gap for consumers who were unable to visit retail outlets. The freight network supported by our roadway infrastructure proved invaluable in the pandemic, ferrying the essential supplies critical to meet the public health crisis. But the new and growing demands have led to freight-movement patterns not anticipated by the existing network's capacity or design. Last-mile delivery to the doorstep has added to the complexity of managing traffic flows and curbside access. The logistics workforce, already stressed by worker shortages and high demand, has been affected directly. Automation is filling some gaps, but not necessarily meeting the needs of the workforce for higher skill levels and better working conditions.

## Comparison of Metrics Within the U.S.: Trip Distance, Count, Duration, and VMT

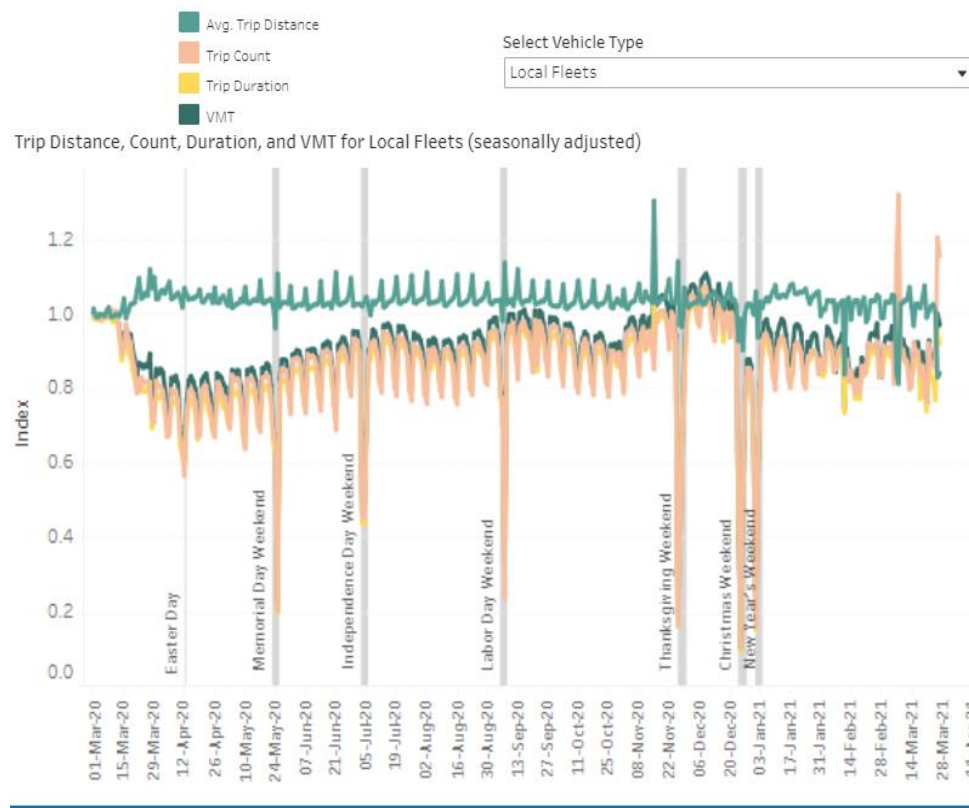
Use the drop down to select the type of vehicle you'd like to see. Are there noticeable differences in trends for freight vehicles (local fleet and long-haul trucks) vs. passenger vehicles? How do holidays impact travel patterns?





### Comparison of Metrics Within the U.S.: Trip Distance, Count, Duration, and VMT

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#### Discussion highlights:

- PA Freight Plan process is under development, for release this year. The plan will address efficiency of freight, modal connectivity, coordinated planning with planning partners, community impacts, innovative solutions, emerging technologies like autonomous trucking, workforce challenges, tonnage growth, safety and underinvestment in the freight system.
- First/Last Mile issues: a tough issue to tackle at state level, but an opportunity for M/RPOs. Once this was primarily a downtown issue, but now it's more widespread. Growing delivery volumes occurring in residential neighborhoods.
- Act 106 of 2020 authorized the operation of "Personal Delivery Devices (PDD), small automated delivery vehicles, on roadways with speed limits up to 35 mph, as well as sidewalks and shoulders, subject to PennDOT oversight and permit. Municipalities may prohibit their operation where it is deemed hazardous.

- Bicycles -- both electric and human-powered -- and other micromobility devices are being adopted (and adapted in design) for use as local delivery solutions.
- New management strategies are emerging, such as limiting larger trucks in/at high-congestion areas/times. Growing focus on curbside (capturing value), lockers and other facilities/services. DVRPC Delivery Guide addresses this.
- Automation is forcing industry to consider new approaches in distribution facility design. Larger hubs with smaller satellites closer to destinations.

