CHAPTER 4 – FUTURE TRENDS

4.1 LAND USE SCENARIO PLANNING

Scenario planning represents the next generation of analytical processes created to evaluate the influence of development intensities and land use patterns on the efficiency of a proposed transportation system. The working premise is that stronger linkages between land use (demand), urban form (design), and transportation (supply) can significantly improve the efficiency of the regional transportation system; while also promoting a variety of local planning initiatives underway — revitalization of cities and towns, suburban place-making, rural preservation, and protecting the natural environment — to make the region more livable and economically-viable.

Phase I of the FAMPO scenario planning initiative, entitled *Your Vision, Our Future*, was completed in 2012. As part of that effort a CommunityViz software tool was developed for the George Washington Region that when used with the regional travel demand model afforded FAMPO the opportunity to study five distinct land use growth scenarios for evaluating the relationship between land use, urban form, and travel behavior.

Phase II of the FAMPO scenario planning initiative, which is the subject of this summary, built upon the findings of Phase I, but with a focus on testing transportation-oriented scenarios in terms of their effects on regional travel behavior and traffic conditions.

4.1.1 PHASE I STUDY OUTCOMES

It was important for *Your Vision, Our Future* that the Phase I growth scenarios reflected the region's rich history, environmental assets, military presence, and geography within the super region extending between Washington, D.C. and Richmond, VA. The project team worked with several stakeholder groups to understand the challenges and opportunities facing the region and create viable alternative growth scenarios.

Based upon inputs received through the outreach process, the project team defined four initial alternative growth scenarios for *Your Vision, Our Future*. Each scenario was different enough to pose real choices for how the region could develop under one or more planning initiatives. The four alternative growth scenarios included:

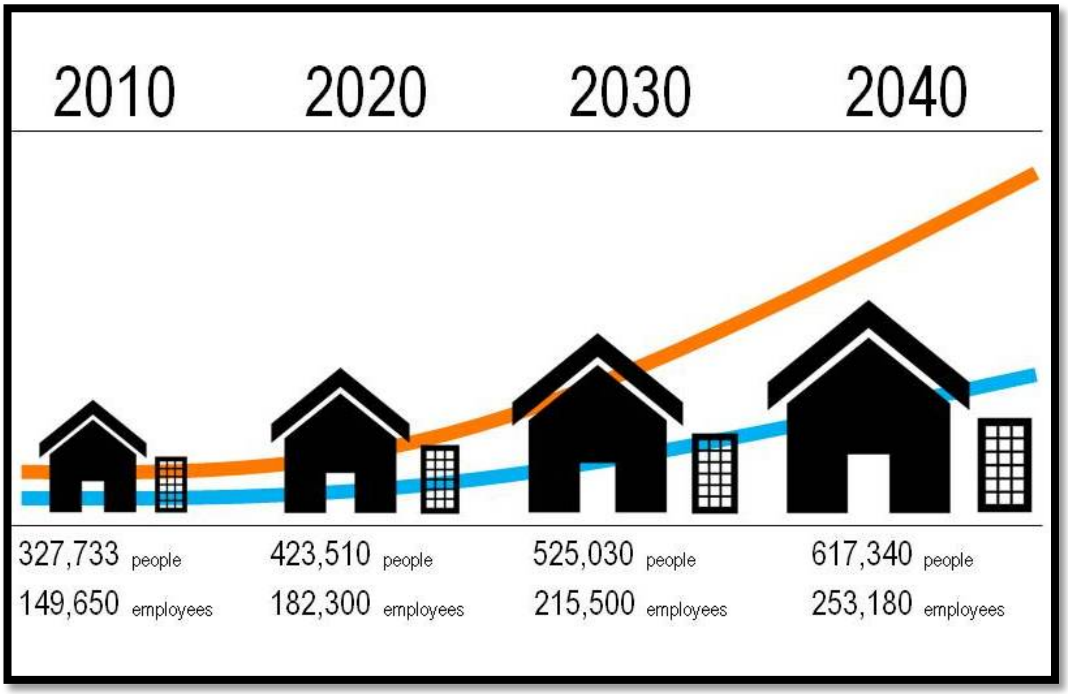
- Decentralized Growth
- Compact Centers & Growth Corridors
- Green Print Initiative
- Greater Jobs-Housing Balance

