Transportation Revenue in the Age of New Mobility

Fall 2018
Eugene • Gresham

Michele Stark • Rebecca Lewis

PPPM 629 Public Budgeting

UNIVERSITY OF OREGON
Eugene
CITY OF GRESHAM OREGON
SCI Sustainable Cities Institute
SCYP Sustainable City Year Program

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COLLEGE OF DESIGN

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About SCI

The Sustainable Cities Institute (SCI) is an applied think tank focusing on sustainability and cities through applied research, teaching, and community partnerships. We work across disciplines that match the complexity of cities to address sustainability challenges, from regional planning to building design and from enhancing engagement of diverse communities to understanding the impacts on municipal budgets from disruptive technologies and many issues in between.

SCI focuses on sustainability-based research and teaching opportunities through two primary efforts:

1. Our Sustainable City Year Program (SCYP), a massively scaled university-community partnership program that matches the resources of the University with one Oregon community each year to help advance that community's sustainability goals; and

2. Our Urbanism Next Center, which focuses on how autonomous vehicles, e-commerce, and the sharing economy will impact the form and function of cities.

In all cases, we share our expertise and experiences with scholars, policymakers, community leaders, and project partners. We further extend our impact via an annual Expert-in-Residence Program, SCI-China visiting scholars program, study abroad course on redesigning cities for people on bicycles, and through our co-leadership of the Educational Partnerships for Innovation in Communities Network (EPIC-N), which is transferring SCYP to universities and communities across the globe. Our work connects student passion, faculty experience, and community needs to produce innovative, tangible solutions for the creation of a sustainable society.

About SCYP

The Sustainable City Year Program (SCYP) is a year-long partnership between SCI and a partner in Oregon, in which students and faculty in courses from across the university collaborate with a public entity on sustainability and livability projects. SCYP faculty and students work in collaboration with staff from the partner agency through a variety of studio projects and service-learning courses to provide students with real world projects to investigate. Students bring energy, enthusiasm, and innovative approaches to difficult, persistent problems. SCYP's primary value derives from collaborations resulting in on-the-ground impact and expanded conversations for a community ready to transition to a more sustainable and livable future.

About Urbanism Next

The Urbanism Next Center at the University of Oregon focuses on understanding the impacts new mobility, autonomous vehicles, e-commerce and the sharing economy are having and will continue to have on city form, design, and development. The Center does not focus on the emerging technologies themselves, but instead on the multi-level impacts — how these innovations are affecting things like land use, urban design, building design, transportation, and real estate and the implications these impacts have on equity, health and safety, the economy, and the environment. Urbanism Next brings together experts from a wide range of disciplines including planning, design, development, business, and law and works with the public, private, and academic sectors to help create positive outcomes from the impending changes and challenges confronting our cities.

About Eugene, Oregon

Eugene is the second most populous city in Oregon with just over 160,000 residents. The city contains many recreational opportunities in town and nearby. Eugene is also recognized for its focus on the arts, as referenced by its slogan: "A Great City for the Arts and Outdoors."

Eugene's economy has grown steadily in recent years. In 2012, the city was dubbed the "Silicon Shire" for its burgeoning technology industry. Its largest employers include PeaceHealth Medical Group, the University of Oregon, and Eugene School District 4J. Finally, Eugene is well known for its sustainability efforts and green activism. The city maintains urban forests that extend into large parks such as Hendricks, Alton Baker, Skinner Butte, and Amazon Creek parks. The city promotes multiple alternative transit forms. The Lane Transit District (LTD) operates a fleet of busses and a bus-rapid transit system known as the EmX; 45 of LTD's busses are hybrids. Eugene also takes pride in its extensive bike network, being named the fifth most bike-friendly city in America in 2010 by *Bicycling* magazine. In total, cycling accounts for 7.3% of Eugene's commuters, 13 times higher than the national average. In partnering with SCYP, Eugene furthers its commitment to sustainability and forward-thinking development.

About Gresham, Oregon

With over 110,000 people, Gresham is the fourth largest city in Oregon. It is bordered to the west by Portland, the largest city in the state. Gresham is ideal for families and businesses wanting to start something new and grow.

Gresham is in close proximity to the Columbia Gorge National Scenic Area and Mount Hood, the highest point in Oregon. It has a wide variety of neighborhoods including: the Civic Center, known for its active transportation network, rapid transit connections, and residential, commercial, and retail mix; Historic Downtown which offers a walkable blend of shops, restaurants, and service businesses; and Rockwood, one of the youngest and most diverse neighborhoods in Oregon.

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Executive Summary

Significant changes in transportation technology will change the way cities collect revenue and fund infrastructure projects. Forward thinking cities like Eugene, Oregon and Gresham, Oregon are already considering what may happen when residents rely on electric cars, autonomous vehicles (AVs), fleets of shared cars, bikes, and e-scooters. Given cities' current reliance on revenue from gasoline taxes, parking fees and fines, and vehicle registration fees, cities will face a significant decrease in revenue.

Students in the PPPM 629 Public Budgeting class were tasked with evaluating new mobility's potential effects on current revenue sources for Eugene and Gresham. Additionally, students examined innovative sources of revenue that the cities could adopt.

Collectively, the students identified 13 innovative sources of revenue that could help cities recoup lost revenue. The students evaluated each source based on equity, neutrality, efficiency, and productivity. Each student group then recommended a funding package for Eugene or Gresham based on their analysis.

To achieve success, we recommend each city take the following measures:

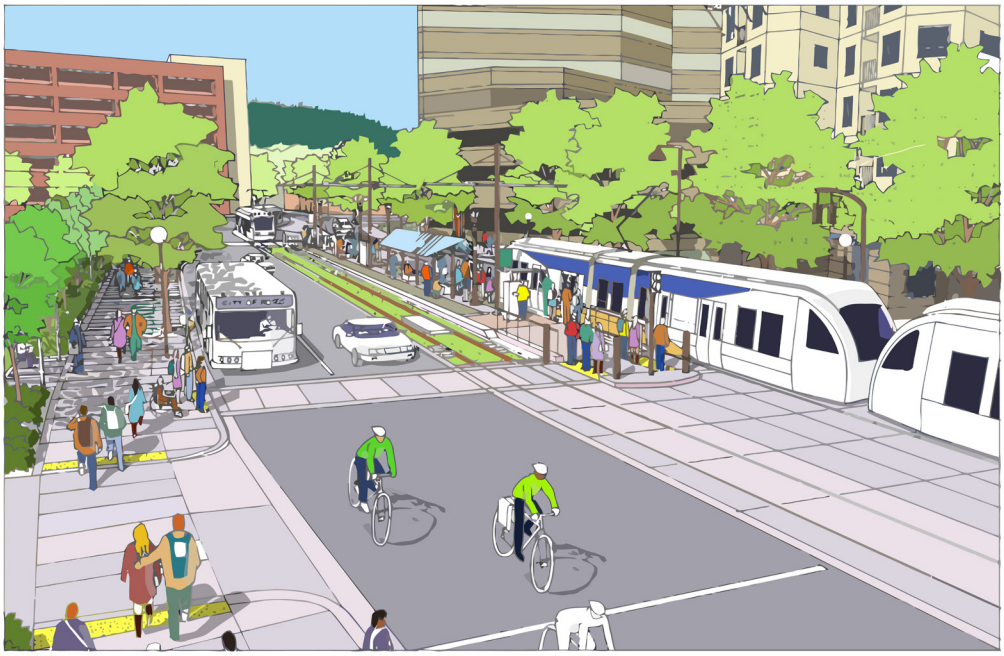
- Adopt a combination of revenue sources to provide resilient, stable funding that will withstand future changes in technology and distribute the tax burden widely.
- Coordinate regionally or push for the adoption of state level taxes to mitigate potential location effects (changes in behavior based on policy differences between jurisdictions), increase collection efficiency, and reduce local administrative burden.
- Consider adopting at least one high-yield revenue source such as a Vehicle Miles Travelled (VMT) tax.
- Address potential equity issues by implementing tiered rate fee systems for some revenue sources, including the VMT tax, the electric vehicle charging tax, Transportation Network Company (TNC) ride fees, tolls for roads and bridges, and shared use parking.
- Address potential traffic congestion by implementing congestion pricing, "zombie" AV taxes, and pick up/drop off zones for TNCs.
- Consider new mobility's potential impact on public transit and take appropriate steps to ensure long-term access to transportation options.