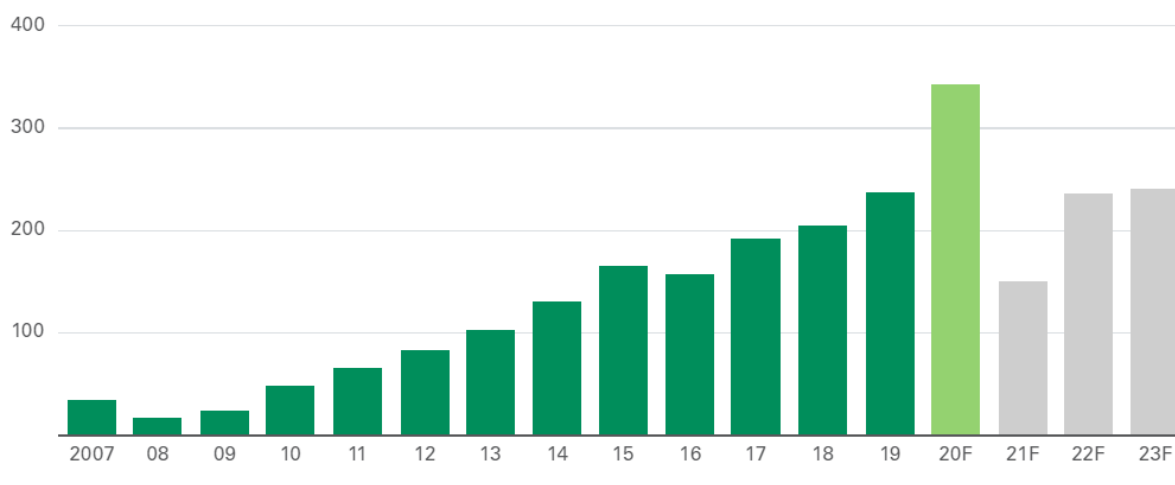
Some trends will remain post-COVID, others may not. Less restaurant dining has meant more demand for groceries –will that be lasting?

- We have relied on long, lean, efficient supply chains designed to cut costs, but they have been shown to be vulnerable to disruption from bottlenecks, warehouse capacity, availability of shipping containers, etc.
- Firms are now thinking more about resiliency, including multiple suppliers to protect against disruption, but will likely cost more. Will customers be willing to pay for this added resiliency?
- E-commerce patterns grew up around moving high-value, relatively small, light-weight goods. Now we see bulk items shipping to the doorstep. The system wasn't designed or ready for that shift. Extremely hard on the delivery workforce.
- This shift from delivery primarily small, high-value goods to many more types of less valuable, often bulky merchandise compels logistics providers to seek efficiencies and cost reductions. This trend has been accelerated by COVID-19 and raises the prospects of costs externalized onto communities and transportation facilities, as well as significant workforce implications.
- New delivery patterns where one truck parks and services multiple recipients as a result of increased density of packages per area has improved efficiency.
- COVID-19 has induced some lessening of time sensitivity, which had grown more acute through years of speedier deliveries. Delivery delays raise concerns about prioritization, though they may be more sustainable as an ongoing model.
- Growth of doorstep delivery has brought previously out-of-sight freight externalities right into the neighborhood. Many new and more numerous, diverse stakeholders now care about supply-chain impacts, increasing complexity and fueling some contention.

- Shift to e-commerce benefits the largest businesses, implications for Main St. retail. The cost advantage the big box stores had at the mall is now amplified by last-mile delivery.
- Distribution facilities are being resized smaller within denser areas to serve them locally, even as they continue to be built larger near major-highway access, to function as regional logistics hubs.
- Some e-commerce giants have a strategy of repurposing underutilized shopping malls near highway interchanges for conversion to logistics facilities. This strategy is exemplified by the conversion of the 800,000-sq.ft. Schuylkill Mall off I-81, Frackville, into industrial warehousing.
- Retailers are citing “ship from store” and “curbside pick-up” as crucial strategies to maintain competitive edge.
- Equity issues arise around rural delivery options. Traditional reliance on USPS is in question: can USPS be repurposed for last-mile goods delivery? This would require major federal investment in the Postal Service, but would bolster delivery services, particularly in rural communities served by fewer available options.
- Delivery is work, and thus shaped by labor laws, regulations, contractual agreements and business practices. While these concerns fall outside the governance or planning of the transportation they must be taken into account.
- A prime example is the effect of federally mandated Electronic Logging Devices (ELDs) that ensure driver compliance with Hours-of-Service rules, in turn placing tremendous demand for limited truck parking capacity.
- Logistics is a data-rich environment which can be mined for better decision-making.
- Increased technology use and deskilling of drivers and outsourcing to drive down the cost of last-mile delivery is critical here. The last-mile delivery system we've had until the last few years was designed to delivery small amounts of small or high value goods (not 50 lb. bags of dog food). What Amazon is doing is fundamentally different, arguably akin to the transformation of retail into a big box system, only more transformative from a transportation system.
- The key here is cost, how are they going to drive down costs, what costs will be externalized onto the public, and what challenges does that pose. How do we shape that system to be fast, efficient, safe? COVID has massively accelerated the timeline for this transformation

### ANNUAL GROWTH OF E-COMMERCE SALES, GLOBAL

\$, billions



Source: Prologis <https://www.prologis.com/logistics-industry-research/logistics-real-estate-sizing-retail-conversion-opportunity>

### Recommendations:

1. Create a Task Force on Last-mile Delivery composed of DOT and stakeholders including shippers, carriers, labor and local government to identify needs and opportunities.