Results from the technical analysis for *Your Vision, Our Future* were joined with comments from the stakeholder awareness campaign to help the project steering committee recommend a preferred growth scenario for developing FAMPO's 2040 Long Range Transportation Plan (LRTP). Ultimately, the project steering committee decided to create a new growth scenario — Community Plans — based on the information available.

The Community Plans Growth Scenario contemplated how the region develops if city and county comprehensive plans were fully implemented. This scenario also met federal rules and requirements for updating a long-range transportation plan; specifically, to consider land use and development controls reflected in adopted local government plans and ordinances for evaluating future year transportation conditions, recommending improvements, and prioritizing their implementation.

The Community Plans Growth Scenario projected a growth in population of 90% by 2040, with a corresponding employment growth of 70%.

Figure 4.1: Community Plans Growth Summary



4.1.2 PHASE II SCENARIOS

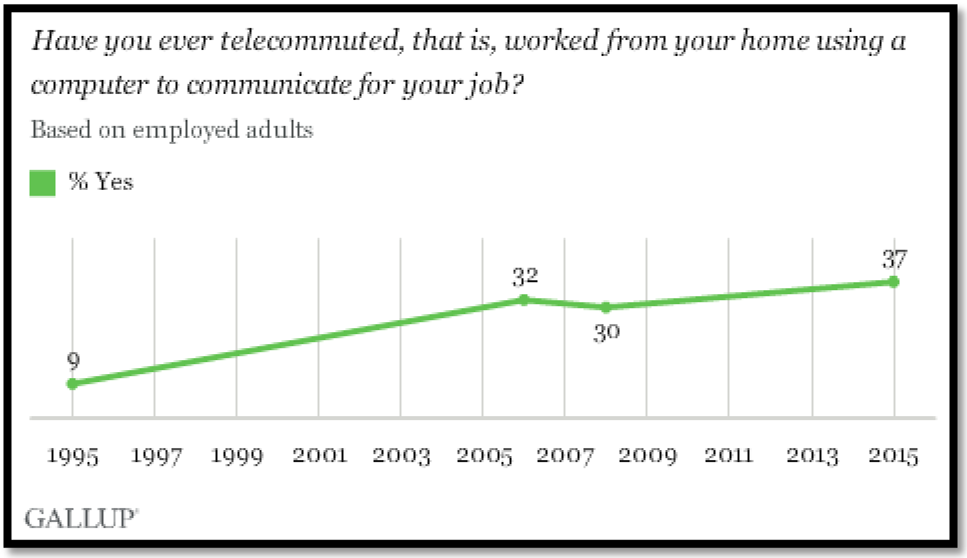
The Phase II scenarios were focused on aggressive transportation system policy and technological shifts that included substantial enhancements to transit infrastructure, continued growth in telecommuting participation and implementation of state-of-the-art automated vehicle technologies. Descriptions of each of these three alternative transportation scenarios are provided below:

1. All-in-Transit Scenario

The All-in-Transit Scenario considered how the region might develop if initiatives were enacted to shift a significant number of single-occupant automobile trips to transit or vanpool trips. Government investments in the transportation system would focus on the infrastructure required for a viable transit system in the George Washington Region, while each city, town, and county in the region would also adopt rules and procedures in their local plans and development ordinances that require minimum participation criteria for promoting transit and vanpool trips in the private sector. Opportunities to live, work, shop, and be entertained in mixed-use, walkable transit activity centers (existing or proposed) would draw people to transit service areas.

