

# Transportation Technology Strategic Plan (TTSP): Implementation Update

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Mackenzie Love, AICP  
Regional Transportation Planner





# History of the Transportation Technology Strategic Plan (TTSP)

The TTSP describes **strategies** for advancing the beneficial use of technology in transportation, in **alignment with NVTA Core Values**, and identified **roles the NVTA can take** in pursuit of them.

It also recognizes that the objectives of the TTSP cannot be achieved by NVTA alone, and relies on the **strong coordination and partnerships** that are foundational to NVTA's work in the region.

Year	Month	Milestone
	2017	<ul style="list-style-type: none"> <li>Transportation Technology Committee (TTC) established by the NVTA CEO</li> </ul>
2019	October	<ul style="list-style-type: none"> <li>TTC began development of the TTSP</li> </ul>
2020	December	<ul style="list-style-type: none"> <li>Draft TTSP "core content" (8 strategies, 9 NVTA roles and 3 core values) shared with the TTC</li> </ul>
2021	January	<ul style="list-style-type: none"> <li>Draft structure for the TTSP (minus Action Plan) proposed to the TTC</li> </ul>
	February/ March	<ul style="list-style-type: none"> <li>First full draft of the TTSP and draft structure for the Action Plan presented to the TTC</li> <li>Draft structure for the TTSP shared with TAC, PCAC and PPC</li> <li>TTSP mini-session at the 6<sup>th</sup> annual NoVA Transportation Roundtable</li> </ul>
	April	<ul style="list-style-type: none"> <li>TTC, PCAC and PPC all recommend the Authority adopt the eight strategies and Action Plans of the TTSP</li> </ul>
	May	<ul style="list-style-type: none"> <li>The Authority adopted the inaugural NVTA Transportation Technology Strategic Plan's Action Plan and Eight Strategies within</li> </ul>
	Summer	<ul style="list-style-type: none"> <li>TTSP-related topics included in TransAction outreach and survey</li> </ul>
	October	<ul style="list-style-type: none"> <li>TTC receives an update on the first six months of implementation of the TTSP</li> </ul>
	November	<ul style="list-style-type: none"> <li>The Authority receives an update on the first six months of implementation of the TTSP</li> </ul>



## TTSP Deliverables in the First Six Months

- Introduction of a technology-related section to NVRTA's annual Legislative Program (pending Authority action)
- Outreach activities, including via TransAction
- Whitepaper on Emissions
- Evaluations of two emerging technologies
  - Autonomous and Electric Shuttles
  - Personal Autonomous Vehicles
- Transportation Policy Template
- Minor updates to the TTSP, including the addition of a technology timeline



## TTSP in the Legislative Program

- Each year, the Authority develops a legislative program to communicate to the Virginia General Assembly. This helps us convey our **priorities** and advocate for things that **support NVRTA's objectives and core values**.
  - NVRTA's Legislative Liaison has been drafting a program that is **under review by the Governance and Personnel Committee**. The Authority will have their first official review of the draft program in November, with a second review and **Authority action anticipated in December**.
- The role of technology in transportation is becoming more and more significant, and this has policy and budget implications. For this reason, a **new TTSP-related section has been proposed for addition to the NVRTA legislative program**.
  - Each year the focus of this section could be updated. All topics would be derived from/supported by the TTSP.
  - This year the proposed focuses are: **electric vehicles**, and **support for continued funding of pilot programs and research initiatives** throughout the Commonwealth.



# Whitepaper on Emissions

- In the US, there was a **48% increase in VMT** between 1990 and 2019
  - Transportation accounts for 29% of emissions, nationwide
    - Light-duty vehicles contributed 58% of that
- In Virginia, transportation accounts for 32.3% of energy consumption, but **48.6% of emissions**
  - Virginia generated the 11th most VMT of any state in 2019
- In general, all types of EVs generate less emissions than conventional vehicles
  - The **composition of sources** used in the energy grid used to charge them has a significant impact
  - In Virginia, the most consumed energy source is Natural Gas (33.9%), and coal accounts for 4% of consumption

Virginia Emissions, by Sector

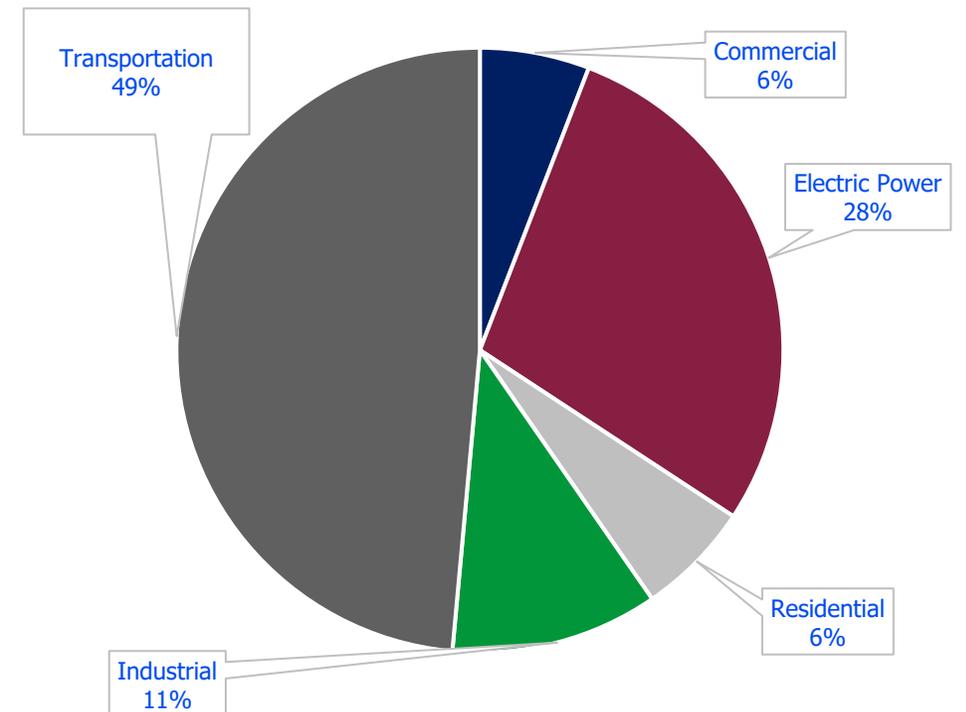


Chart data from the U.S. Energy Information Administration: <https://www.eia.gov/environment/emissions/state/>