Initial Tasks would include:

- Develop a conceptual framework and processes for monitoring changing demand and impacts from ecommerce and to provide regular reports to elected officials at the state and local level to inform public debate and policy
- Assess government and private data sources and processes that allow greater insight into ecommerce impacts on freight movement
- Assess emerging issues for state and local governments (e.g. vehicle registration, changing traffic patterns, curb and sidewalk management, congestion, autonomous delivery)
- Assess the impact of regulation based on vehicle size
- Work with other state agencies, most importantly Labor Department and Department of Environmental Protection, to understand the impact of labor issues on transportation outcomes and ecommerce on other priorities (e.g. GHG emissions, electrification)

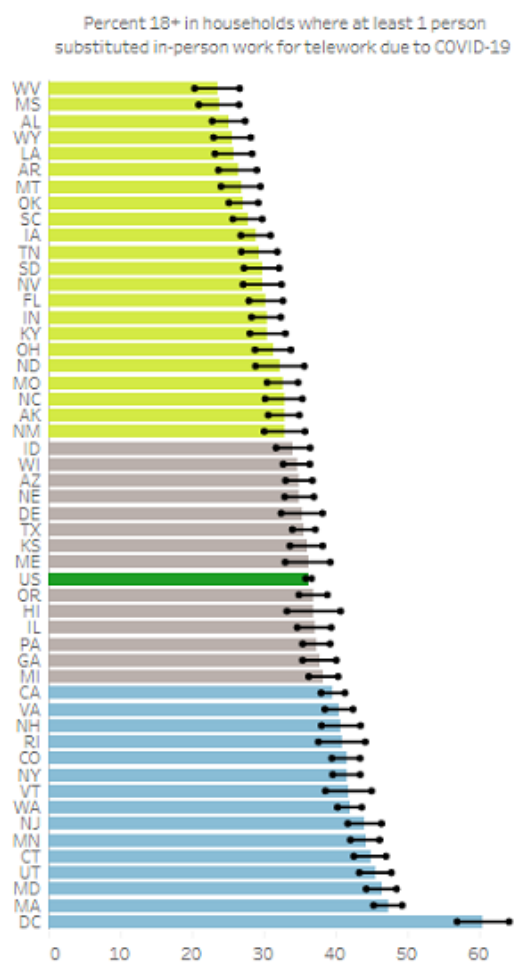
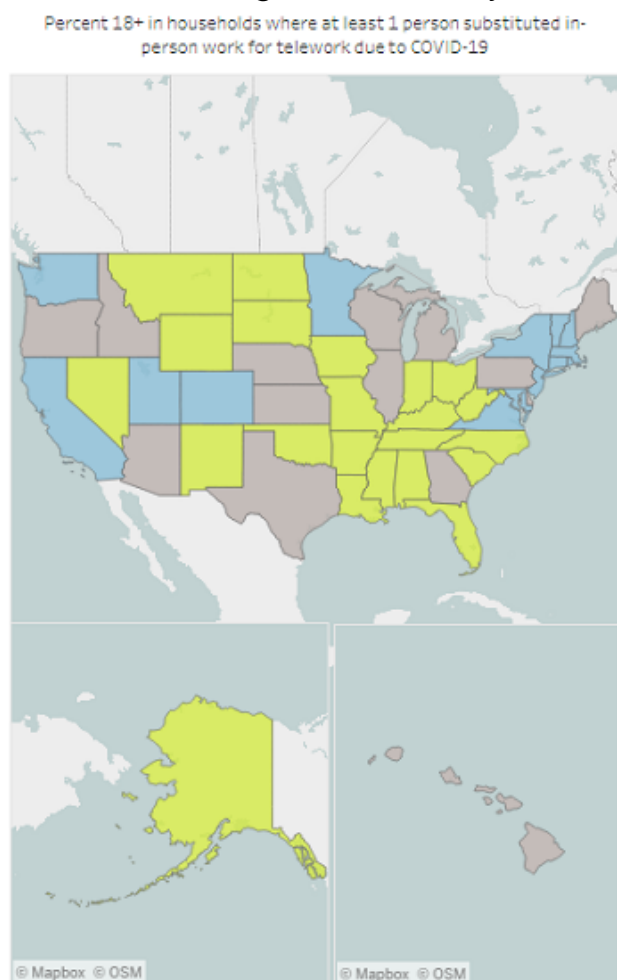
- Evaluate the impact of overlapping authority among the state and local governments on issues of traffic regulation, parking, land use, etc.
- Identify models of good governance and cooperation for novel approaches to meeting ecommerce demand (e.g. off-peak delivery, repurposing retail for logistics)

### **Scenario: Growing reliance on telemobility**

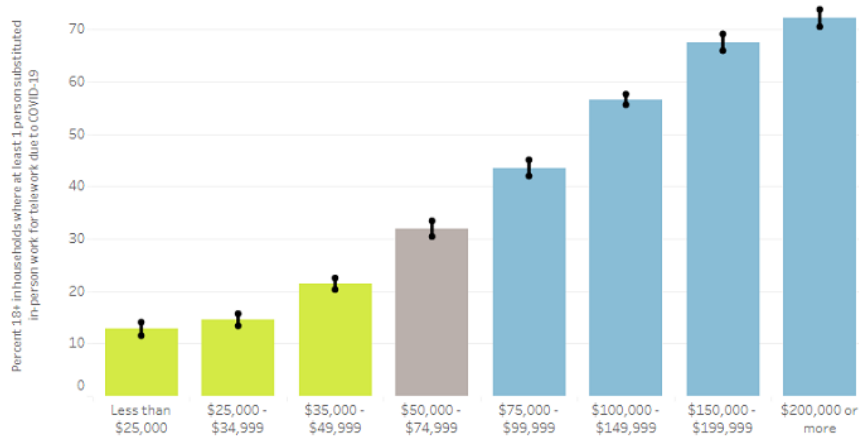
**Summary:** The rise of digital connectivity has long fostered the expectation that work in centralized locations would give way to new work-from-anywhere employment. COVID-19 proved the viability of this model for those whose jobs are information-based. More than just “telework”, the pandemic demonstrated that social, leisure, healthcare and commercial activities of many kinds can be carried on remotely, leading to the Roundtable referring to this shift in behavior as “telemobility.” These behavioral changes lead to altered travel patterns by eliminating commutes during the daily peaks, while changing the hour, duration, distance and purpose of other trips. These changes are seen as having a high probability of continuing and possibly growing in the post-pandemic period, affecting not just transportation demand, but also land-use and housing patterns and the vitality of downtown business districts, all of which affect travel demand differently. Telemobility during COVID-19 underscored the gaps and inequalities that obstruct opportunities for many fellow citizens and residents of the Commonwealth. For the most part, remote work is available only to information workers, and those without means or access to reliable digital service are also excluded.