Introduction

A new era of transportation stands before us. Advancements in technology, including electric cars, autonomous vehicles (AVs), transportation network companies (TNCs) like Uber and Lyft, and shared transportation networks will change the transportation landscape of America's cities.

This 'new mobility' movement is projected to improve road safety, traffic, parking congestion, and mobility, while reducing energy consumption and pollution (Fagnant and Kockelman, 2015; Litman, 2018). It will also change the way cities collect transportation revenue and fund infrastructure projects. Forward thinking communities such as Eugene and Gresham, Oregon, are already asking themselves about the potential impacts and are looking for long-term solutions.

This report evaluates the potential impacts of new mobility on the budgets of the city of Eugene and the city of Gresham, as well as novel funding ideas that will position both cities to enjoy long-term financial stability. Students in the School of Planning, Public Policy, and Management's Public Budgeting course were tasked with investigating two different mobility scenarios for each city. Over the course of ten weeks, the students conducted extensive research and analysis, the results of which constitute the findings of this report.



New Mobility: Effects on Current Transportation Revenue

Though cities across America vary greatly, transportation-related revenue sources are strikingly similar. Current sources of revenue depend heavily on current transportation modes. As a result, new mobility is likely to affect the fiscal landscape in cities of all sizes and in all regions.

Transportation-related revenue in Oregon cities currently comes from the following sources:

- Gasoline taxes
- Driver's license and vehicle registration fees
- Weight mileage fees for heavy vehicles
- Traffic citations
- Parking fees and fines
- Airport parking
- Right-of-way fees
- Taxes levied on new vehicles (Oregon HB-2017)
- Development fees and system development charges

This revenue may be collected at the local level or come to cities as pass-through funding from the state or federal government. As a new mobility future draws closer, cities are beginning to think about fiscal impacts and long-term solutions.

NEW MOBILITY SCENARIOS

For this analysis, we considered two different scenarios:

FIG. 1

Scenario A	Scenario B

• 50% of passenger autos = AVs
  • 10% private
  • 90% shared
• 100% AVs = electric
• 50% non-AVs= electric
• Number of vehicles drops 75%
	• 100% of passenger autos = AVs
	  • 30% private
	  • 70% shared
	• 100% AVs = electric
	• Number of vehicles drops 85%

Under either scenario cities would lose revenue from gasoline taxes, driver and vehicle registration fees, parking fees and fines, airport parking, and new car purchases. The only current source of revenue not negatively impacted would be right-of-way rental fees. Each scenario would result in the following decline in revenue:

Scenario A	Scenario B
• 94% decline in conventional (gas) vehicles • 75% decline in registration • 84% decline in licensing • 77% decline in cars needing parking • 7.5% increase in VMT	• 100% decline in conventional (gas) vehicles • 85% decline in registration • 100% decline in licensing • 100% decline in cars needing parking • 9% increase in VMT

FIG. 2

CURRENT TRANSPORTATION REVENUE FOR EUGENE & GRESHAM

For Eugene and Gresham, we began by calculating the current revenue sources that would be affected in a new mobility future.

To calculate the potential loss in revenue, we made several assumptions:

- All gas tax revenues—both own source and pass-through—drop in proportion to the drop in use of gas fueled cars.
- Efficiency and average per-car use of gas fueled cars will remain the same.
- Vehicle registration will drop in proportion to the drop in number of vehicles.
- Parking fees will drop in proportion to the drop in number of vehicles.
- AVs follow the law and will not incur parking fees or fines.
- People will no longer pay to park at the airport given the availability of AVs.

The city of Eugene currently raises $29.2 million in transportation-related revenue. Under each scenario, Eugene could expect a decrease in revenue collected through its airport parking fees, motor vehicle fuel tax (MVFT),

parking fees, and parking fines. In addition, Eugene would receive less pass-through funding from the State; revenue from the State Highway Fund, HB-2017, licenses, and permits would decrease. We estimate the city of Eugene's transportation-related revenue would be $9.5 million under Scenario A and $7.3 million under Scenario B, a decline of 68% and 75% respectively (Appendix A).

The city of Gresham currently raises $21.7 million in transportation-related revenue. Gresham could expect a decrease in revenue collected through its own parking fines as well as pass-through funding from the State Highway Fund. We estimate the city of Gresham's transportation related revenue would be $11.7 million under Scenario A and $10.8 million under Scenario B, a decline of 46% and 50% respectively (Appendix B).

NEW MOBILITY: INNOVATIVE REVENUE SOURCES

Given that the cities of Eugene and Gresham could potentially lose tens of millions in transportation revenue, each city will need new revenue sources. Students generated the following list of potential revenue sources.

- Vehicle Miles Traveled (VMT) Tax: A fee assessed on the number of miles driven. A VMT tax could be used in place of the gasoline tax, which will generate much less revenue with widespread adoption of electric vehicles. In addition, the VMT tax has the added benefit of relying on distance traveled rather than energy consumed, so more efficient cars will not necessarily decrease revenue. Oregon is currently piloting a VMT tax program, which has been set to roughly match the cost of the state's current gas tax (Oregon's Mileage Fee Concept and Road User Fee Pilot Program, 2017).

- "Zombie" autonomous vehicle tax: A fee assessed on AVs driving without passengers. This type of tax would incentivize owners of AVs to prioritize passenger trips and/or opt to park rather than continually drive. In so doing, this type of tax would prevent traffic congestion and unnecessary road wear while protecting the environment.

- Licensing and operating fees for TNCs: A fee assessed on all TNCs for operating in a given jurisdiction. These flat- or tiered-rate fees could be collected at the local or state level.

- Transportation Network Company (TNC) ride fees: A per-ride fee assessed on each trip made by a TNC vehicle. Because TNCs provide a taxi-like service, this fee would approximate fees currently charged by taxis.

- Electric vehicle charging tax: A tax collected each time an electric car—both shared and private use—is recharged. Such a tax could be collected at recharging stations like current taxes collected at gas stations.

- Data fees for selling data to private companies: New mobility options will generate valuable data about resident behavior. Cities may opt to sell this data to private companies for a fee. Cities will want to consider what types of data collection and storage infrastructure may be needed as well as ways to address privacy concerns.

- Pick up/drop off zones for TNCs: AVs will be pulling over frequently to pick up and drop off passengers, which could disrupt the flow of traffic and create congestion. By designating pick up and drop off zones for TNCs at popular destinations and charging them for use of space, cities could generate revenue while easing traffic congestion and increasing rider safety.

- Congestion pricing: Though there will be significantly fewer cars on the road in each scenario, AVs may spend more time on the road picking up and dropping off passengers rather than being parked. At peak hours, congestion may actually increase. Creating a fee for use of congested roadways at peak times would generate revenue while incentivizing travel at off-peak hours and use of alternate routes.

- Parking fees for shared use vehicles: a fee for parking shared use cars. Though shared use vehicles will be on the road more frequently, they will still need to park. Cities could charge special parking fees for these cars.

- Vacant land tax: Given a significant reduction in cars in either scenario, there will be significantly less demand for parking. By adding an additional tax to vacant land, cities could incentivize parking lot infill and redevelopment.

- Increase in property tax base: As parking lots are redeveloped due to lack of demand, many sites may be redeveloped and improved, increasing the taxable value of the property. This could provide increased property revenue for cities.

- Tolls for roads and bridges: A fee for motorists using certain roads or bridges. Though this is a well-established revenue source in many locations across the U.S., the use of tolls in Oregon has historically been limited.

- Storage locker fees: Given increased use of shared use cars, commuters may need a safe place to keep belongings in lieu of a personal vehicle. Cities could install lockers near popular destinations and charge a per-hour or per-day usage fee.