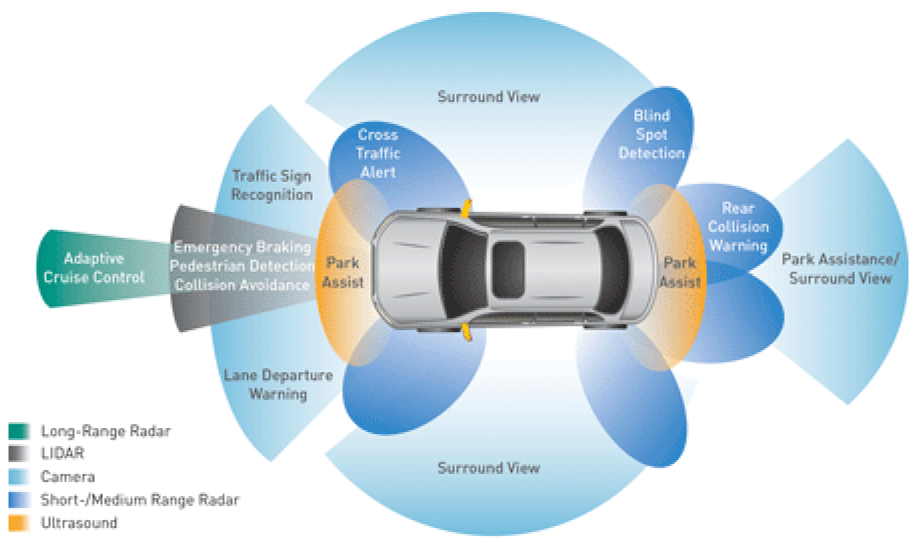
2. Region of Telecommuters Scenario

The Region of Telecommuters Scenario considers the transportation impacts if a significant number of people in the labor force were able to shift from traditional office work to telecommuting for meeting their daily employment responsibilities. The chart below based on Gallup data shows that approximately 37% of employees have telecommuted as of 2015 and this is trending upward.



3. Thinking Cars Scenario

The Thinking Cars Scenario considers the impacts if automotive technologies were advanced to a point where more capacity was available in the existing (or proposed) regional transportation system. Major automotive technology advancements could lead to reduced following distance criteria, free-flow or timed speeds to eliminate vehicle stops and starts, coordinated vehicle movements, or optimum routing based on congestion levels. All these advancements would benefit the existing transportation system.



4.1.3 PHASE II SCENARIO RESULTS

Each of the Phase II scenarios was evaluated using the system-level roadway performance measures used for the Phase I land use scenario planning effort. The FAMPO regional travel demand model was used to project travel demand on the regional roadway system for 2040 under the All-in-Transit, Region of Telecommuters and Thinking Cars Scenarios. A 2040 model run for the Community Plans Growth Scenario was also performed to use as a comparison to the Phase II scenario results. The four system-level roadway performance measures that were calculated for the region based on the travel demand model outputs included:

- Vehicle miles of travel (VMT)
- Vehicle hours of travel (VHT)
- Average roadway speed
- % Travel on congested roadways

Vehicle miles of travel (VMT) is a measure of the demand for vehicular travel on the region's roadways. It is calculated by multiplying each vehicle trip times the length (in miles) of that trip.

Vehicle hours of travel (VHT) is a measure of the time that vehicles spend traveling on the region's roadways. It is calculated by multiplying each vehicle trip times the length (in hours) of that trip.