- We keep referring to telework, but we see the same impacts of people not going to traditional shopping centers and doctors, those are also having similar impacts on retail industry, transit, etc. This is not just about people using communications instead of driving to work, but many other activities and tasks: shopping, medical, leisure. Consider online-gaming and its impact on casinos. That’s why we are using the term “telemobility”.
- One resource is a new university transportation center at Northwestern University, charged by USDOT to explore communications technology and e-commerce effects on travel demand. They use the new term of ‘telemobility,’ speaking to communication as a mode of transportation.
- This topic separates haves and have-nots. Remote work benefits information workers. Those who can have new flexibility, but for many, such as essential workers or those without means or access to reliable, affordable digital services, remote work is not possible.

## Telework During COVID-19 by State



## Telework During COVID-19 by Income



Note: Black bars represent 90% confidence interval.

- Some recommendations have been advanced for a new [‘telework tax’](#), which may be not politically feasible, but underscores the issue of inequity. Much of the promise of telemobility could be diluted by the inequities.
- Remote workers may be at risk of double taxation by states if their residency and employer are located across state lines.
- Various effects that telemobility and especially the remote workplace will have that in turn affect transportation demand include reduction of CBD commutes, variable trip-making times, changed travel patterns, effects on real estate markets/commercial vitality of downtowns.
- Remote workers tend to be information workers in the service sector. There’s still a pressing transportation need for those who will continue to work on site to get to and from the workplace, underscoring the vital role of transit for essential workers, esp. low-income. Yet many legacy transit services primarily serve wealthier communities or neighborhoods whose residents may be traveling less, particularly work commutes.
- Telework could enable transit systems to switch focus to a more holistic approach to designing and operating transit services that better address equity ... while providing environmentally sustainable transportation choices for all travelers.
- For decades, TDM advocates recommended remote working for congestion and emissions. Now we’re seeing the unintended consequences, particularly the impact on transit. Should PennDOT reassess this policy to better account for the way remote work affects transit?
- As schools reopen, traffic patterns may again change. Remote work may be more feasible for lower income individuals once kids are at school.
- Important to monitor the potential effects that a more ubiquitous telework culture has on land use. There could be more development pressure in rural, exurban and suburban areas that will impact road use and equity of opportunity. There may be the need to consider land use policy that results in sustainable development patterns.
- Telemobility disrupts traditional models. It’s had more impact than we’ve expected, and it will last.

#### **Recommendations:**

1. Planning organizations develop broadband plans.
2. PennDOT should continue to lead with DCED and other agencies.

## Scenario: Altered Land Use Patterns and Real Estate Demand

**Summary:** COVID-19 has affected both commercial and residential real estate markets dramatically, and whatever lasting changes to demand for housing, business and industrial space are in store, they will have ramifications for the transportation network. Shifting land-use patterns place changing demands on the infrastructure, often resulting in smart investments bedeviled by the traditional governance arrangements that put land-use authority primarily in the hands of local government, and transportation planning and funding responsibility primarily with regional and state authorities. While observed trends may be transient, a robust housing demand in many markets suggests a keen appetite for space and digital connectivity to support remote work, as much in cities as in suburbs and beyond. Forecasts indicate that major central business districts may face some continuing period of moderation in their characteristic bustle and congestion, but new vitality may emerge in surrounding neighborhoods, suburbs and smaller hinterland cities. And less traffic congestion in metropolitan downtown and on its commuting arteries present opportunities to repurpose capacity, especially to support enhanced transit services. At the same time, growing freight flow volumes and increasing supply-chain complexity may manifest in greater need for distribution facilities and logistics services, and the intensive land-use they typically require.

### Discussion highlights:

- COVID has emphasized the old-story: Land-use decisions shape transportation patterns, and demand for infrastructure investment, but the transportation planners still have little direct authority or input into development decisions, resulting in infrastructure investment demand and projects that are too often reactive and too little proactive.
- Planners End up chasing local land-use.
- During COVID, real estate patterns have been disrupted in all directions. People want more space, still prices in central metropolitan areas continue to be strong, indicating many people continue to choose urban living.
- Commercial real estate in CBDs has been affected. Great uncertainty obtains as to the permanence and degree of this trend.
- Some observed trends: Big-city CBDs are quieter, but around health care facilities remain very busy. More street-dining uses in some CBDs (e.g., Pittsburgh). High vacancy in parking facilities, indicative of business and revenue uncertainties for local governments. Concern about increase in vehicle use in suburbs. Weekday suburban traffic is heavy, like a Saturday, in commercial corridors.
- Repurposing of ROW has taken off (though some uses are seasonally dependent). Not just dining, but retail, and social uses like block parties and traffic-restricted recreational blocks.