# Evaluation of Emerging Technology: AV, EV Shuttles

Rating	Topic	Reasoning
 (Green)	Relevance to NVTA Responsibilities	<ul style="list-style-type: none"> <li>The prevailing edition of <b>TransAction</b> recognized the importance and timeliness of planning for innovation, which led to the creation of the Transportation Technology Committee that was charged with development of the TTSP. In the ongoing update of TransAction, the TTSP is being used to inform scenario modeling; outreach and education efforts and; the development of the top-down project list.</li> <li>Electric and autonomous shuttles could contribute to <b>congestion reduction</b> by providing a FLM solution and thus encouraging use of mass transit. They can also be used independently and in this way, reduce short vehicular trips.</li> <li>Electric and autonomous shuttles have the potential to be very <b>efficient in terms of time and energy usage in moving people</b>. However, the initial capital costs of these systems may be high and it is critical to make equity a central tenet in developing and pricing or incentive schemas, to avoid systemic exclusion of any group.</li> </ul>
 (Green)	Vision Statement	This type of shuttle has the potential to provide a safe FLM connection when integrated with transit. This would encourage use of sustainable mass transportation, and contribute to an equitable system through improved access.
 (Green)	Equity	EV, AV shuttles can improve low-cost and equitable access to transportation and contribute to independent mobility for persons with disabilities, the elderly and children. Additionally, these can help reduce emissions and future environmental degradation, both of which tend to impact disadvantaged communities more deeply. Both of these types of benefits can be achieved independently or in synergy with mass transit.
 (Green)	Sustainability	EV, AV shuttles can contribute to a reduction in emissions in three key ways: alleviating congestion by reducing the number of vehicles on a road; increasing overall throughput for a given facility, which may reduce idling and associated pollution and; by generating little to no tail pipe emissions (depending on if the shuttle is an Electric Vehicle or a Plug-In Hybrid Electric Vehicle or PHEVs). However, it is critical to consider the source of electricity used in their charging stations to ascertain their full environmental impacts.
 (Yellow)	Safety	EV, AV shuttles reduce the number of fallible human drivers on a road and contribute to optimization of travel flow. Together these factors create the potential to reduce crashes and secondary crashes. There is also the potential for AVs to automate maintenance monitoring and scheduling and thus reduce incidents that may result from component failure. However, the potential impacts of these benefits is still a subject of debate, and the technology that underpins them still faces developmental hurdles.



# Evaluation of Emerging Technology: Personal AV EVs

Rating	Topic	Reasoning
 (Yellow)	Relevance to NVTA Responsibilities	<ul style="list-style-type: none"> <li>The prevailing edition of <b>TransAction</b> recognized the importance and timeliness of planning for innovation, which led to the creation of the Transportation Technology Committee that was charged with development of the TTSP. In the ongoing update of TransAction, the TTSP is being used to inform scenario modeling; outreach and education efforts and; the development of the top-down project list.</li> <li>AVs could contribute to <b>congestion reduction</b> by increasing carrying capacity of infrastructure and throughput of intersections through platooning. If they are shared (SAVs), there are additional opportunities to reduce congestion. However, if AVs are not shared, the convenience of travel could facilitate sprawl.</li> <li>AVs have the potential to <b>move people efficiently</b>, due to their ability to communicate and optimize travel through approaches like platooning. However, private ownership of AVs may increase sprawl and create exclusionary benefits. Encouraging shared use (either for share access or shared rides, through SAVs) could address both of these potential concerns and create net positive impacts on the transportation system.</li> </ul>
 (Yellow)	Vision Statement	AVs have the potential to improve the functioning of the transportation system and increase safety in Northern Virginia. Encouraging shared use (SAVs) in terms of either share access or shared rides could facilitate equitable access to this technology, help mitigate potential negative travel behavior changes and facilitate achieving the potential congestion reduction and environmental benefits of this technology.
 (Red)	Equity	AVs will likely be expensive to purchase, with prices high enough to exclude many from the market. Further private AVs may facilitate longer commutes and thus sprawl. However, SAVs may mitigate these concerns but it will be important to promote universal design and to encourage equitable access.
 (Green)	Sustainability	The environmental benefits of AVs achieved through efficiency and optimization are projected to increase as the percentage of the vehicular fleet comprised of AVs increases. These benefits could be further amplified through shared use and the fact that it is likely AVs will be powered by electricity.
 (Yellow)	Safety	Autonomous driving means that vehicles will no longer be reliant on fallible human drivers. This alone may yield a substantial reduction in crashes, however, the programming of AV priorities will be a key factor in maximizing safety benefits.



# Updates to the TTSP

- Addition of a technology timeline
- Tweaks and updates to referenced projects
- **Discussion point:** should an additional strategy(s) be added to the TTSP? Current candidates include:
  - Autonomous Vehicles
  - Freight
  - Personal Delivery Devices (Sidewalk robots)

Year	NVTA History	Technology Milestones	
		Event	Description
2002	NVTA created by the General Assembly. Learn more <a href="#">here</a> .		
2003		MySpace is launched	Learn more <a href="#">here</a> .
2004		First DARPA Grand Challenge	The Defense Advanced Research Projects Agency (DARPA) issued the challenge to create a vehicle that could autonomously navigate a 142 mile course through the desert. This event is largely credited as the impetus for serious pursuit of Autonomous Vehicle technology. No vehicle finished the inaugural race, and the \$1 million prize went unclaimed. Learn more <a href="#">here</a> .
		Facebook is launched	The site was originally open to Ivy league students only, but expanded to anyone over the age of 13 in 2006. Learn more <a href="#">here</a> .
...			
2020		The Federal government granted its first driverless car exemption	The U.S. DOT granted the first exemption of the Federal Motor Vehicle Safety Standards, for an autonomous, low-speed delivery vehicle. The exemption allows the manufacturer to produce a vehicle without rearview mirrors, a windshield, steering wheel or pedals. Due to the novelty of this design, the manufacturer will be required to conduct outreach to communities in which the vehicles are deployed, submit regular reports, and will be subject to greater-than-typical review from the National Highway Traffic Safety Administration (NHTSA). Learn more <a href="#">here</a> .
		Amazon ordered 100,000 electric delivery vehicles	The purchase was made to help Amazon achieve its Climate Pledge and aim to have zero net carbon by 2040. Learn more <a href="#">here</a> .
		Virgin Hyperloop completes first manned pilot test	Learn more <a href="#">here</a> .
		Virginia's first on-street autonomous transit shuttle pilot begins in Mosaic District, Fairfax County	"This pilot project is a partnership between Fairfax County, Dominion Energy, EDENS (Mosaic), The Virginia Department of Rail and Public Transportation (DRPT) Virginia Department of Transportation (VDOT), Virginia Tech Transportation Institute (VTI) and George Mason University (GMU)." Learn more <a href="#">here</a> .
		Launch of iPhone 12	Learn more <a href="#">here</a> .
2021	On May 13, 2021, the Authority adopted the inaugural NVTA Transportation Technology Strategic Plan's Action Plan and Eight Strategies within, that focus on mobility, accessibility, and resilience, while embracing the core values of safety, equity and sustainability. Learn more <a href="#">here</a> .	Biden pushes for electric vehicles to make up half of U.S. auto sales by 2030	President Joe Biden recently issued an executive order, <a href="#">setting a new national target</a> for Electric Vehicles (EVs) to comprise half of all new auto sales in the United States by 2030. Although the target is not binding, several large auto manufacturers, including General Motors, Ford Motors and <a href="#">Stellantis</a> , are supportive of the concept and have set their own goals for electrification of their product lines. The timing of this announcement coincided with a separate <a href="#">Executive Order</a> that directed a review and possible revision of fuel economy standards. Learn more <a href="#">here</a> .
		New York requires all passenger vehicles sold in state to be emission-free by 2035.	"The law will make New York the second state after California to phase out greenhouse gas emissions in cars and light trucks. It also aims to eliminate emissions from medium- and heavy-duty vehicles by 2045, and requires the creation of a detailed plan for zero-emissions vehicle development by 2023." Learn more <a href="#">here</a> .