A few key considerations apply to these new revenue sources and new mobility in general.

First, it will be imperative that cities consider the potential locational effects of adopting these innovative revenue mechanisms. If nearby cities do not also adopt similar measures, particularly in the Eugene-Springfield and Portland-Metro regions, residents and TNCs may alter their behavior to avoid paying additional taxes. In such cases, the potential neutrality of any of the above measures (particularly TNC fees and congestion pricing) would be significantly diminished. Regional cooperation or adoption of taxes at the state level may help address this issue.

In addition, cities may also want to consider new mobility's potential effect on public transportation. As new mobility emerges, riders may opt to use AVs, bike shares, or e-scooters instead. Cities may want to consider how to incentivize use of public transportation and how to work in tandem with private companies to cover existing gaps in coverage.

Cities may also want to pay careful attention to TNC pricing. Research shows that TNCs often attempt to undercut an area's public transit system

through predatory pricing (Speck, 2017). By charging less than the public transit system, these companies eventually erode the profitability of the system as ridership drops (Speck, 2017). Once the public transit system is effectively marginalized, the TNC raises prices and creates a monopoly. To prevent this, cities could monitor TNC rates and fine TNCs when they undercut public transit rates.

EVALUATION OF NEW REVENUE SOURCES

The students evaluated each of the above revenue sources in terms of equity, neutrality, efficiency, and productivity, which are defined as:

- Equity: When addressing equity, the fairness and impartiality of a revenue source are considered. It is important to assess whether the revenue source reflects an individual's ability to pay or if it reflects the benefits received from the method of payment. Both horizontal and vertical equity are considered. Horizontal equity refers to the distribution of a tax burden among individuals or businesses in comparable circumstances. Vertical equity refers to the variation of a tax burden across the spectrum of income (Bland, 2013).
- Neutrality: When considering the neutrality of a revenue alternative, it should not change the way an individual or community would otherwise make decisions or use resources unless it is socially desirable (Bland, 2013).
- Efficiency: We must not only consider the cost-effectiveness of each alternative but also whether the alternative maximizes individual utility. The administering of these revenue alternatives should be feasible, and the overall costs should remain in proportion with the revenue (Bland, 2013).
- Productivity: The productivity of an alternative revenue source evaluates the resulting yield of this alternative. A tax or fee should produce sufficient and stable revenue in order to meet the desired levels of expenditures (Bland, 2013).

Students analyzed the revenue sources using the following scale:
Green/3 = high, Yellow/2 = moderate, Red/1 = low.

Vehicle Miles Traveled (VMT) Tax

A VMT tax would likely take the place of current motor fuels taxes. Such a tax, when implemented at a flat rate, is considered regressive; low-income households will pay a larger share of their income than will high-income households. Lack of vertical equity could be remedied by implementing a tiered rate system with special consideration for low-income households. For this reason, the VMT tax is considered moderately equitable. If the level of the tax approximated the current motor fuel taxes, the VMT tax would be unlikely to change consumer behavior and would have a high level of neutrality. In addition, at such a level, the tax would produce a substantial yield. Efficiency of collecting the VMT tax would depend, at least in part, on the chosen method of implementation. Technology could ease the burden of collecting the tax, especially if trackers were installed automatically in all new vehicles. When implemented this way,

the VMT tax could be highly efficient. However, citizens may be uneasy about using such tracking devices and there may be significant push back based on privacy concerns. We evaluate the VMT tax as follows:

	Equity	Neutrality	Efficiency	Productivity
VMT Tax	2	3	3	3

FIG. 3

"Zombie" autonomous vehicle tax

One concern about the adoption of AVs is that they could potentially drive non-stop without carrying passengers. This would increase traffic congestion and degrade roads with needless wear and tear. The zombie AV tax would tax AVs for trips completed without any passengers, thereby disincentivizing needless trips. This tax would be highly equitable as it would be paid by AV owners and operators in a similar financial position. The zombie AV tax would have moderate neutrality, as it would hopefully curb AV use. It would also have moderate productivity as AVs would likely park rather than pay the tax. However, the zombie AV tax would likely be difficult to administer and enforce. Governments would need to find a way to track whether AVs were travelling without passengers and charge the tax for each car. As a result, this tax receives a low efficiency score.

	Equity	Neutrality	Efficiency	Productivity
Zombie AV Tax	3	2	1	2

FIG. 4

Licensing and operating fees for TNCs

Like the VMT tax, licensing and operating fees for TNCs would likely be neutral, efficient, and productive. This is because the fee could be collected from a single source—TNC companies—and set at such a rate to produce an ample yield. As long as rates are not high enough to dissuade TNCs from operating in the jurisdiction, fees would be unlikely to affect TNC operations. We do not know if or how these fees would be passed along to consumers, as it is unclear how heavily residents would depend on TNCs in scenarios A and B. For this reason, we consider licensing and operating fees to be moderately equitable.

	Equity	Neutrality	Efficiency	Productivity
Licensing and Operating Fees for TNCs	2	3	3	3

FIG. 5

Transportation Network Company (TNC) ride fees

Another option would be to charge TNCs a fee for each ride they provide. We believe TNCs would pass along this fee directly to consumers, which would raise the cost for riders. Such a fee would have low vertical equity. However, given the quantity of rides given, it is likely that the yield would be high. Governments would need to develop a way to track the number of rides each vehicle provides and enforce payment of the fee. For this reason, ride fees for TNCs are only moderately efficient.

FIG. 6

	Equity	Neutrality	Efficiency	Productivity
TNC Ride Fees	1	3	2	3

Electric vehicle charging tax

Implementing an electric vehicle charging tax could be another alternative to current motor fuels taxes. Such a tax would be similarly regressive, as low-income households would pay more of their overall income on such a tax. However, if such a tax were set at a comparable rate, it would be highly neutral and productive. If such a tax were collected at charging stations—as motor fuel taxes are collected now—administration would also be quite efficient.

FIG. 7

	Equity	Neutrality	Efficiency	Productivity
Electric Vehicle Charging Tax	2	3	3	3

Data fees for selling data to private companies

The use of AVs and other shared use vehicles will create ample data about consumer behavior. This data may be of interest to private companies who would be willing to purchase it from local governments. Given that private companies would purchase the data, AV users would not pay an additional fee or tax, making this option highly equitable. It is unclear whether consumers would alter their behavior if they knew their data would be sold, making this fee moderately neutral. Governments would need to implement systems to track and store this data, which could be difficult depending upon their current technology resources and staff familiarity with such projects. These fees are therefore considered to be moderately efficient. We do not believe the yield from selling this data would be significant.

FIG. 8

	Equity	Neutrality	Efficiency	Productivity
Data Fees	3	2	2	1

Pick up/drop off zones for TNCs

Autonomous and shared vehicles will be pulling over frequently to drop off and pick up passengers. While many of these passengers will be traveling to private residences, a large portion will be traveling to the same, highly frequented destinations. The city could charge TNC's a fee to stop curbside at these destinations, as frequent stops disrupt the flow of traffic. The amount of revenue generated will largely depend on how the local government chooses to apply the charge. For example, companies could pay a high fee annually, meaning neutrality would be low. Alternatively, the city could choose to charge companies per stop. The latter may be more neutral and equitable, but costlier to implement and administer. Overall, pick-up and drop off zones would benefit the flow of traffic, the safety of riders and other pedestrians, and revenue generation.

	Equity	Neutrality	Efficiency	Productivity
Pick Up/Drop Off Zones for TNCs	2	1	1	2

FIG. 9

Congestion pricing

Congestion pricing could help decrease traffic congestion at peak hours and on frequently travelled roadways. This will be especially important with the adoption of AVs, which could increase traffic significantly. Governments could charge an additional fee to drivers using particular roads at peak times through the use of a system similar to EZ pass, which is an electronic payment device placed in cars that is scanned at certain locations. Congestion pricing that uses a tiered-rate system based on number of passengers or level of income could lead to a more equitable pricing system. Because decreasing congestion is a socially desirable outcome, congestion pricing is also considered to be high in neutrality. Though the technology to track these trips exists, implementation would require significant investment as this system is not currently used in Oregon. As a result, congestion pricing is only moderately efficient. Lastly, congestion pricing would likely yield significant revenue.