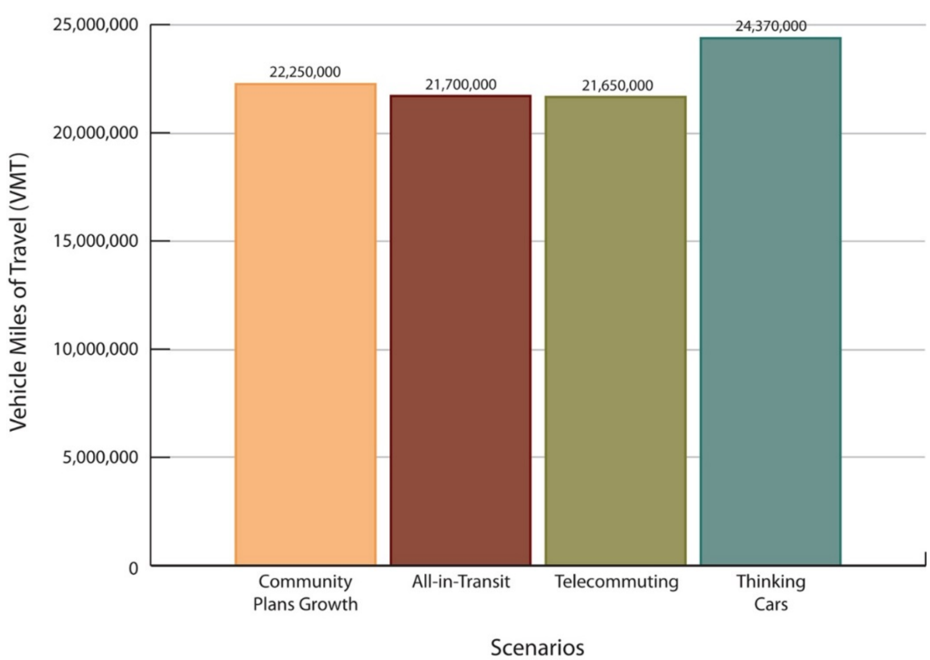
Average roadway speeds were calculated by dividing regional VMT by VHT. As such, these speeds reflect an average of speeds on all roadways on a daily basis. They are not reflective of peak period speeds, which would likely be lower.

The percentage of travel that is projected to take place on congested roadways in the George Washington Region is calculated by summarizing the VMT that travels on congested roadway links. For the purposes of this analysis, congested roadways are defined as those that are operating at level of service (LOS) E or F. The FAMPO travel demand model calculates a roadway's LOS based on the projected volume as compared to a roadway's capacity. LOS E represents a situation where a roadway is operating at capacity and LOS F represents a roadway that is over-capacity.

Vehicle Miles of Travel Results

The figure below shows the projected VMT under the three Phase II 2040 scenarios as compared to the Community Plans Growth scenario. The All-in-Transit and Region of Telecommuter Scenarios show a 2-3% reduction in regional VMT, while the Thinking Cars Scenario results in a 10% increase in regional VMT. The increased VMT is a result of the added roadway capacity and increased vehicle speeds that will be obtained with the advent of thinking car technology.