## Next Steps

- Additional Transportation technology evaluation ratings, as appropriate
- TransAction
  - Integration of technology-related strategies into the TransAction scenario analysis work
  - Public engagement under the TransAction umbrella
  - Incorporation of eligibility or scoring criteria that consider the goals of the TTSP
- Technology-related Outreach
  - Development of a more comprehensive approach to technology-related outreach and education that builds upon the 'Driven by Innovation' eBlast
  - Ongoing monitoring of market trends and trigger points
  - Creation of a home for TTSP content on the NVTA website
- White Paper development
  - Collaborate on a process for development of future regional transportation policies, utilizing the template developed in the first six months of implementation
  - Identify and prioritize topics for potential future regional transportation policies\*
- Identify potential technology-related refinements to future NVTA SYP project selection process (post-TransAction update)
- Consider if any additional strategies should be added to the TTSP and its Action Plan

# TransAction Survey

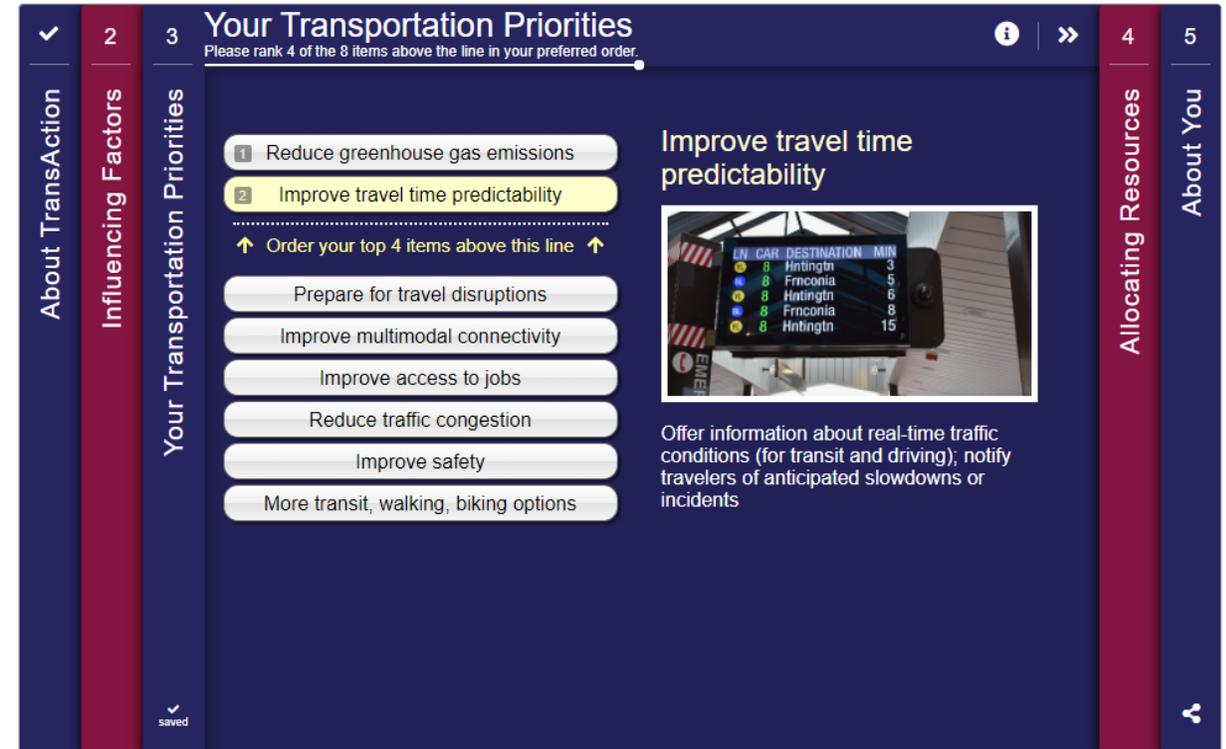


NVTA's  
**TransAction**  
*Transportation Action Plan  
for Northern Virginia*

# 2021 TransAction Survey

- » Purpose: to seek feedback on travel behaviors, transportation needs and priorities
- » Format: MetroQuest platform utilizing interactive “gamified” exercises
- » Available languages: English, Korean, and Spanish
- » Dates: August 6<sup>th</sup> - September 19<sup>th</sup>
- » Responses:
  - English: 2,164
  - Korean: 89
  - Spanish: 65\*
  - TOTAL: 2,318