	Equity	Neutrality	Efficiency	Productivity
Congestion Pricing	3	3	2	3

FIG. 10

Parking fees for shared use vehicles

Shared use parking spaces are parking spaces reserved specifically for shared use vehicles, which we assume will be autonomous in the future. Ride-sharing vehicles may find themselves without customers at certain times of the day; they could either circle around until hailed or park and wait until hailed. Policy may be required to make these cars park during idle times. However, companies could pass the expense of a parking pass on to their customers through increased rates. The potential for this occurring would depend on the elasticity of demand for service. If operators do pass along the cost through rate increases, it would be a regressive distribution; users who earn less would pay more of their overall income as opposed to higher-earning users. As a result, parking fees for shared use vehicles have low equity. If the bulk of this cost is passed along to riders, some may opt to not use shared use cars, making the policy only moderately neutral. However, this fee would likely mirror current parking fees and would therefore be both efficient and productive for local governments.

FIG. 11

	Equity	Neutrality	Efficiency	Productivity
Shared Use Parking	1	2	3	3

Vacant land tax

Parking lots will become underutilized space in the future with significantly fewer cars on the road. To promote urban density, a vacant land tax could be implemented to encourage development that does not detract from equity criteria. Parking lot owners would be incentivized to sell their land to developers, helping local jurisdictions meet their density goals and reduce speculation. The vacant land tax would be high in equity. Assuming land values continue to appreciate, high yields could also be expected. However, this type of tax has not been widely implemented. Governments would need to develop a system to collect the tax, giving it moderate efficiency. In addition, voters unfamiliar with how such levies work may be unsupportive. Given that higher density is socially desirable and in line with Oregon's growth management plan, the vacant land tax would be considered highly neutral.

FIG. 12

	Equity	Neutrality	Efficiency	Productivity
Vacant Land Tax	3	3	2	3

Increase in property tax base

A significant reduction in the number of vehicles operating presents the opportunity to reclaim curb space, parking lots, and parking structures. If the land currently dedicated to parking were improved upon, local governments could generate additional revenue via property tax. Given that this option would rely on taxes currently in place, we know that this option would provide a stable and reliable revenue source that is difficult to evade. The increase in property tax base would be quite productive, though it would require reevaluation of the taxable value of properties throughout the jurisdiction. Therefore, the increase in property tax base is only moderately efficient.

	Equity	Neutrality	Efficiency	Productivity
Increase in Property Tax Base	2	3	2	3

FIG. 13

Tolls for roads and bridges

Another feasible option for creating revenue would be user fees applied to the use of roads and bridges. These fees would be collected through either an automated electronic payment device scanned upon accessing the road or bridge, or payment at a kiosk from toll-collecting structures. Given that this is not yet a common practice in Oregon, significant investments in infrastructure would be required. Tolls therefore have moderate efficiency. However, once the initial costs are overcome, these user fees offer a very productive source of revenue. User fees are equitable in that only those accessing those tolls and bridges are charged. However, this poses challenges for those of lower socioeconomic status. This fee may be regressive, particularly for those who live further from the city center. Therefore, tolls are considered only moderately equitable. These fees may also move drivers onto side roads in avoidance of tolls, lowering the neutrality of this option.

	Equity	Neutrality	Efficiency	Productivity
Tolls for Roads & Bridges	2	2	2	3

FIG. 14

Storage locker fees

Storage lockers would give residents a place to store items while using shared use vehicles. The associated fees would likely not affect an individual's behavior, thereby making them highly neutral. However, this would require local governments to install and oversee the use of the storage lockers, which would only be moderately efficient. These fees would have limited vertical equity as lower income individuals would pay a greater share of their income. The fees would not generate significant revenue, but could potentially cover the cost of related infrastructure.

FIG. 15

	Equity	Neutrality	Efficiency	Productivity
Storage Locker Fees	2	3	2	1

The chart below summarizes the ratings for each revenue type:

FIG. 16

	Equity	Neutrality	Efficiency	Productivity
VMT Tax	2	3	3	3
Zombie AV Tax	3	2	1	2
Licensing and Operating Fees for TNCs	2	3	3	3
TNC Ride Fees	1	3	2	3
Electric Vehicle Charging Tax	2	3	3	3
Data Fees	3	2	2	1
Pick Up/Drop Off Zones for TNCs	2	1	1	2
Congestion Pricing	3	3	2	3
Shared Use Parking	1	2	3	3
Vacant Land Tax	3	3	2	3
Increase in Property Tax Base	2	3	2	3
Tolls for Roads & Bridges	2	2	2	3
Storage Locker Fees	2	3	2	1

Recommendations

Eugene and Gresham can address potential revenue shortfalls that may occur in the age of new mobility by adopting new revenue sources. Students identified the following potential revenue packages for Eugene and Gresham.

RECOMMENDED REVENUE PACKAGE FOR EUGENE

Student recommendations for the city of Eugene all relied on a combination of revenue sources. Each recommendation suggested adopting a VMT tax. The VMT tax scores well on neutrality, efficiency, and productivity because it closely approximates the current gas tax and could utilize existing tax collection structures. However, the VMT tax is regressive as low-income individuals will pay a higher percentage of their income than higher income individuals. To solve this, Eugene could adopt a tiered-rate system based on whether the vehicle is privately owned or shared, and an AV or a non-AV. Special rates may also be set for low-income individuals.

Other recommended sources of income include high-yield sources such as licensing for TNCs, per-ride fees for TNCs, tolls for roads and bridges, and congestion pricing. More innovative sources include data fees, a vacant land tax, and storage locker fees. Though the latter options are not expected to generate significant revenue, revenue could be used to fund and maintain related infrastructure.

Eugene Group A Recommended Package

VMT	$13,745,826
Licensing TNC	$608,000
Tolls for Roads & Bridges	$11,625,000
Congestion Pricing	$1,580,800
Total Revenue	$27,559,626

FIG. 17

Eugene Group B Recommended Package

VMT	$15,722,000
User Fees	$118,250
Total Revenue	$15,840,250

FIG. 18

Eugene Group C Recommended Package

VMT with Tiered Rates	$20,857,241
Data Sharing Fee	$1,974,400
Vacant Land Tax	Variable
Locker Fees	$182,500
Total Revenue	$23,014,141+

FIG. 19

Packages for the City of Eugene could generate up to $27.6 million in revenue. For additional details, please see Appendices C, D, and E.

RECOMMENDED REVENUE PACKAGE FOR GRESHAM

Student recommendations for the city of Gresham took two different approaches. The first would be to diversify funding streams so that the city is not reliant on any one source of revenue and transportation is funded by a variety of users. As a result, this recommended package would prove resilient and adaptable should one or several sources become non-viable due to unforeseen technological changes. Such a package may contain a combination of VMT tax, Zombie AV tax, licensing and registration fees, and a TNC per- ride fee, generating up to $11.8 million in revenue (see Appendix F).

Gresham Group A Recommended Package

VMT Tax	$2,305,429
Licensing Fees	$241,790
Registration Fees	$1,924,450
Zombie AV Tax	$2,122,043
TNC Per-Ride Fee	$3,764,610
Utility License Fees	$1,487,520
TOTAL	$11,845,842

FIG. 20

Another approach would be to adopt a large, single-source revenue source that would be collected on a local level. Because Gresham currently relies heavily on pass-through revenue, this would bolster the city's autonomy and ability to fund transportation infrastructure. Such a package may be as simple as adopting an electric vehicle charging tax, which would provide stable and reliable funding for years to come. This approach has the added benefit of being easily adaptable should electric cars increase their efficiency: the city could simply raise rates. Such a package could generate up to $24.1 million in revenue (see Appendix G).