Figure 4.2: Vehicle Miles of Travel Comparison

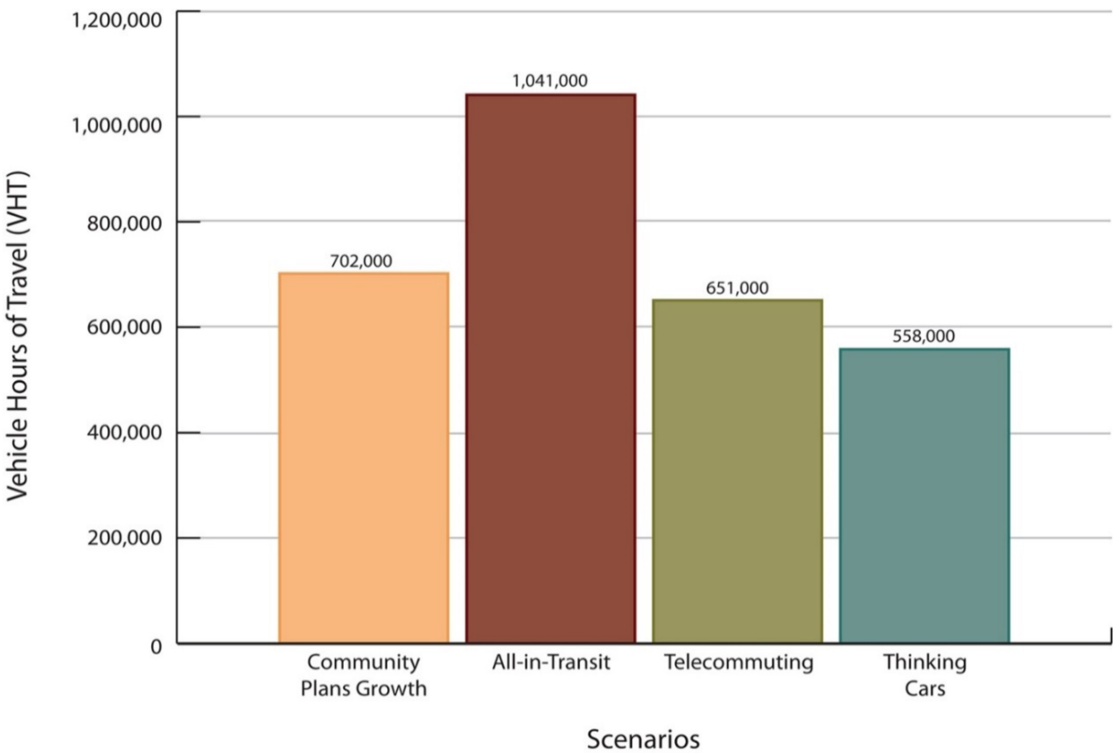


Vehicle Hours of Travel Results

The figure below shows the projected VHT under the three Phase II 2040 scenarios as compared to the Community Plans Growth Scenario. The VHT results show a wider differential among the scenarios as compared to the VMT findings. This is more a function of the roadway network speed and capacity assumptions than it is the changes in vehicle demand. For example, while the All-in-Transit Scenario results in a 6-7% reduction in vehicle trips, the benefits of this reduced vehicle demand are being offset by the fact that highway infrastructure investment has been replaced by transit infrastructure investment under this scenario. This results in more congestion and longer travel times for vehicle trips.

The Region of Telecommuters Scenario shows a 7% reduction in VHT which is the result of peak period work trip reductions due to significantly increased telecommuting. The 20% reduction in VHT under the Thinking Cars Scenario is the direct result of increased roadway speeds and capacities.

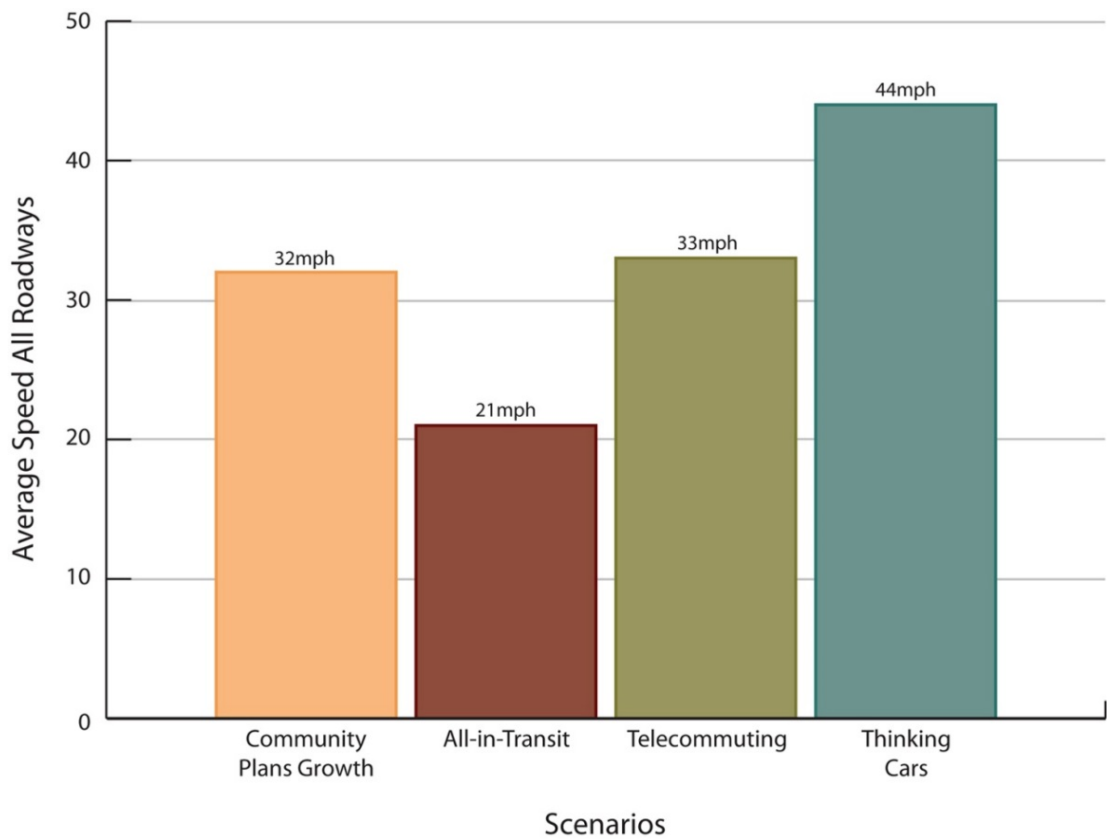
Figure 4.3: Vehicle Hours of Travel Comparison