- Deliveries happening everywhere, not just traditional loading zones, demanding more curbside access.
- Where congestion is diminished, such as downtown centers, new opportunities emerge to enhance transit operations through strategies including signal prioritization and dedicated transit lanes.
- The effects that underutilized office space may have on city economies and urban transportation systems have caused uncertainty and difficulties for local government finances. Parking revenue streams are particularly uncertain.
- In-home telework space is highly desirable for the growing share of workforce not in the office. Residents need housing with enough space to carry on work lives. Housing affordability is being impacted. Office hotels and other models are popping up.
- Urban neighborhoods will possibly be less tethered to CBD, and instead begin to develop to meet all needs of the resident within walking distance, the so-called “15-minute neighborhoods”, where everything needed is nearby. Walkability is the salient reason to live there.
- Mall redesign: Traditional Suburban retail malls are financially challenged. Therein lies the potential for repurposing these buildings for logistics, or village-style housing/small retail possible, with transit connections.
- Counterpoint view is that this is a pause in the long-term urbanization trend. The driving force toward density is businesses and activity which will resume post-pandemic. Agglomeration will still be a key to the future. It will be interesting for the workforce if employers continue to offer as much flexibility as to the choice of worksite.
- Opportunities for reinvention and revitalization of small cities, towns and boroughs. Many are near popular outdoor activities. Lower-cost real estate, strong central business cores are inherent advantages to build on. Attractive quality-of-life attracts people who want to leave dense cities. Internet access and affordability in those communities are key to this strategy.
- Hybrid home-and-office work arrangements are beginning to emerge, though their adoption may be concentrated primarily by larger companies and organizations.

#### **Recommendations:**

1. Use data and advance analytics to track trends and inform local land-use and development decisionmakers. Look at whole picture.
2. Develop policies and guidance to redesign and value curbside uses, including funding opportunities.
3. Development that supports re-use and asset management should be encouraged.

## Scenario: Demand for Alternative Uses of the Right-of-Way

**Summary:** In many communities and urban neighborhoods, reduced traffic congestion enabled the streetscape to be reimagined and repurposed for new uses. Many of them, such as outdoor dining and shopping and blocks closed for periods of recreational and social activity, may not be long lasting after the pandemic recedes, and tend to be seasonal in any case. Other uses that remain popular after COVID-19, such as dedication of more capacity to meet increased demand for walking and cycling, as well as curbside pick-up and delivery, may create new stresses on existing capacity as recovery proceeds. This dynamic may prompt contention between competing interests, as traditional incumbents (i.e., motorists) reassert their claim to capacity long devoted primarily to their use, but now also in demand for other uses that have been proved useful and popular during the pandemic. However, changing travel patterns, particularly in urban centers which experience reduced daily commuter flows, could also present a unique opportunity to dedicate more roadway space to surface transit services and active transportation. PennDOT's relatively recent planning initiative, PennDOT Connects, has been an effective tool to ensure community input early in the project development process, helping to better balance right-of-way uses and satisfy emerging mobility preferences.

### Discussion highlights:

- Repurposing of R-o-W has taken off (though seasonally dependent), especially in urban centers. Not just dining, but retail, social use, recreation.
- Certain amount of over-capacity to the infrastructure if daily commute patterns remain less peaked. Opportunity for repurposing.
- Opportunity for transit prioritization.
- Delivery activity is exploding, not just traditional loading zones but everywhere, demanding curbside access.
- When considering reuse of infrastructure in new ways, the traditional incumbents often resist losing or sharing access, underscoring the sensitivity of transitioning uses. Public acceptance is hard.
- Repurposing also carries opportunity costs. Better understanding is needed of the social and economic costs of repurposing capacity allocated primarily for one primary use to another.
- Hence, defining costs and benefits require new, improved tools. Better tools and methodologies. Non-monetized and general benefits like environment, quality-of-life and public health are difficult to quantify and often undervalued in many analyses.
- Incumbency bias toward motor vehicles' predominance as infrastructure user disadvantages other uses and entrenches discriminatory practices and outcomes that have negative economic

and social consequences for poor, overburdened and underserved communities and often people of color.

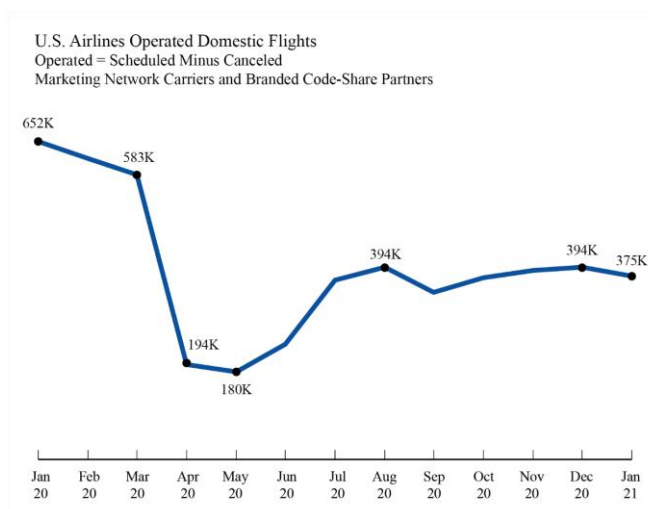
- PennDOT Connects has improved coordination for projects: adding shoulders, bike lanes, sidewalks, making things more than just a highway or bridge project.