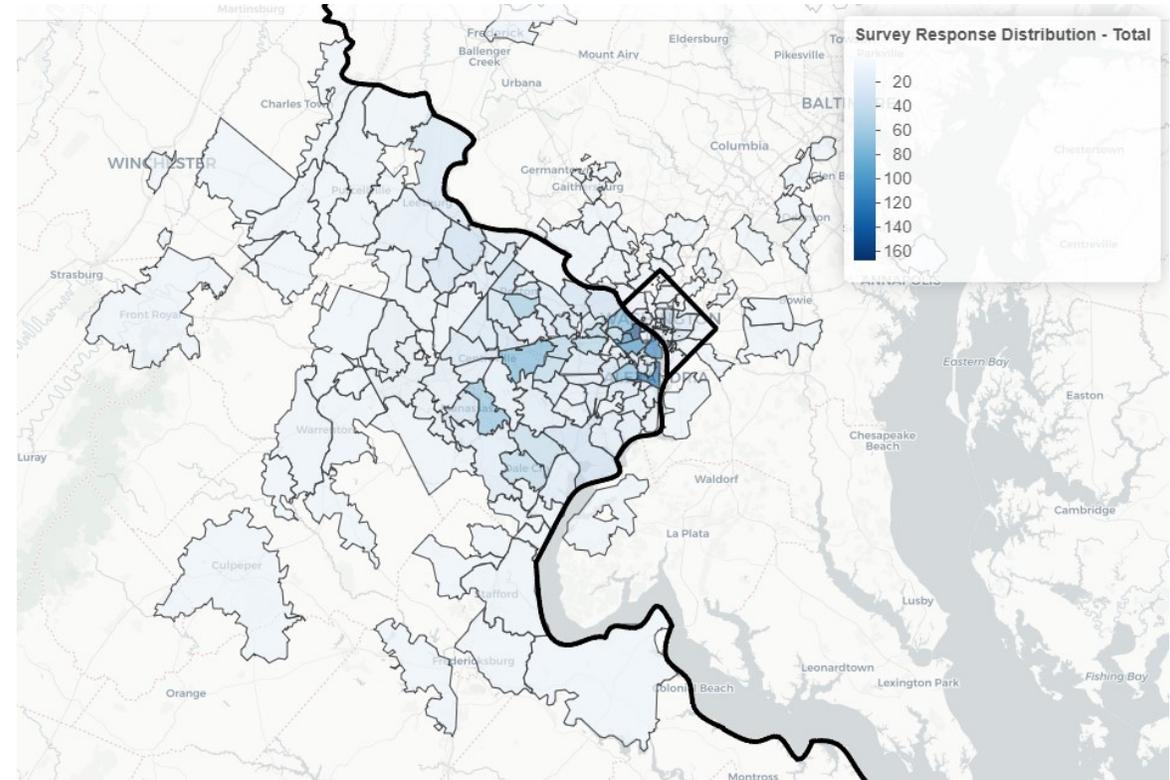
\* At pop-up events, 123 Spanish speakers received assistance completing the survey in English



*The survey did not apply a random sample recruitment method. Therefore, the sample does not statistically represent the population of the NVTA region.*

# About the Survey Respondents

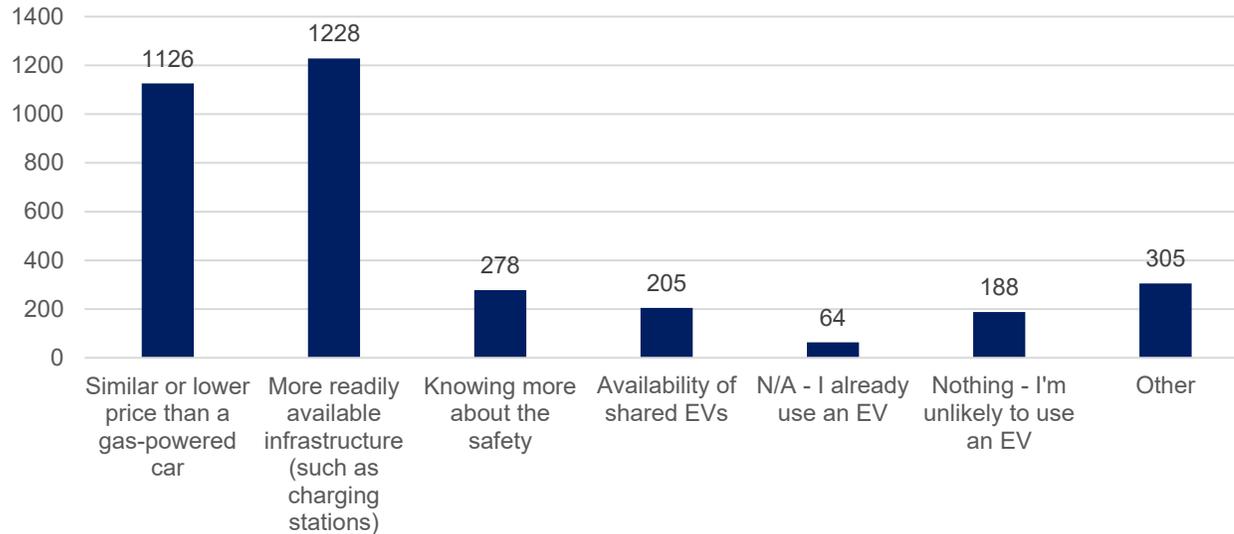
- » Roughly half of respondents from Arlington, Alexandria, and Falls Church
- » 12% from households with less than 50k in annual income
- » 31% identified as non-white or Hispanic/Latinx
- » 19% were people 65 years or older



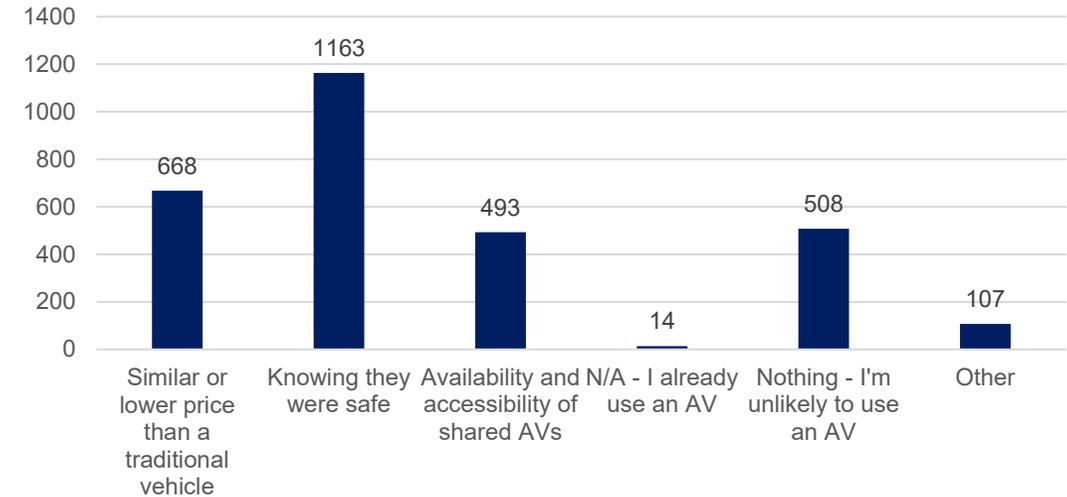
Map of Home Zip Codes of Survey Respondents