Average Roadway Speed Results

The figure below shows the projected average roadway speeds under the three Phase II 2040 scenarios as compared to the Community Plans Growth Scenario. These results are consistent with the VHT results described above. For example, lower VHT generally is a result of higher speeds on the roadway network.

Figure 4.4: Average Roadway Speed Comparison



Percent Travel on Congested Roadways Results

The figure on the next page shows the projected percent travel on congested roadways under the three Phase II 2040 scenarios as compared to the Community Plans Growth Scenario. These results are basically the inverse of the average roadway speed comparison. As speeds increase, roadway congestion decreases.

4.1.4 PLANNING AND IMPLEMENTATION

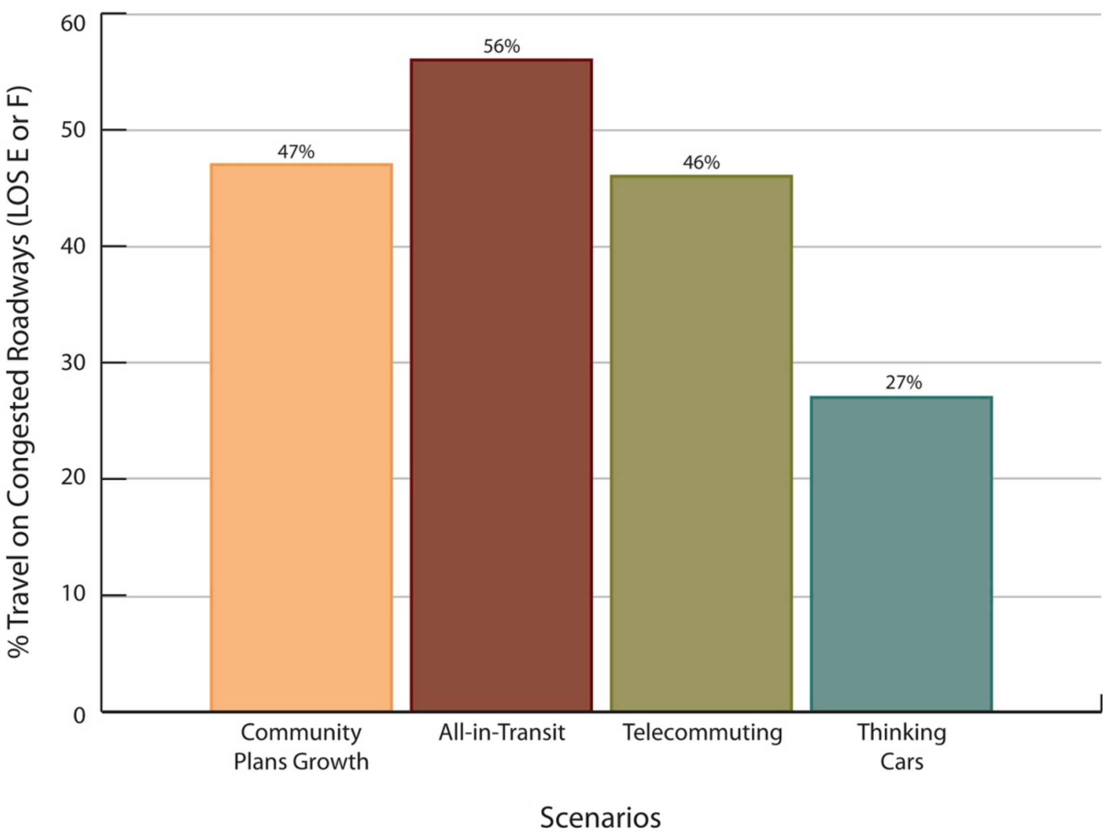
Each of the Phase II scenarios will require varying levels and types of policy decisions and infrastructure investment decisions going forward. These are discussed below for each scenario.