Gresham B Recommended Package

Charges for AV Charging Stations	$ 24,119,204
TOTAL	$ 24,119,204

FIG. 21

OVERALL RECOMMENDATIONS

Each city will want to carefully consider its long-term goals and administrative resources when evaluating new revenue sources. To achieve success, we recommend each city take the following measures:

- Use a combination of revenue sources to provide resilient, stable funding that will withstand future changes in technology and distribute the tax burden widely.
- Coordinate regionally or push for the adoption of taxes at the state level to mitigate potential location effects, increase collection efficiency, and reduce local administrative burden.
- Consider the adoption of at least one high-yield revenue source such as a VMT tax.
- Address potential equity issues by implementing tiered rate fee systems for some revenue sources, including the VMT tax, the electric vehicle charging tax, TNC ride fees, tolls for roads and bridges, and shared use parking.
- Address potential traffic congestion by implementing congestion pricing, zombie AV taxes, and pick up/drop off zones for TNCs.
- Consider new mobility's potential impact on public transit and take appropriate steps to ensure long-term access to transportation options.

Conclusion

In the age of new mobility, it will be imperative to look ahead and consider the future of transportation revenue. Eugene and Gresham have already begun thinking about how to address the fiscal challenges posed by new transportation technology.

After conducting considerable research and extensive analysis, students in the School of Planning, Public Policy, and Management have outlined several potential paths forward. Most recommendations suggest using a combination of sources to provide resilient, stable revenue that will withstand future changes in technology. Across the board, students recommend future investigation of the VMT tax because of its neutrality, efficiency, and productivity. In addition, its vertical equity can be bolstered through the use of tiered rates. To ensure the success of any new revenue source, cities will want to mitigate any potential location effects of new measures. Regional cooperation and/or state level implementation of new taxes are solutions to explore. Cities will also want to think carefully about new mobility's potential impacts on public transit and take appropriate steps to safeguard this public resource.

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Appendix A

City of Eugene Revenue Estimate

	Percent Loss		Eugene		
	Scenario A	**Scenario B**	**Current**	**Scenario A**	**Scenario B**
Local Gas Tax	6.3%	0%	$3,000,000	$187,500	$-
State Highway Fund			$9,919,000	$3,769,348	$3,207,309
Fuel Tax (43.9%)	*6.3%*	*0%*	*$4,354,441*	*$272,153*	*$-*
Registration (24.9%)	*25.0%*	*15%*	*$2,469,831*	*$617,458*	*$370,475*
Licensing (2.7%)	*16.0%*	*0%*	*$267,813*	*$42,904*	*$-*
Weight Mile Tax (28.6%)	*100.0%*	*100%*	*$2,836,834*	*$2,836,834*	*$2,836,834*
SUBTOTAL			***$12,919,000***	***$3,956,848***	***$3,207,309***
Other Parts of City Budget Affected by AV					
Parking Fees	12.5%	0%	$9,860,000	$1,232,500	$-
Airport Parking	0.0%	0%	$989,000	$-	$-
Parking Fines	12.5%	0%	$1,351,500	$168,938	$-
Traffic Violations	50.0%	0%		$-	$-
SUBTOTAL			***$12,200,500***	***$1,401,438***	***$-***
General Fund	100%	100%	$-	$-	$-
Fees (including SDCs and TDTs)	100%	100%	$-	$-	$-
Bonds	100%	100%	$-	$-	$-
City Utilities	100%	100%	$2,053,000	$2,053,000	$2,053,000
Licenses/Permits	100%	100%	$2,058,000	$2,058,000	$2,058,000
Grants	100%	100%	$-		
Misc. Revenues (Charges for Service, Interest, Interfund, Internal Service Charges)	100%	100%	$-	$-	$-
SUBTOTAL			***$4,111,000***	***$4,111,000***	***$4,111,000***
TOTAL			**$29,230,500**	**$9,469,286**	**$7,318,309**

	Eugene	
	Scenario A	**Scenario B**
% Decline in Revenues	68%	75%
% Revenues Left	32%	25%

City of Gresham Revenue Estimate

	Percent Loss		Gresham		
	Scenario A	**Scenario B**	**Current**	**Scenario A**	**Scenario B**
Local Gas Tax	6.3%	0%	$4,469,946	$279,372	$-
State Highway Fund			$8,146,164	$3,095,647	$2,405,868
Fuel Tax (43.9%)	*6.3%*	*0%*	*$3,576,166*	*$223,510*	*$-*
Registration (24.9%)	*25.0%*	*15%*	*$2,028,395*	*$507,099*	*$76,065*
Licensing (2.7%)	*16.0%*	*0%*	*$219,946*	*$35,235*	*$-*
Weight Mile Tax (28.6%)	*100.0%*	*100%*	*$2,329,803*	*$2,329,803*	*$2,329,803*
SUBTOTAL			***$12,616,110***	***$3,375,019***	***$2,405,868***
Parking Fees	12.5%	0%	$-	$-	$-
Airport Parking	0.0%	0%	$-	$-	$-
Parking Fines	12.5%	0%	$818,000	$102,250	$102,250
Traffic Violations	50.0%	0%			
SUBTOTAL			***$818,000***	***$102,250***	***$102,250***
General Fund	100%	100%	$-	$-	$-
Fees (including SDCs and TDTs)	100%	100%	$-	$-	$-
Bonds	100%	100%	$-	$-	$-
City Utilities	100%	100%	$-	$-	$-
Licenses/Permits	100%	100%	$-	$-	$-
Grants	100%	100%	$-	$-	$-
Misc. Revenues (Charges for Service, Interest, Interfund, Internal Service Charges)	100%	100%	$8,271,490	$8,271,490	$8,271,490
SUBTOTAL			***$8,271,490***	***$8,271,490***	***$8,271,490***
TOTAL			**$21,705,600**	**$11,748,759**	**$10,779,608**

	Gresham	
	Scenario A	**Scenario B**
% Decline in Revenues	46%	50%
% Revenues Left	54%	50%