# Survey Results – Emerging Technologies

Conditions for Future EV Usage



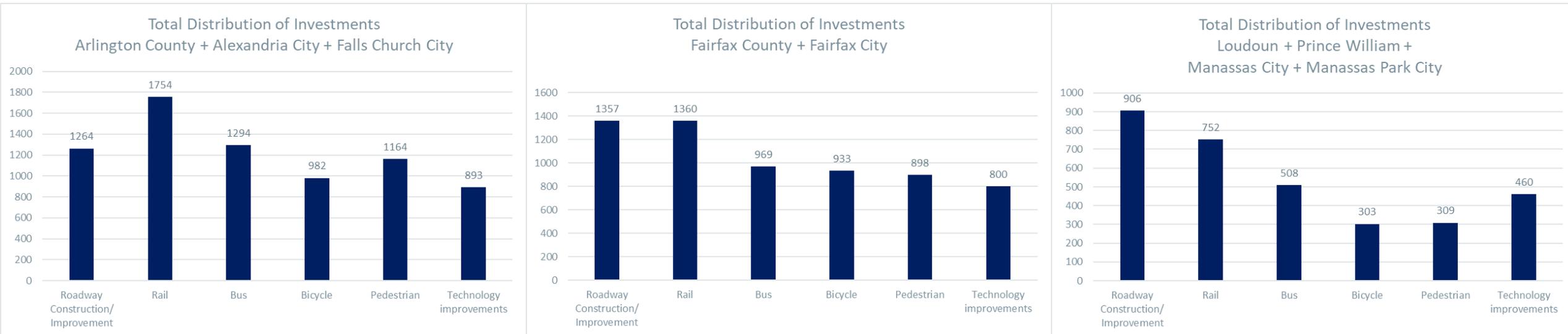
Conditions for Future AV Usage



- More likely to consider using an EV once there is more readily available infrastructure (64%) and once the price is similar or lower than the price of a gasoline-powered car (58%)
- More likely to use an AV once they had confidence that AVs were safe (61%)



# Survey Results – Allocating Resources



- Respondents were given 10 hypothetical coins, each representing \$1 million, and asked to distribute them between six different project types
- Rail projects received the most investments (total “coins”), followed by roadway construction/improvement and bus



Thank you!



# Supplementary Slides



# What is the Transportation Technology Strategic Plan (TTSP)?

- Tool that will inform a proactive approach to adoption of transportation technology;
- TTSP considers how transportation technologies support the region's vision, i.e. needs-driven NOT technology-driven;
- Includes eight strategies, and up to nine NVTA roles for each strategy;
- TTSP is a living document that will be updated as transportation technologies evolve;
- TTSP Action Plan enables NVTA to think big, start small, and build momentum with respect to adoption of transportation technologies in the region.



# Adopted Strategies

Recommended Strategies		Intent of Strategy (long term)
1	Reduce congestion and increase throughput	Support deployment of transportation technologies that improve performance and optimize efficiency of the regional multimodal transportation system
2	Maximize access to jobs, employees and housing	Support deployment of transportation technologies that increase travel options and awareness of them
3	Maximize cybersecurity and privacy for members of the public	Monitor concerns on behalf of Northern Virginians, and leverage NVTa processes where appropriate and feasible
4	Minimize potential for Zero Occupancy passenger Vehicles	Identify measures to address avoidable increases in passenger vehicle miles traveled
5	Develop pricing mechanisms that manage travel demand and provide sustainable travel options	Identify technology-related measures at a regional scale to dynamically address congestion, including incentives; revenues will be re-invested in equitable solutions
6	Maximize the potential of physical and communication infrastructure to serve existing and emerging modes	Support adaptation of existing resources to support desirable technologies such as CASE vehicles, travel apps, micro modes and robust data collection
7	Enhance regional coordination and encourage interoperability in the transportation system	Leverage regional synergies in the deployment of transportation technologies
8	Advance decarbonization of the transportation system	Support deployment of transportation technologies that reduce greenhouse gas emissions



# TTSP Strategies and NVTA Roles

Strategy		NVTA Roles								
		Authority Roles			Shared Roles			Staff Roles		
Number	Name	Funding	Policy	Advocate	Champion	Facilitate	Stakeholder	Planning	Outreach/ Education	Observer
1	Reduce congestion and increase throughput	✓		✓	✓	✓		✓	✓	
2	Maximize access to jobs, employees and housing	✓			✓	✓		✓	✓	
3	Maximize cybersecurity and privacy for members of the public	✓					✓			✓
4	Minimize potential for Zero Occupancy passenger Vehicles		✓	✓	✓	✓		✓	✓	
5	Develop pricing mechanisms that manage travel demand and provide sustainable travel options		✓	✓			✓	✓	✓	
6	Maximize the potential of physical and communication infrastructure to serve existing and emerging modes	✓			✓	✓		✓	✓	
7	Enhance regional coordination and encourage interoperability in the transportation system	✓			✓	✓		✓	✓	
8	Advance decarbonization of the transportation system	✓	✓	✓	✓	✓		✓	✓	



# TTSP Draft Action Plan Consolidated Actions Table

Roles		Immediate				Near Term				Mid Term	Long Term								
		Jan - March, 2021	April - June, 2021	July - Sept, 2021	Oct - Dec, 2021	Jan - March, 2022	April - June, 2022	July - Sept, 2022	Oct - Dec, 2022	2023 - 2025	2026 - 2029	2030 and Beyond							
Title	Applicable Strategies								TransAction kick-off			Completion of TransAction Phase 1		TransAction adoption		Development of legislative program			
	1	2	3	4	5	6	7	8				Development of legislative program	Six Year Program Update FY2022-2027						
Funding	1A, 1B	2A	3A, 3B			6A, 6B	7A	8A											
Policy				4B	5A			8B											
Advocate	1C			4C, 4D, 4E	5A			8C											
Champion	✓	✓		✓		✓	✓	✓											
Facilitate	✓	✓		✓		✓	7B	✓											
Stakeholder			✓		✓														
Planning	1A	2A	3A	4A	5B	6A	7A	8A											
Outreach/ Education	✓	✓		✓	✓	✓	✓	✓											
Observer			✓																

Key				
Preparatory Action	Potential Direct Action	Direct Action	Follow Up Action	Continual/ Serendipitously
Bold text indicates this Role is a focus of the Strategy-Specific mini-action plans.				