#### **Recommendations:**

1. Expand PennDOT Connects to more local projects and commit a larger proportion of project resources to its implementation.
2. Planning Partners should identify corridors and locations where peak demand has moderated as opportunities to implement alternated or shared uses of the right-of-way.
3. Rethink the curbside by developing guidance or model rules charging for curbside usage.
4. Engage FHWA to encourage flexible application of the commercial-use prohibition to enable publicly beneficial alternative uses.

#### **Scenario: Aviation changes: airside and landside**

**Summary:** The Roundtable did not delve in detail into COVID-19's lasting effects on aviation broadly, particularly in light of the long-term uncertainties facing air travel. We were especially interested in possible impacts on surface transportation. Will medium-distance intercity trips shift to other modes; will demand for connecting flights from regional airports to major hubs undergo changes. This latter trend was already evident before the pandemic struck and may continue. This trend has serious implications for small-city airports, their workers and the role they play in local and regional economies. Dedicated air-freight service could present a strategy to address those shifts in demand, though the economic structure of aviation strongly militates toward centralization and agglomeration.



### Discussion highlights:

- Trends in aviation and intercity transit were changing before COVID but have accelerated due to pandemic.
- Indicators of travelers opting to drive further; bypass connecting flight. An issue for small airports is the possible contraction of service.
- As flights continue to be depressed at many airports, will carriers pull out? It's an open question as to the fate of smaller and rural airports connecting to hubs and destinations.
- Conversely, concentration of volumes at the major hubs raises questions of the acceleration of congestion and access to major airports.
- Possible consequences for aviation industry, including airports, airlines, workers.
- But also possible opportunity for something more equitable and accessible, such as improved intercity bus travel. Intercity bus not being much addressed. Automated platooning a possibility.
- Federal COVID-19 relief funds have helped many smaller airports stay afloat. Lots of scheduled service doesn't necessarily correlate to high demand.
- Pre-pandemic, not much planning about how air transport supply drives ground transport demand. Cities all want new services; offer incentives (Austin). Will airlines keep service after incentives? We all can't be big aviation centers.
- Work patterns (remote work) may lead to change in business-travel patterns. Unemployment and discretionary travel trends also factor in.

- Role of freight in supporting small airports? Large airports are not ceding any business. ATL 6<sup>th</sup> runway proposal.
- Airports can't generate sustainable service because there are lower-fare options at the mega-airports, Atlanta, NY/NJ. Example: Tennessee-DC for \$1600, fly through Atlanta for \$300.
- Agglomeration factors, economic pressures are the basic drivers of airline investment. For airport operators, the challenge is how to grow sustainably in this environment of cutthroat economic-development competition.

#### **Recommendations:**

1. PennDOT should evaluate the potential for air-cargo growth at under-utilized aviation facilities that are proximate to major freight-shipping corridors.

#### **Cross-cutting Issues**

The Roundtable's discussions have repeatedly underscored the extent to which each of these trends and scenarios affects many or all the others. As these forces radiate across the transportation network and intersect or collide, they also can intensify. Addressing one problem, opportunity or need untethered from its broader context within the mobility ecosystem risks unintended outcomes requiring future attention and resources.

The pandemic has been an intensifier, supercharging the pace of great changes already afoot. It will upend assumptions and forecasts on which today's planning is largely based. Investment portfolios will be reanalyzed based on changed or accelerated trends in transportation demand and traveler choices. Investment priorities may need to shift accordingly, foretelling difficult and controversial reallocation issues. A path to resolving those issues fairly and for the greatest public good is to treat them holistically, within the context of what the future of transportation might be.

#### **Planning for the Whole**

The practice of "holistic transportation planning" across modes has grown gradually, at least since the deregulation of freight and commercial aviation in the late 1970s, followed by the world trade boom of the post-Cold War era. COVID-19 accelerated forces of change that have been gathering for a generation. Yet siloed organizational design, reflective of US DOT's traditional modal administration structure, will be hard-pressed to respond effectively to the future's more complex problems in ways that leverage each modes' assets and advantages to support the system in whole -- particularly as it relates to resource allocation and investment decisions.

In this sense, holistic planning unlocks smarter and more effective allocation of scarce resources, offering better returns on transportation investment. Moreover, new digital applications are introducing powerful capabilities to gather and analyze up-to-the-moment data, predict the impact of developing conditions or situations, and identify and suggest effective responses. With these tools, the next generation of planning and operations will look very different from the past.

The scenarios that the Roundtable explored were representative of the kinds of post-pandemic issues likely to arise but were by no means comprehensive. Changes in store may not be anticipated. However, for those that we did think about, certain topics of concern arose repeatedly. Many of us in the transportation professions are only beginning to grasp these rising concerns, yet they could demand focus and resources on par with that of transportation's legacy priorities such as safety, through-put and travel-time.

### Topics of Rising Concern

- **Climate** – US public expenditures on transportation infrastructure and operations over a recent dozen-year span total \$3.8 trillion. Virtually everywhere, these public assets face growing risk of disruption resulting from more frequent and severe weather events and climate extremes. Moreover, as the nation's largest source of greenhouse gas emissions, the transportation sector will necessarily bear major responsibility for reducing the very waste product that is imposing costly new demands for more resilient infrastructure and robust systems.
- **Technology** – Rapid-fire innovations in data collection and analysis, joined with artificial intelligence applications that can model the complex workings of the transportation system in startling detail and precision offer the prospect of vastly safer, more efficient, less polluting, more affordable and accessible mobility. Harnessing the immense power of innovative technology to serve public needs and to mitigate its often-disruptive impacts, such as that on work and workers, is a priority for society as a whole. Transportation has been a seedbed of innovation and technological advancement throughout history, so we should expect that it will play an important role in the broader debate over the ownership, governance, oversight and management of many transformative technologies.
- **Workforce** – These rapid technological advances discussed above portend profound changes to the nature of work. This is no less true of transportation than any other sector of commercial activity. Tasks that require low skills, are repetitive in nature, are dangerous or otherwise difficult to recruit staff to are candidates for replacement by automated equipment and processes. Conversely, the technical skills required to manage these increasingly complex data-driven systems are in short supply. Transitioning the transportation workforce both to support workers whose jobs are disrupted by automation and to train and qualify them to meet the demands of the future is an urgent priority already testing transportation organizations and providers everywhere.