All-in-Transit

For the All-in-Transit Scenario to become viable, there will need to be changes to both future land use development plans and transportation infrastructure investment.

On the land use side, the region has historically developed as an auto-oriented and sprawled environment and it is not realistic to think that this will change in the near term. Yet, high capacity transit facilities must serve higher density mixed use environments to be successful. The scenario planning exercise undertaken in Phase I provides guidance on what a more transit-friendly land use plan for the region would look like, as shown in the Compact Centers and Growth Corridors Scenario, which contemplated how the region could develop if new growth was focused into compact, walkable communities with nearby opportunities to live, work, shop, and be entertained. However, in order for the features of this scenario to be implemented, local jurisdictional comprehensive and land use plans will need to be updated. Since existing development levels and patterns can't be undone, change will have to take place through new development or redevelopment initiatives and projects.

Figure 4.5: Percent Travel on Congested Roadways Comparison



From a transportation infrastructure investment perspective, there will need to be a fundamental shift in how the region spends its limited transportation funding. High capacity transit facilities are expensive and there will likely not be enough money to fund both major transit and major highway improvement projects.

For this Phase II planning exercise, this shift in investment strategy was accounted for at a rough level by assuming that none of the highway improvements in the FAMPO Long Range Transportation Plan would be implemented between 2020 and 2040. The results, as documented in this summary, were that highway congestion got significantly worse even with an assumption of a dramatic increase in transit usage. What was not reflected in this analysis is that transit projects increase person throughput along congested corridors, even if the roadways are at or over capacity, especially during peak periods of travel demand. The significant benefits of high occupancy, non-transit modes such as vanpools were also not accounted for and need to be. A more rigorous evaluation of this scenario would benefit from use of an improved regional travel demand model with a more robust mode choice component.

Region of Telecommuters

Unlike the All-in-Transit Scenario, this scenario was relatively easy to evaluate and is in many ways already being implemented. Ever-expanding broadband networks, improved computer technologies and evolving workplace management policies are leading to steadily increasing levels of telecommuting. Telecommuting does have a limit, however, in how much it can reduce person travel. Nationally, data shows that less than 20% of person trips are work-related[1] so there are a finite number of trips that can be taken off the transportation system on any given day due to telecommuting. A second important factor limiting the future extent of telecommuting is the simple fact that only about 50% of jobs are compatible with telecommuting. Workers in service industries, for example, need to be at the workplace to perform their jobs.

There are certainly many benefits to telecommuting, including but not limited to reduced person trips during weekday peak periods, reduced vehicle emissions, reduced workspace requirements and improved worker moral. The analyses performed as part of this study focused on the highway effects of telecommuting, which showed marginal improvements to daily VMT, VHT, average speeds and congestion.