# Technologies Mapped to TTSP Strategies

Strategies		Technologies										
Number	Name	Automated/ Autonomous vehicles	Shared Mobility Devices (SMDs)	Signal technologies	Apps	System optimization	Drones	Changes to delivery and freight systems	Surveillance/ monitoring (including telematics)	Data generation/ collection/ sharing	Improvements to mass transit (including BRT)	Smart technologies/ cities and IoT
1	Reduce congestion and increase throughput	●	●	●	●	●	●	●	●	●	●	●
2	Maximize access to jobs, employees and housing		●	●	●	●	●	●	●	●	●	●
3	Maximize cybersecurity and privacy for members of the public	●	●	●	●	●			●	●		●
4	Minimize potential for Zero Occupancy passenger Vehicles	●	●	●	●	●	●	●	●	●	●	●
5	Develop pricing mechanisms that manage travel demand and provide sustainable travel options	●	●		●	●	●	●	●	●	●	●
6	Maximize the potential of physical and communication infrastructure to serve existing and emerging modes	●	●	●		●	●	●			●	●
7	Enhance regional coordination and encourage interoperability in the transportation system	●	●	●	●	●	●	●	●	●	●	●
8	Advance decarbonization of the transportation system	●	●			●						

Key	
Will definitely be helpful	●
Potential to be helpful	●
Equal potential to be helpful or detrimental	●
Potential to be detrimental	●
Likely to be detrimental	○
Not applicable or Insufficient Information Available	

# Encouraging Survey Participation

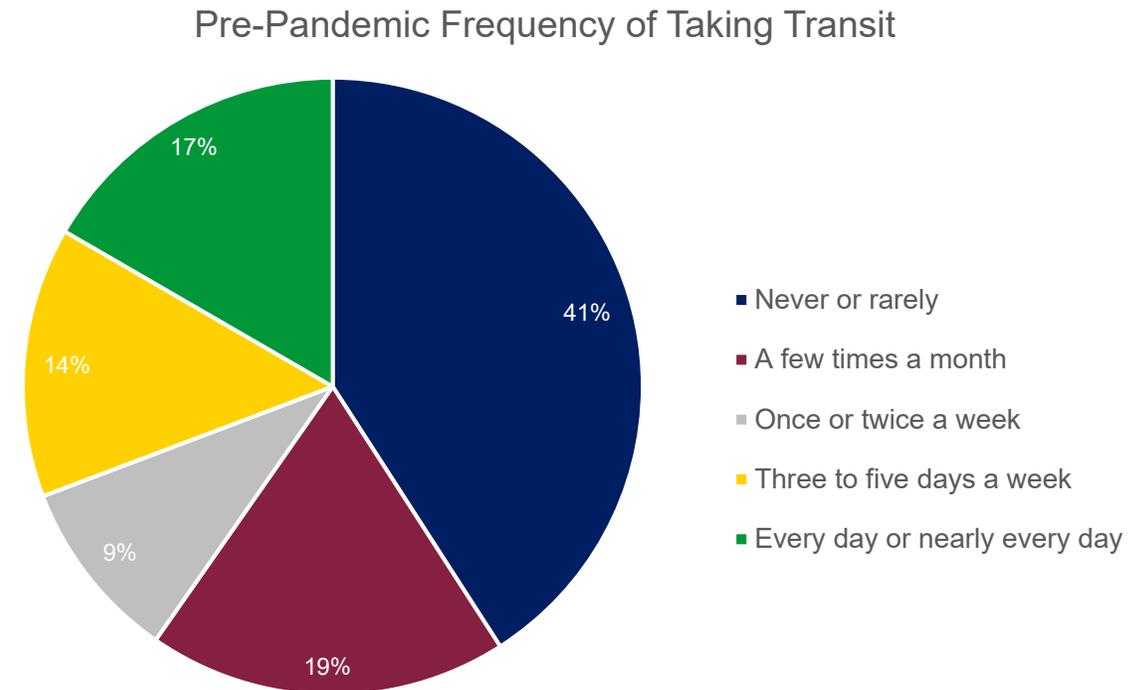
- » Range of engagement activities used to “get the word out” about the survey
- » Traceable links show where participants heard about the survey:

Source	Number of Responses
Website	691
Stakeholder outreach	405
Pop-up events	351
General (not traceable)	252
Paid social media	206
Newsletter	166
LinkedIn	92
Twitter	89
Facebook	65
Geofenced ads	1
Instagram	0



# Survey Results – Travel Characteristics

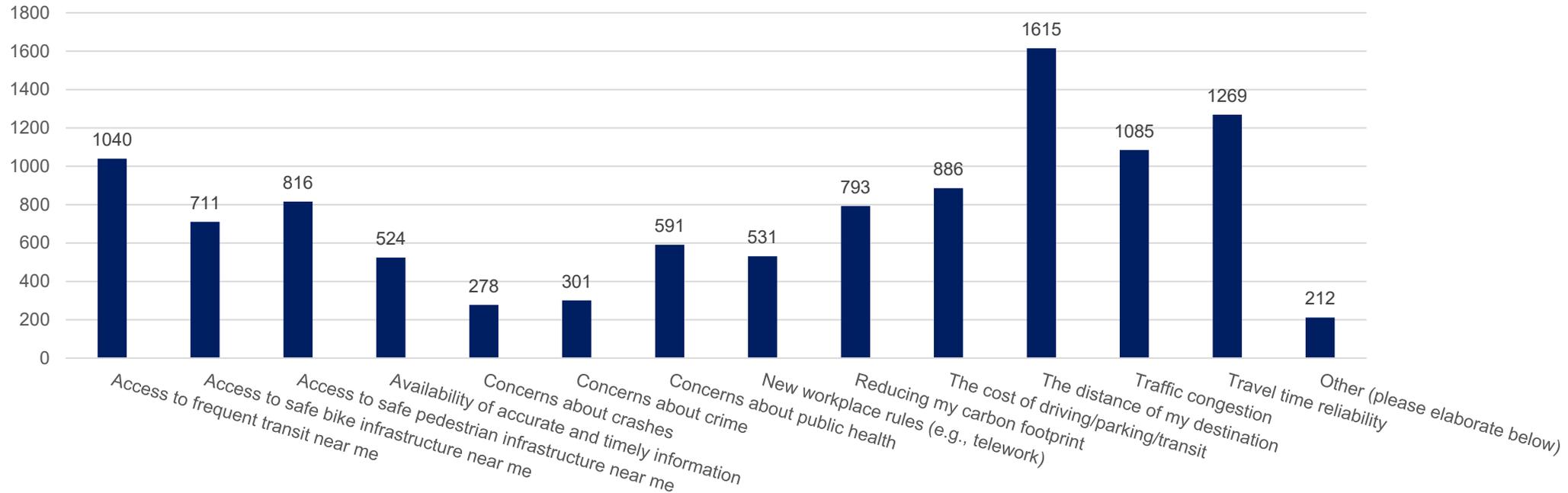
- » Pre-pandemic trips to work/school/other:
  - 31% used transit at least 3 days a week
  - 14% biked at least 3 days a week
  - 28% walked at least 3 days a week
- » About a third of respondents anticipate changing their post-pandemic travel habits compared to pre-pandemic
  - 28% will reduce driving
  - 21% will reduce transit use
  - 8% will reduce biking
  - 6% will reduce walking