- **Equity** – People and communities who have historically been disempowered in decision-making around transportation investment and service provision are insisting they have their needs better met and their concerns better addressed. They want not only a voice, but an active role in transportation planning and decisions. There are two major aspects to this: First, whether by neglectful indifference or purposeful racism, past infrastructure development, such as urban expressways and major airports, were frequently sited through or near low-income neighborhoods. Frequently communities of color, such neighborhoods suffered economic and social devastation as the price for public improvement. Second, poor neighborhoods and households are often inadequately provided with affordable transportation options to access work, social opportunities or vital services, such as public health or education. Newly empowered citizens and communities see future transportation investment as a step to remediate these negative effects of the past through more mindful planning and higher quality services that strengthen neighborhoods and expand mobility. Equity challenges extend deeper. They include that of better serving rural areas, recruiting more people of color into the transportation workforce to meet future demands, and ensuring that law-enforcement functions necessary for the safe operation of all forms of transportation not be misused as a weapon of racial injustice.

### **Institutional adaptability**

While new tools and capabilities offer a vision of transportation services and facilities greatly improved over that of the present, the Roundtable members frequently observed that the institutions responsible for implementing this vision will need to adapt across multiple dimensions. The disruptive rise of technology-enabled mobility services like ride-hail and micromobility are examples of changes that occur faster than public agencies can address proactively. Transportation departments have improved intermodal coordination, though siloed mindsets and organizational structures evolve more slowly.

As much as how we organize ourselves, the skills of the transportation workforce will need to develop to master the new tools that will plan and operate the system. Transportation agencies will be hard-pressed to manage great streams of data being generated. They will have to rely increasingly on collaborative approaches with other public jurisdictions and agencies, as well as with business, non-profits and academia. Public-private partnerships are evolving as a project-delivery model. P-3 projects, however, have often been lightning-rods for public opposition, and do not always gybe with public expectations of transparency and accountability.

Government generally is not well suited to entrepreneurship. Its legal foundations and regulatory requirements, so imperative to ensure transparency and accountability, constrain nimble responses or creative solutions to emerging and unfamiliar problems. Where trial-and-error is the most reliable path to find and test new ideas, the political and media environments in which government operates often unduly punish mistakes or short-circuit creative strategies. Effective governance and public-service provision are much harder to achieve than private business success.

In view of these fundamentals, the role of citizen and public engagement in the overall governance of a changing transportation model will be crucial as agencies adapt. Here again, technology can be deployed to give people a more meaningful say in planning and participation in deciding investment and service priorities that will directly affect their lives and their communities.

### **Funding: Without Which, Nothing**

Nowhere will the public's voice and preferences be more determinative than as regards the questions around sustained and adequate funding. While tremendous improvements to transportation can be envisioned, realizing them is only possible through society's commitment to devote the resources that are necessary to do it.

The Roundtable deliberations did not address transportation's ongoing funding inadequacies, though the issue loomed over every topic. PennDOT's Pathways program is currently under way to implement tolling on major Interstate system bridges, enabling their reconstruction without cannibalizing the balance of the Department's construction program. The Transportation Revenue Options Commission (T-ROC), convened by Governor Wolf to "analyze new future-focused sources of funding that could better serve our communities and all Pennsylvanians for the next generation," anticipates the electrification of transportation and the future need to replace motor fuels taxes. The outcome of these initiatives will determine if Pennsylvania will be positioned to advance many of the new approaches and improvements that the Roundtable has discussed.

### **Conclusion: Renewing Commitment and Purpose**

The possibilities envisioned by the Roundtable are only possible if Pennsylvania and the nation mindfully choose to renew a historic commitment to investment in a common future. The urgency to invest in America's transportation infrastructure was a factor contributing to the creation of the Republic in 1787. It has been a consistent federal priority throughout the nation's first two-hundred years. In the decades following the authorization of the Interstate system in 1956 and establishment of USDOT ten years later, consistent and adequate commitment to reinvest has receded amid competing policy imperatives. Congress failed to provide a significant infusion of new funding for almost thirty years until this year's enactment of the landmark Infrastructure Investment & Jobs Act (IIJA).

The magnificent national highway network built during the third quarter of the 20<sup>th</sup> Century is at the end of its functional lifespan and is inadequately designed, scaled or equipped for the vehicles and loads it must handle in the 21<sup>st</sup>. Our rail and transit networks are older still, and, as COVID-19 revealed, operating on little or no margin to meet unforeseen needs or problems. US aviation, while spectacularly safe, is not as well integrated into the broader transportation network as it might be in order to support America's future global economic competitiveness.

The IIJA represents a welcome renewal of the nation's historic commitment to building infrastructure as a foundation for a thriving society. It remains to be seen if this renewed commitment is sustained and,



in the short-term, if Pennsylvania and our sister states rise to the challenge IJJA presents and does their share.