Thinking Cars

This scenario tested the potential impacts of widespread use of driverless, or autonomous, vehicles. Potential positive impacts include improved safety, improved mobility and circulation, increased ridesharing, reduced emissions and increased roadway capacity and throughput. Potential negative impacts could include increased VMT (which was shown as part of this analysis), increased urban sprawl and short-term job loss in some motor vehicle manufacturing and taxi/delivery driver sectors.

Moving into the future it is likely that a roll-out of driverless vehicles will happen more quickly on highways than local roads due to the more predictable operating environment of highways. Initially driverless and manually-operated vehicles will co-exist on the road, but ultimately, they will have to be separated with dedicated lanes for each. Some experts predict that freight and transit vehicles will be the first to become automated.

Apart from the technology development aspects driverless cars, there will also need to be a proactive policy and regulatory government role at the Federal, state and local levels. The federal government will likely need to update, establish and enforce policies and regulations related to safety, privacy/data sharing and cyber security, in addition to establishing and enforcing vehicle and safety standards. On the other hand, state and local governments will need to update, establish and enforce policies and plans for mobility, infrastructure, transit and financials. In the medium to long-term, potential planning activities at the state and local level could include:

- Update travel demand models to reflect operating and usage characteristics of driverless vehicles,
- Evaluate roadway capacity needs based on outputs of updated travel demand models,
- Re-assess transit service delivery plans and fleet requirements, and
- Forecast the financial implications that may result from changes in conventional revenue and cost streams.

From a state and local policy perspective, the following may need to occur depending on the goals of the region:

- Update roadway policies and infrastructure to manage VMT impacts,
- Adjust land use policies to reduce urban sprawl,
- Adjust the tax/fee structure to dis-incentivize car ownership and/or parking and change transit pricing in response to service and cost changes due to an advent of driverless transit vehicles.

For more information on the George Washington Region Phase II Scenario Planning Study, please refer to Appendix C.

[1] Commuting in America 2013, The National Report on Commuting Patterns and Trends, AASHTO, May 2013.

4.2 CONNECTED AND AUTONOMOUS VEHICLES

Connected Vehicles (CVs) and Autonomous Vehicles (AVs) are two technologies which are likely to significantly impact transportation within the timeframe of the 2045 Long Range Transportation Plan. CVs refer to vehicles which can communicate with one another to achieve goals such as reducing traffic congestion and improving safety. Autonomous vehicles refer to vehicles which can travel independently of a human operator. The precise timeframe for the widespread implementation of these technologies is uncertain with estimates ranging from the 2020's to the 2040's. This plan assumes that widespread implementation is possible by 2045.

There are several potential benefits of CVs and AVs such as reduced traffic congestion, increased safety, reduced fuel consumption and travel time, lower insurance and healthcare costs, better city planning due to lesser need for parking, increased productivity, and improving personal mobility and public transit. The impact of CVs and AVs on commuting patterns is not clear. Some research suggests that they could increase vehicles miles traveled (VMT) by encouraging workers to live further away from employment and take advantage of their commute time to increase productivity. The impact of CVs and AVs on vehicle ownership is another significant factor. Some research suggests that they will reduce personal vehicle ownership and that consumers will alternatively use on demand driverless transportation services for most of their travel. CVs and AVs also have the potential to significantly change transit. Since the driver generally accounts for over half of the cost of operating a public transit vehicle, driverless vehicles would likely drive down transit costs and perhaps encourage increased private sector transit service.

While the potential benefits of CVs and AVs surpass disadvantages, there are certain barriers to adoption such as public safety and privacy concerns from possible equipment failures and cyber security threats. There is also uncertainty regarding the impact of partial implementation of CVs and AVs which would result in a mixed population of driverless and non-autonomous vehicles. Estimates for how long it would take for most of the vehicle fleet to transition from non-autonomous to driverless vehicles are generally more than ten years. A mixed population would likely reduce benefits significantly. The coming impacts of CVs and AVs will continue to be monitored by FAMPO staff as preparations for the 2050 Long Range Transportation Plan begin in FY2019.