# Survey Results – Influencing Factors

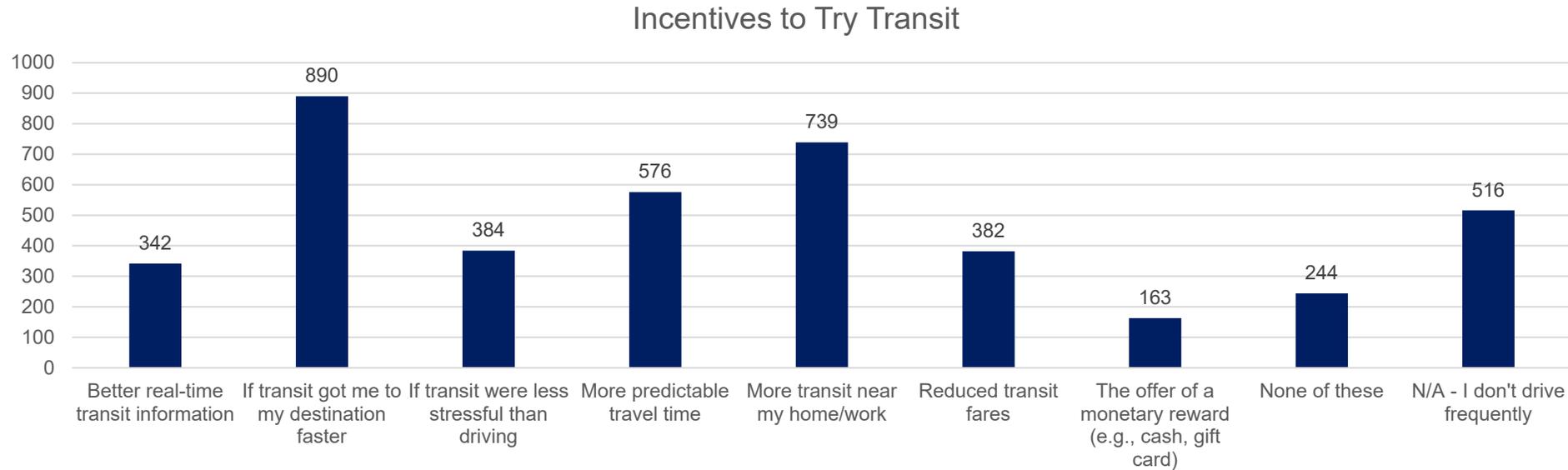
Factors That Influence Mode Choice



- Factors that will most affect mode choice: trip distance (76%), travel time reliability (60%), traffic congestion (51%), and access to frequent transit (49%)
- Factor least likely to affect mode choice: concerns about crashes (13%) and concerns about crime (14%).



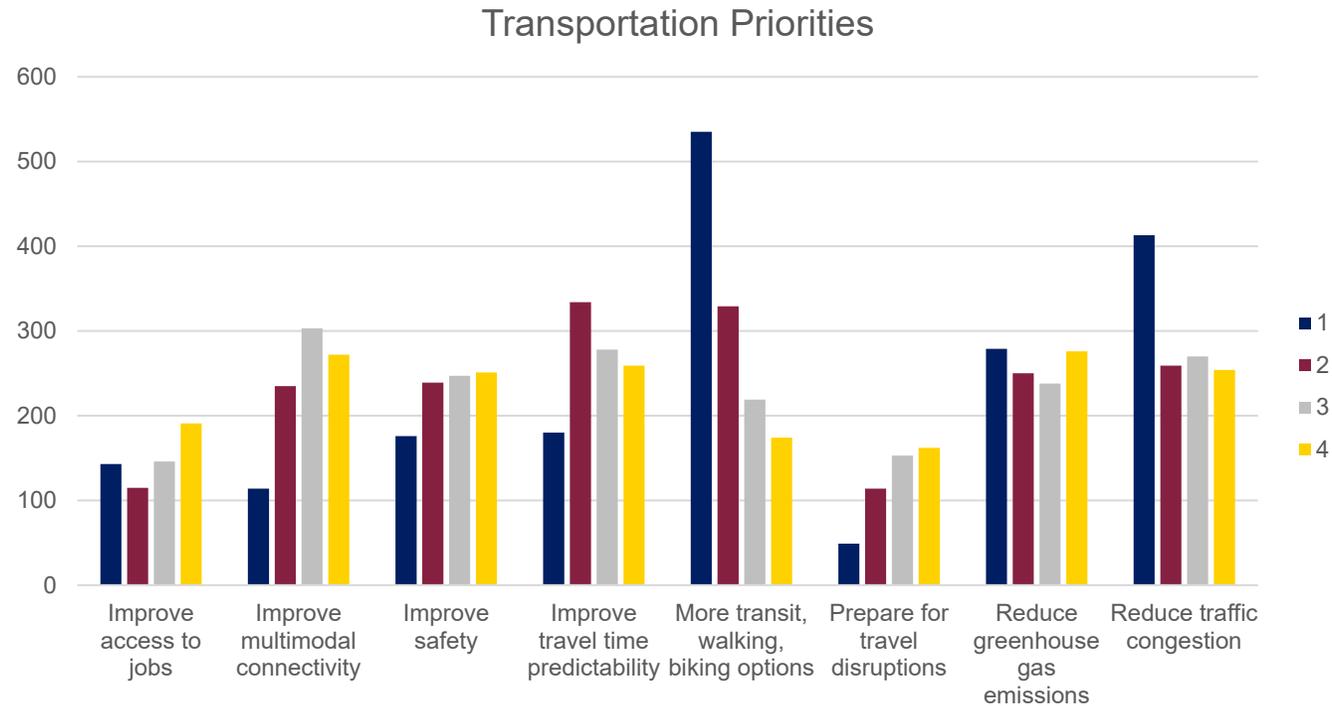
# Survey Results – Incentives to Use Transit



- Would be more likely to try transit if:
  - Got them to their destination faster (44%)
  - More transit near their home and/or work (36%)
  - More predictable travel time (28%)
- Only 12% of respondents reported they were not interested in trying transit