Present-day Americans have for decades been living off the investments of the past. In essence, we are engaging in a slow disinvestment of public capital that has eroded the nation's quality of life and economic competitiveness. The future brings with it the possibility of a better life for more people, greater prosperity and thriving communities. Planning for that future can envision what those possibilities might look like. But it will be the resolve of our vast and diverse society coming together to create its future that will determine what it will turn out to be.



### Afternote

This report was primarily written during the winter and spring of 2021. During that time, it appeared as though COVID-19 was subsiding in the face of effective public health measures such as vaccines, appropriate masking and social distancing practices. The beginning of the post-pandemic “new normal” looked to be in sight. Some transportation patterns, like roadway traffic, recovered to close to pre-pandemic levels, others, like transit, stabilized at below their 2019 levels. Unmistakable changes from how we previously understood transportation demand and behavior have occurred: aggressive driving and roadway deaths are alarmingly up; city-center worker populations and commuter trips remain subdued; supply-chain disruptions cast a shadow over economic recovery.

However, the new post-pandemic reality has not truly set in because, as of December 2021, the pandemic continues, as variants have spread across the globe and compliance with public-health measures has been inconsistent. Recent months suggest that there will be “no going back,” but the picture of the future post-pandemic transportation system continues to develop amid uncertainty. What remains, however, is the ongoing opportunity for society's decision-makers, stakeholders and citizens to take an active hand in redrawing the future.



## Sources & References

### General Resources

American Association of State Highway and Transportation Officials - <https://www.transportation.org/>  
 American Planning Association - <https://www.planning.org/>  
 American Public Transportation Association - <https://www.apta.com/>  
 American Road & Transportation Builders - <https://www.artba.org/>  
 Association of Metropolitan Planning Organizations - <https://amapo.org/>  
 Bureau of Transportation Statistics (USDOT) - <https://www.bts.gov/>  
 Congress for the New Urbanism - <https://www.cnu.org/>  
 ENO Center for Transportation - <https://www.enotrans.org/>  
 Governors Highway Safety Association - <https://www.ghsa.org/>  
 Green Car Congress - <https://www.greencarcongress.com/>  
 PennDOT Traffic Information - <https://www.penndot.gov/ProjectAndPrograms/Planning/TrafficInformation/Pages/default.aspx>  
 SmartGrowth America - <https://smartgrowthamerica.org/>  
 Transport Policy - <https://www.journals.elsevier.com/transport-policy>  
 Transportation Research Board - <https://www.nationalacademies.org/trb/transportation-research-board>  
 Volpe National Transportation Systems Center - <https://www.volpe.dot.gov/>  
 The World Bank - <https://www.worldbank.org/en/topic/transport>

### University Transportation Centers

Mobility 21 – Carnegie Mellon University - <https://mobility21.cmu.edu/>  
 National Center for Sustainable Transportation - University of California, Davis - <https://ncst.ucdavis.edu/>

### References

Pg. 8-10 - PennDOT Bureau of Innovations, Post-Pandemic Roundtable Survey  
 Pg. 11 - USDOT, Bureau of Transportation Statistics  
 Pg. 19 - [transitapp.com/APTA](https://transitapp.com/APTA)  
 Pg. 21 - [apta.com/wp-content/uploads/APTA\\_Covid\\_Best\\_Practices\\_09.29.2020.pdf](https://apta.com/wp-content/uploads/APTA_Covid_Best_Practices_09.29.2020.pdf)  
 Pg. 24-25 - USDOT, Bureau of Transportation Statistics  
 Pg. 28 - Prologis, [prologis.com/logistics-industry-research/logistics-real-estate-sizing-retail-conversion-opportunity](https://prologis.com/logistics-industry-research/logistics-real-estate-sizing-retail-conversion-opportunity)  
 Pg. 29 - <https://www.mccormick.northwestern.edu/civil-environmental/news-events/news/articles/2020/nutcdot-funding.html>  
 Pg. 30 - [bts.gov/covid-19/changes-travel-behavior](https://bts.gov/covid-19/changes-travel-behavior)  
 Pg. 36 - [bts.gov/newsroom/air-travel-consumer-report-january-2021-numbers](https://bts.gov/newsroom/air-travel-consumer-report-january-2021-numbers)  
 Pg. 37 - <http://citeseerx.ist.psu.edu>  
 Pg. 38 - [bts.gov/content/transportation-expenditures-mode-and-level-government-own-funds-fiscal-year-current-millions](https://bts.gov/content/transportation-expenditures-mode-and-level-government-own-funds-fiscal-year-current-millions)  
 Pg. 38 - [epa.gov/ghgemissions/sources-greenhouse-gas-emissions](https://epa.gov/ghgemissions/sources-greenhouse-gas-emissions)  
 Pg. 39 (Equity) - *The Power Broker*, R. Caro, Robert, <https://www.scribd.com/document/399313663/Caro-One-Mile>  
 Pg. 39 (Adaptability) - [apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102](https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102), and S. Goldsmith, <https://www.enotrans.org/event/webinar-reimagining-regulations-for-a-changing-mobility-landscape/>  
 P. 40 (Funding) – [www.penndot.gov/about-us/funding/Pages/default.aspx](https://www.penndot.gov/about-us/funding/Pages/default.aspx)  
 P. 40 (Commitment) - <https://www.thenewatlantis.com/publications/infrastructure-policy-lessons-from-american-history>