Appendix B

Eugene Group A Report

EUGENE SCENARIO A
Autonomous Vehicle Revenue

by

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Michele Stark

Michael Thomas

December 4, 2018

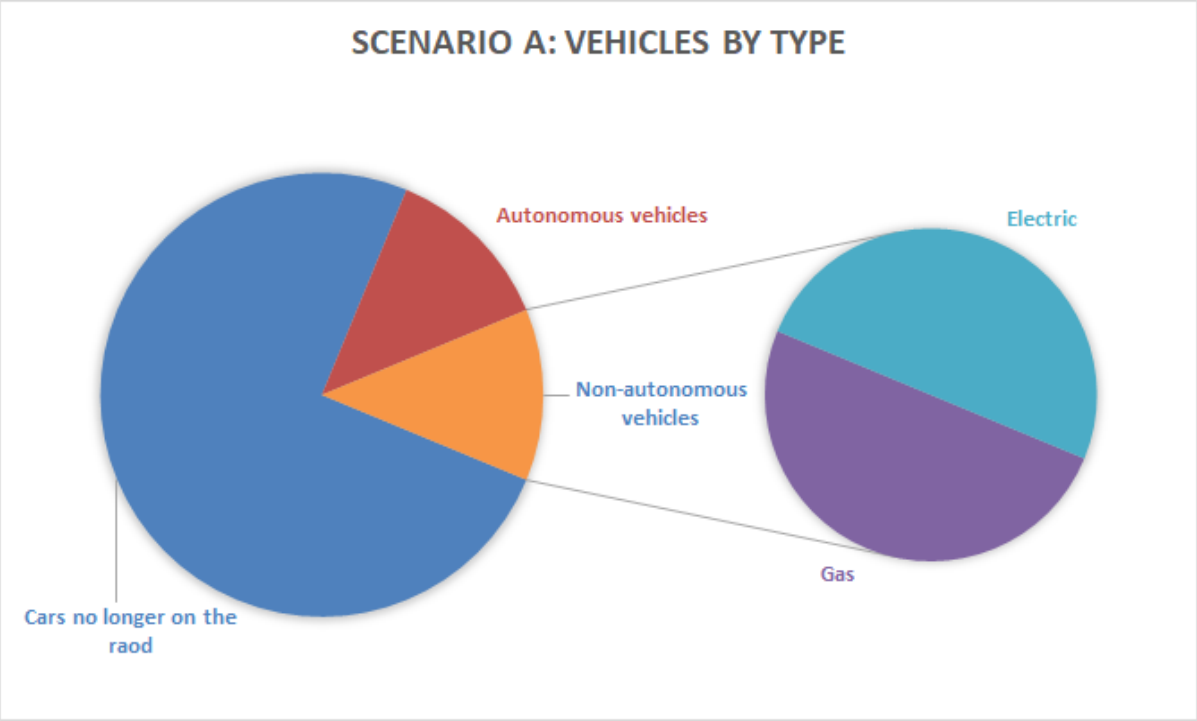
Overview

The City of Eugene, Oregon has partnered with the University of Oregon to participate in the Sustainable City Year Program (SCYP). The program partners cities with the resources of the university and harnesses the ideas and innovations that students, unencumbered by bureaucracy and politics, are able to generate. Under the umbrella of SCYP, the City asked our team to analyze how the adoption of new forms of transportation may affect its budget. Possible shifts in transportation include a move towards additional use of Transportation Network Companies, also known as ride-hailing services, and autonomous vehicles. Currently, a sizable portion of the city's budget comes from sources such as gas taxes, parking fees, traffic tickets, and license and registration fees. Adoption of new modes of transportation would affect the city's revenue.

The specific scenario we have been asked to consider is one in which (Figure 1):

- The number of cars on the road declines by 75%;
- Half of the remaining vehicles are autonomous;
- All autonomous vehicles are electric;
- Half of the remaining vehicles are non-autonomous vehicles; and,
- Half of non-autonomous vehicles are electric.

Figure 1: *Scenario A - Vehicles by Type*



Effects of New Mobility on Eugene, Oregon's Current Transportation Revenue Sources

We determined new mobility will affect local revenue sources including airport parking fees, Eugene's motor vehicle fuel tax, parking fees, and parking fines. Table 1 below demonstrates the difference between the locally generated revenue total projected to occur in FY 2019 under the City's adopted budget and the locally generated revenue totals we predict will result in relation to the changes in transportation described under Scenario A. Ultimately, we believe the City will lose 78% of its FY 2019 projected local revenue.

Parking fines currently make up the largest local revenue source the City receives. Under Scenario A, the number of cars on the road is expected to decrease by 75%. Of the remaining 25% half will be autonomous, and of that half, 90% will be shared. We assume that 90% of the shared autonomous vehicles will be in constant motion circulating between customers without needing to park. Therefore, we conclude the City will lose $8.50 million dollars, or 86% of FY 2019 projected parking fine revenue.

We also determined that airport parking fees will be completely lost. With the option to hail a shared autonomous vehicle, no one will choose to pay to park at the airport. This would result in a loss of $989,000, or 100% of FY 2019 projected airport parking revenue. Further, the local gas tax would only be applied to gasoline-consuming cars. In this scenario, we determined that the city will lose $2.81 million dollars, or 94% of FY 2019's projected gas tax revenue.

We also assume that only non-autonomous vehicles will receive fines due to driver-error. Autonomous vehicles, due to their programming, will obey the rules of the road. From a humanist perspective, this is good because it will mean a reduction in vehicle-related deaths and injuries. From a financial perspective, this has the potential to reduce City revenue by $1.18 million, or 87% of FY 2019 projected parking fine revenue.

We do not believe that revenue derived from City utilities in the right-of-way will be affected by new mobility.

Table 1: *A Comparison of Revenue from Local Sources under the FY19 Adopted Budget and the City of Eugene's Scenario A.*

Source of Revenue	Level	FY19	Scenario A Estimate
Airport Parking Fees	Own Source	$989,000	$0
Eugene Motor Vehicle Fuel Tax (MVFT)	Own Source	$3,000,000	$187,500
City Utilities - Right of Way	Own Source	$2,053,000	$2,053,000
Parking Fees	Own Source	$9,860,000	$1,356,000
Parking Fines	Own Source	$1,351,500	$168,750
Total Revenue		$17,253,500	$3,765,250

Regarding pass-through (state and federal) sources of revenue, we determined that new mobility will affect the State Highway Fund and the privilege tax levied on to new vehicles as enacted under HB 2017-10. Table 2 below demonstrates the difference between the pass-through revenue total projected to occur in FY 2019 under the City's adopted budget and the pass-through revenue totals we predict will result in relation to the changes in transportation described under Scenario A. Ultimately, we believe the City will lose 77% of its FY 2019 projected local revenue.

We calculated that revenue garnered through HS 2017-10 will fall from the $2 million projected for FY 2019 to $500,000, a 75% decline that reflects the 75% decline of vehicles on the road. We also ascertained that, under the scenario provided to us by the City, only 6.25% of FY 2019 gas revenue will continue to be generated through the small portion of gasoline-consuming vehicles. Financially, this will result in a 93.75% decline revenue derived from the State Highway Fund.

Table 2: *A Comparison of Revenue from Pass Through Sources under the FY19 Adopted Budget and the City of Eugene's Scenario A.*

Source of Revenue	Level	FY19	Scenario A Estimate
State Highway Fund	Pass-Through	$9,919,000	$619,937.50
HB 2017-10	Pass-Through	$2,000,000	$500,000
Licenses/Permits	Pass-Through	$2,058,000	$2,058,000
Total Revenue		$13,977,000	$3,177,937.50

We conclude there will not be a significant difference in license revenue under Scenario A. Currently a new driver's license is $20 more than a non-driver's ID. The difference between a renewed license and a renewed ID is only $0.50. A replacement ID is $13 more than a replacement license. Therefore, shifts away from licenses to IDs will not result in a substantial difference in revenue.

Total lost revenue

Ultimately, we conclude the City of Eugene would lose 77.77% of its transportation related revenue under Scenario A. This includes local and pass through revenue from both operating and capital budgets (Appendix B).

Revenue Solutions for New Mobility in Eugene, Oregon

To recoup lost revenue, we designed three revenue packages for consideration. The first consists of revenue sourced from historical and traditional taxes and user fees. The second is comprised of sources that could be considered new and innovative. The third contains a mixture of options from both the first and second packages.

Package 1: Traditional Sources of Revenue

The first package of revenue options includes possible sources from traditional means. These are taxes or fees which have either already been introduced in some form through legislature, or otherwise would have high political feasibility in terms of adoption in Eugene. Our package includes a vehicle miles traveled (VMT) tax, licensing and registration fees for TNCs, a TNC user fee, and user fees from tolls for roads and bridges.

Vehicles Miles Traveled (VMT) Tax

The City of Eugene could adopt a vehicle miles traveled (VMT) tax and charge motorists based on the number of miles they drive. This would be the closest approximation of the motor fuels tax, which charges motorists based on the gallons of gasoline used. However, this tax has the advantage of generating revenue from all vehicles no matter the fuel used. In addition, it approximates a user fee in that those using the roads pay for upkeep and maintenance.

Administration of the tax could be reasonably efficient once a system was established to obtain an accurate mileage count from motorists. One solution could be to install a mileage tracker in each car that would upload the miles travelled on a regular basis. Another solution would be to track vehicle mileage as part of the vehicle registration process. However, there are several equity issues with the VMT tax. Horizontal equity may be an issue for individuals living in rural areas or those who commute to work. In addition, this tax may make living in the city core more appealing, which could make housing more expensive. These equity issues may be addressed through a variety of innovative fee structures that account for annual income or location of residence.

As the tax would take the place of the already existing motor fuel tax, we do not anticipate any change in motorists' driving habits. For this reason, the VMT tax would be neutral and productive. Currently, the State of Oregon has a motor fuels tax of $0.34 per gallon. The City of Eugene has a local motor fuels tax of $0.05 per gallon. The equivalent VMT tax would be 1.5 cents per gallon and .22 cents per gallon respectively. However, many have argued that the motor fuel tax is already too low as it does not provide adequate funding to repair roads (Quinton, 2017). Therefore, we would raise the VMT tax by an additional 50%. We estimate a VMT tax would generate $13.7 million in revenue each year.