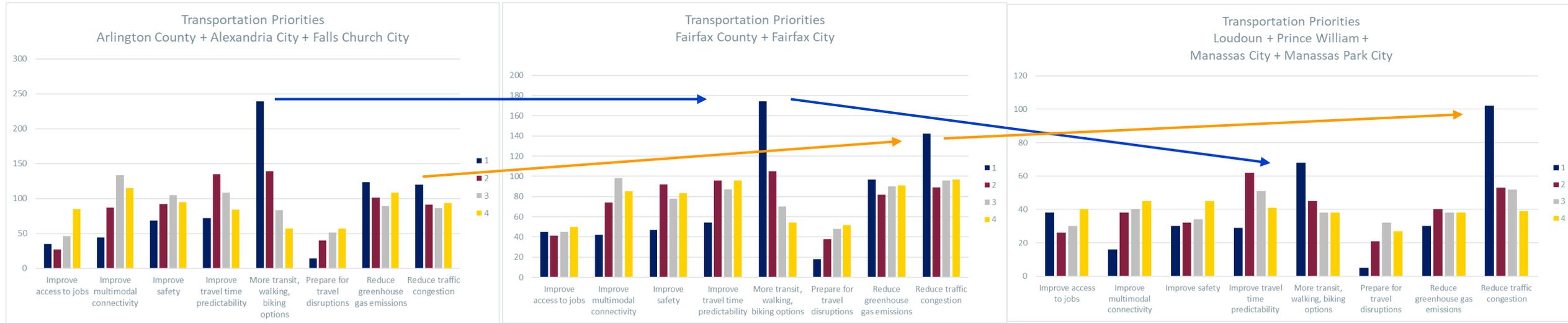


# Survey Results – Transportation Priorities



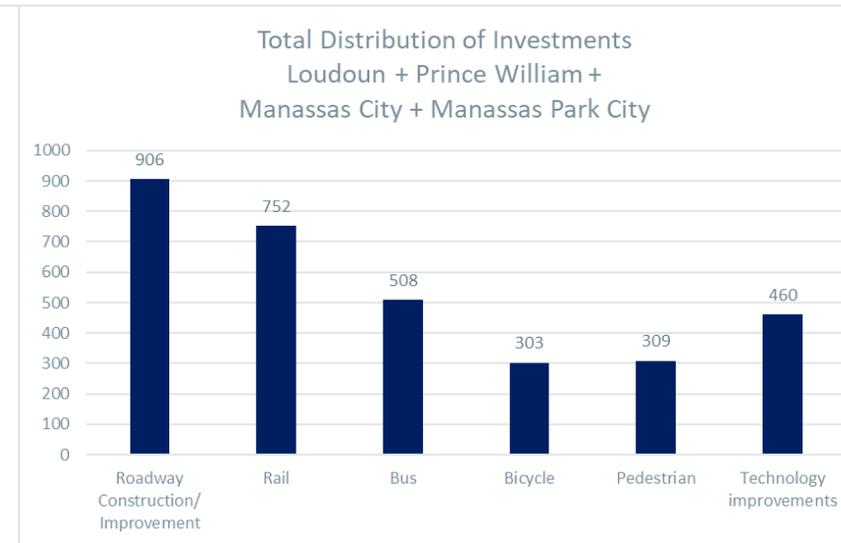
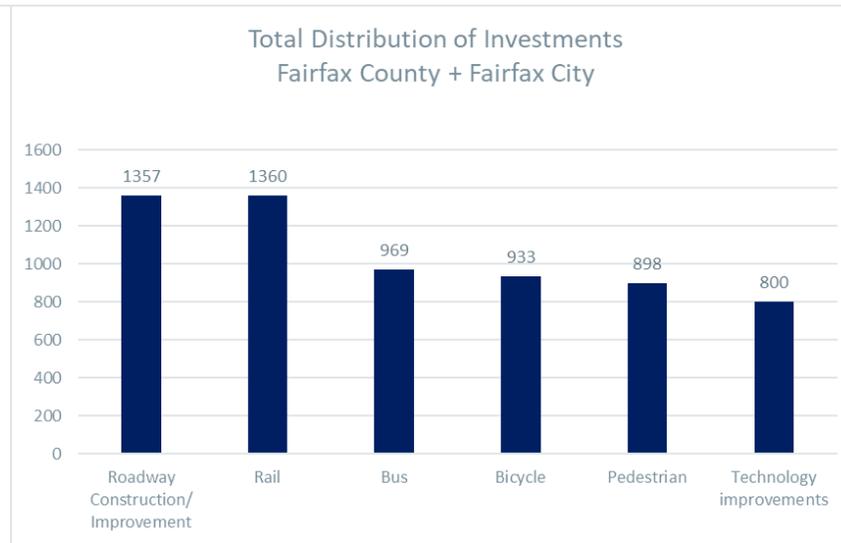
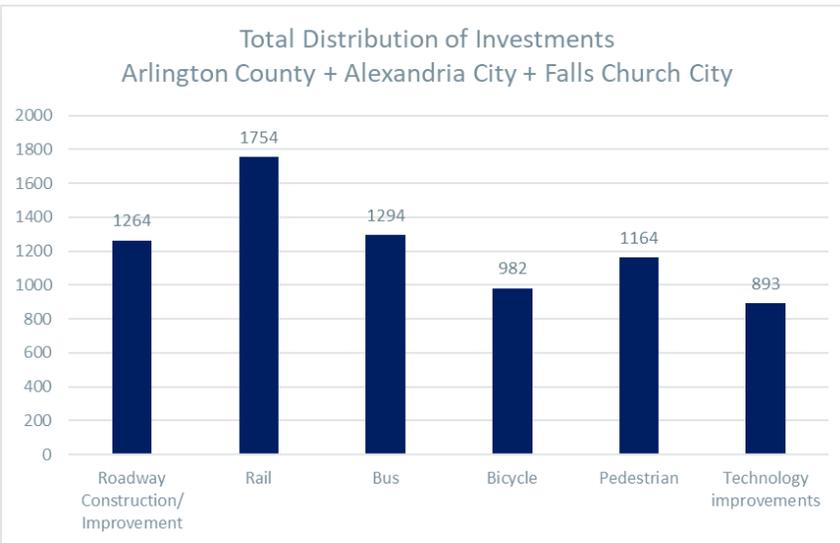
- Priority most frequently ranked 1<sup>st</sup>, was “more transit, walking, biking options”
- 2<sup>nd</sup> and 3<sup>rd</sup> most commonly selected priorities were “reduce traffic congestion” and “improve travel time predictability”

# Survey Results – Transportation Priorities by Geographic Area



- Survey respondents from inner jurisdictions selected “more transit, walking, biking options” as the top priority
- Survey respondents from outer jurisdictions selected “reduce traffic congestion” as top priority
- Other objectives showed less variability between different geographic areas – “improve travel time reliability” was typically the 2<sup>nd</sup> ranked priority

# Survey Results – Transportation Priorities by Geographic Area



- » Home location of respondents did influence selection of type of investments needed:
- Inner jurisdictions allocated resources to rail (1<sup>st</sup>) and bus (2<sup>nd</sup>), before roadway improvements (3<sup>rd</sup>)
  - Fairfax County/City allocated resources about evenly between roadway and rail, then bus
  - Outer jurisdictions allocated the most resources to roadway construction/improvement, followed by rail (2<sup>nd</sup>) and bus (3<sup>rd</sup>)