Licensing and Registration Fees for TNCs

Another option for the City of Eugene would be implementing a special licensing and registration fee for all TNC vehicles. For the purposes of this analysis, we have assumed that in Scenario A all TNCs will be AVs. Administration of these license and registration fees would be efficient given that the TNCs would be charged directly on an annual basis. We do not anticipate a change in behavior for the TNCs and therefore the fees would be neutral. In addition, this would be productive so long as all TNCs were included. The equity of implementing these license and registration fees depends on how much of the cost would be passed along to consumers, which would depend on the elasticity of demand for TNC rides.

Currently, many cities and states charge TNC drivers a special fee. In Eugene, TNC drivers pay $45 to apply for a Driver Certification and $20 for the certification itself. One of the main components of the application process is a background check, which would not be required for AVs. Under Scenario A, we estimate that there would be 15,200 AVs in Eugene. If each of those vehicles were changed $40 per car, we estimate $608,000 in revenue would be generated per year.

TNC User Fee

The City of Eugene could enact a TNC user fee. This fee could be charged upon every ride on a per ride basis. As the rider uses the TNC's application to pay for the trip, a user fee would be charged to the rider. This fee would then be turned over to the City every month by the TNC. Such a user fee would be comparable to the $0.05 charge the City places on shopping bags; the administration of the fee would be similar. This tax would be reasonably efficient, because the fee would be attached to every ride, regardless of duration or distance. It would be charged at the point of sale upon the app. However, getting the TNCs to modify their apps to support the fee may be more difficult, but it is not impossible to make the transactions take place.

The fee may be somewhat inequitable in that someone taking a TNC for less than a mile would pay the same fee as someone taking a longer ride. However, the fee is easy to understand and likely easier to pay, as it is a small fee attached to every transaction. The yield is flexible based on how much is charged per use. Although $30,000 is not much return for the initial investment in administration setup, that is only an example for one type of mobility system. Plus, it is a recurring and reliable fee. The tax base would also be rather large once it is applied to every type of mobility system (scooters, bikes, ride hailing, and ride-sharing).

Using the PeaceHealth bike sharing system within Eugene as an example with a $0.25 flat fee, we think the city could earn $30,000 in annual revenue. A similar user fee may be applied to other TNCs.

User Fees (Tolls for Roads and Bridges)

Another feasible option for creating revenue would be to rely on user fees applied to the use of roads and bridges. In practice, this might include tolls on major highways such as I-105, I-5, Beltline, and Delta Highway. This would be collected either through a device attached to vehicles for electronic payment which could be scanned upon accessing the bridge or road, or payment at a kiosk from toll-collecting structures. The latter would require higher infrastructure costs, and the former may have some associated costs as well, especially in retrofitting older cars. However, once the costs are overcome, these user fees offer a stable source of revenue that would be worth the effort involved.

User fees may be equitable in the sense that only those who are accessing those tolls and bridges are being charged. However, this poses some challenges for those of lower socioeconomic status. This fee may be somewhat regressive for those who are paying proportionately more of their income on tolls, particularly in the case of living further away from the city center and thus potentially paying more in fees. Also, these fees may encourage drivers onto side roads in avoidance of tolls which lowers its overall neutrality.

Beyond the initial costs of infrastructure, not much enforcement will be required, and the yield would be stable and productive in the long-term. According to ODOT, Portland may be able to generate $300 million with similar tolls along I-205 and I-5 (Theen, 2018). As Eugene's Metro Region has 15.5% the population of Portland's Metro Region, we can apply this percentage to the predicted revenue to have a general idea of this yield. In addition, we assume that tolls in Eugene would be $.50 rather than $2. User fees on roads and bridges in Eugene could yield as much as $11.6 million (Appendix D).

Table 3: *Revenue Projection for Package 1*.

Options	New Revenue	Expected Revenue A	Total Revenue (new + A)
Package 1			
VMT	$13,745,826		
Licensing TNC	$608,000		
Tolls for Roads & Bridges	$11,625,000		
User Fee for TNC	$30,000		
Total Revenue	**$26,008,826**	**$6,943,187**	**$32,952,013**

Figure 3: *Heat Map for Package 1*.

Package 1	Equity	Neutrality	Efficiency	Productivity
VMT	**2**	**3**	**3**	**3**
Licensing TNC	**2**	**3**	**3**	**3**
Tolls for Roads & Bridges	**2**	**3**	**2**	**3**
User Fees for TNC	**1**	**3**	**2**	**3**
Total	**7**	**12**	**10**	**12**
				41

Package 2: Innovative Sources of Revenue

The second package of revenue options includes methods that are thought to be new or relatively innovative. This package covers property tax generation from the improvement of land currently dedicated to parking, an electric charging tax, user fees for parking spaces designated specifically for shared-use vehicles, and congestion pricing.

Property Tax

A 75% reduction of vehicles operating in Eugene presents the opportunity to reclaim curb space, parking lots, and parking structures. If the land currently dedicated to parking were improved upon, Eugene would have the ability to generate additional revenue via property tax. The conversion of parking spaces to property could potentially create a positive feedback loop in which the reduction in land available for parking would affect the decision to personally own a vehicle, thus freeing more land from the need for parking. Oregon's

Measure 50 notably assures horizontal equity in property taxation, but introduces vertical inequity based upon if property was purchased before or after 1995.

A property tax would provide a stable, reliable revenue source that is difficult to evade due to the automatic tax lien placed upon properties. In a report released earlier this year, the results of a comprehensive inventory of parking spaces quantified the amount of land that five American cities dedicate to parking: New York City, Philadelphia, Seattle, Des Moines, and Jackson, Wyoming (Scharnhorst, 2018). Using an average of these cities, we determined that Eugene dedicates 3.79 square miles to parking. The Eugene budget for fiscal year 2019 predicts that the city will receive $121,900,000 in property tax. Dividing that by the current square mileage of Eugene, each square mile will generate $2.78 million in property tax during fiscal year 2019. If 75% of Eugene's estimated 3.79 square miles dedicated to parking were able to generate property tax, we predict that the city would benefit from an additional $7.92 million.

Electric Charging Tax

Currently, many municipalities already include some form of gas or fuel tax in order to generate revenue. Eugene is expected to receive $3 million in FY 2019 from its local fuels tax. Translating this tax into an electric charging tax is a politically feasible option for generating revenue as electric-powered vehicles become more widely used. The most efficient method for this tax would be using kilowatt hours due to its more consumer friendly conversion (Appendix D). This may have some infrastructure difficulties as it would require Eugene to work with utilities companies to collect the revenue from this potential tax. An electric tax, similar to a gas tax, may not have horizontal or vertical equity due to it being a regressive flat tax applied to everyone. However, it would have high neutrality in that it may encourage people to carpool or use public transit, which are both socially desirable behaviors.

Extrapolating the gallons of gas from Eugene's projected revenue in FY 2019, it can be assumed that around 60 million gallons of gas is taxed per year. Decreased by 75%, this becomes 15 million gallons of gas. Additionally, 75% of the remaining cars will be electric. At a tax of $0.075 per 10kWh, the total revenue produced from an electric charging tax comes out to a $565,875 yield (Appendix D). This would be a stable source of revenue going forward. While a lower annual yield than the current gas tax, combining this tax with other diverse methods of revenue production described in Package 1 could be a way to support the city's needs.

Shared Use Parking Spaces

Shared use parking spaces are parking spaces reserved specifically for shared use vehicles, which we assume will be autonomous in the future. This definition covers car-sharing services such as Zipcar and Car2Go, and ride-sharing services such as Uber and Lyft. Car-sharing services operate under the model of a customer retrieving a car from a parked location within a geographically predetermined area, using it as necessary, and then returning it to another parking space in that or another geographically predetermined area. Ride-sharing services use a model similar to taxis, in that the car retrieves one or more customers from one or more locations, brings them to a destination, and then picks up another customer.

While it is more likely that car-sharing services will require parking in between uses, ride-sharing vehicles may find themselves without customers at certain times of the day. One of two potential outcomes may occur while cars wait for their next client: they could either circle around until hailed, or they could park and wait until hailed. To make these cars park during this idle time, policy may be required. Another option would be to enact a tax on electric charging as described previously. This may incentivize cars to park while waiting instead of draining their battery by circling.

A potential concern is that companies could pass the expense of a parking pass on to their customers through increased rates. The potential for this occurring would rely on the elasticity of demand for the service, whether ridership would decrease based on the increased rates or remain unaffected, thus raising the potential for TNCs to pass the cost along. If operators do pass along the cost through rate increases, it would be a regressive distribution, as users of the service who earn less would pay more of their overall income opposed to users who earn more.

Using calculations shown in Appendix D, we estimate the city could generate $16.4 million each year from shared use parking spaces. Providing these spaces could be accomplished by reallocating a fraction of current parking spaces to shared-use spaces. This would require educational initiatives and signage. Passes would need to be generated, distributed, have a system of recognition, and a system of revenue collection. Fortunately, this system is already in place for downtown parking passes and could be transitioned to shared use parking passes.

Congestion Pricing

Congestion pricing represents another potentially innovative method of collecting revenue to offset revenue loss from the integration of autonomous vehicles. Although 75% less vehicles will be on the road, the remaining vehicles are expected to access major highways often to pick up passengers and transport them to their destinations. Congestion pricing serves an additional function of changing demand and lowering overall traffic on roads prone to congestion, addressing negative externalities such as pollution and its impact on health. The most likely mechanism for collecting this charge would be a device attached to autonomous vehicles for electronic payment (e.g. E-Zpass) (“E-ZPass,” 2018). This could incentivize the retrofitting of older cars for similar electronic payment, but it may have initial higher infrastructure costs. A high-occupancy vehicle (HOV) lane would charge a fee when accessed on a major highway. For example, a $2 flat charge for all autonomous vehicles accessing a HOV lane during traffic hours (7AM - 9AM and 4PM - 6PM).

A congestion pricing mechanism would be most equitable in the case of providing certain provisions for the disabled or elderly populations. As it also encourages carpooling and ride-sharing, congestion pricing changes behavior to a socially desired outcome and maintains neutrality as a result. As Eugene has 3.8% of the population of Oregon, we can apply an assumption to how many cars may be driving in Eugene per week. Assuming that number is 3.8% of total cars driven in Oregon, we are left with 121,600 cars. A 75% reduction puts 30,400 on the road. Conservatively, half of these cars (15,200) will drive

during rush hour in Eugene per week. Half of these cars are AVs (7,600) and thus are charged congestion pricing at $15,200 total per week (Appendix D). Annually, Eugene might expect a revenue yield around $1.6 million per year following this theoretical framework.

Table 4: *Revenue Projection for Package 2.*

Options	New Revenue	Expected Revenue A	Total Revenue (new + A)
Package 2			
Property Tax	$7,921,827		
Electric Charging Tax	$556,875		
Shared Use Parking	$16,416,000		
Congestion Pricing	$1,580,800		
Total Revenue	**$26,475,502**	**$6,943,187**	**$33,418,689**

Figure 4: *Heat Map for Package 2.*

Package 2	Equity	Neutrality	Efficiency	Productivity
Property Tax	2	3	2	3
Electric Charging Tax	2	3	3	3
Shared Use Parking	1	2	3	3
Congestion Pricing	3	3	2	3
Total	8	11	10	12
				41

Package 3: Combination of Packages 1 & 2

The third package we recommend combines both traditional and innovative revenue sources. This ensures the City gets the most revenue possible by broadening the tax base and the variety of revenue sources. Doing so also generates the most revenue overall.

Using our evaluation criteria, Package 3 seeks to provide the best overall neutrality, productivity, equity, and efficiency. Therefore, the VMT, TNC licensing, tolls, and congestion pricing options are the best options, raising $34.5 million in revenues. This easily overcomes the estimated $24.3 million the City loses when Scenario A occurs. As a result, combining the best of both packages maximizes the potential revenue.

Table 5: *Revenue Projection for Package 3.*

Options	New Revenue	Expected Revenue A	Total Revenue (new + A)
Package 3			
VMT	$13,745,826		
Licensing TNC	$608,000		
Tolls for Roads & Bridges	$11,625,000		
Congestion Pricing	$1,580,800		
Total Revenue	**$27,559,626**	**$6,943,187**	**$34,502,813**

Figure 5: *Heat Map for Package 3.*

Package 3	Equity	Neutrality	Efficiency	Productivity
VMT	**2**	**3**	**3**	3
Licensing TNC	**2**	**3**	**3**	**3**
Tolls for Roads & Bridges	**2**	**3**	**2**	**3**
Congestion Pricing	**3**	**3**	**2**	**3**
Total	**9**	**12**	**10**	**12**
				43

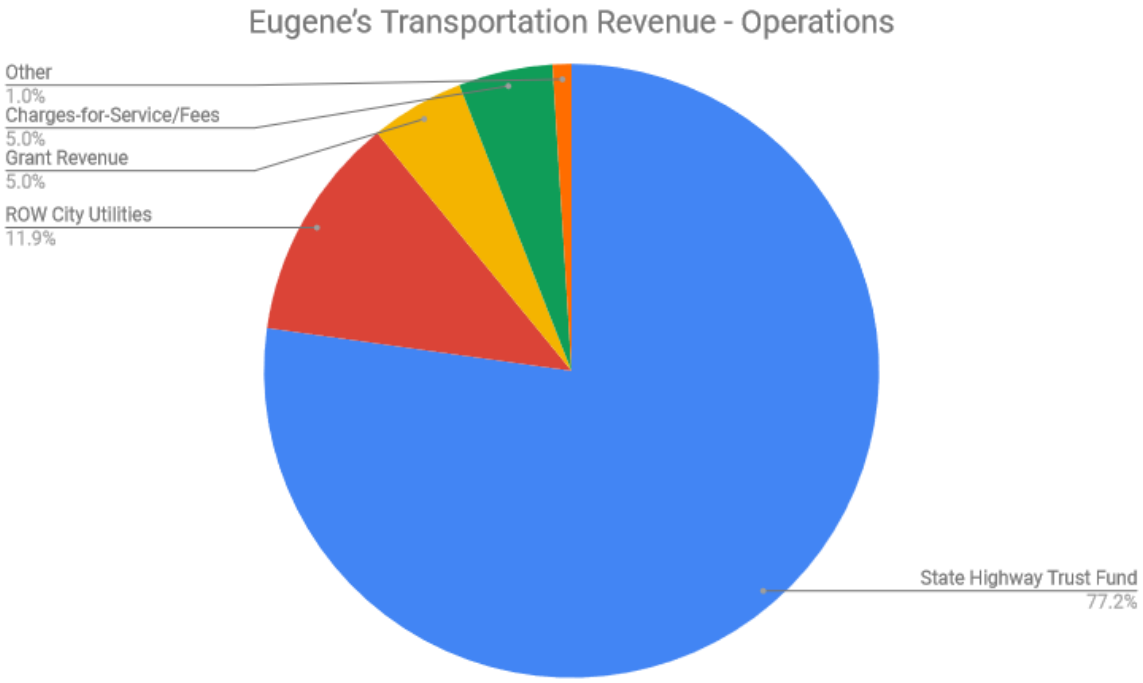
Recommendations

Acknowledging the potential losses in revenue that Eugene faces with Scenario A, we recommend that the City choose the third package and adopt a series of both traditional and innovative options to secure the necessary revenue. The City should also consider the feasibility of the other proposed options that may not directly raise revenue but may strengthen possible mobility choices within the local area (Appendix F).

Appendix A - Current Transportation Revenue Sources

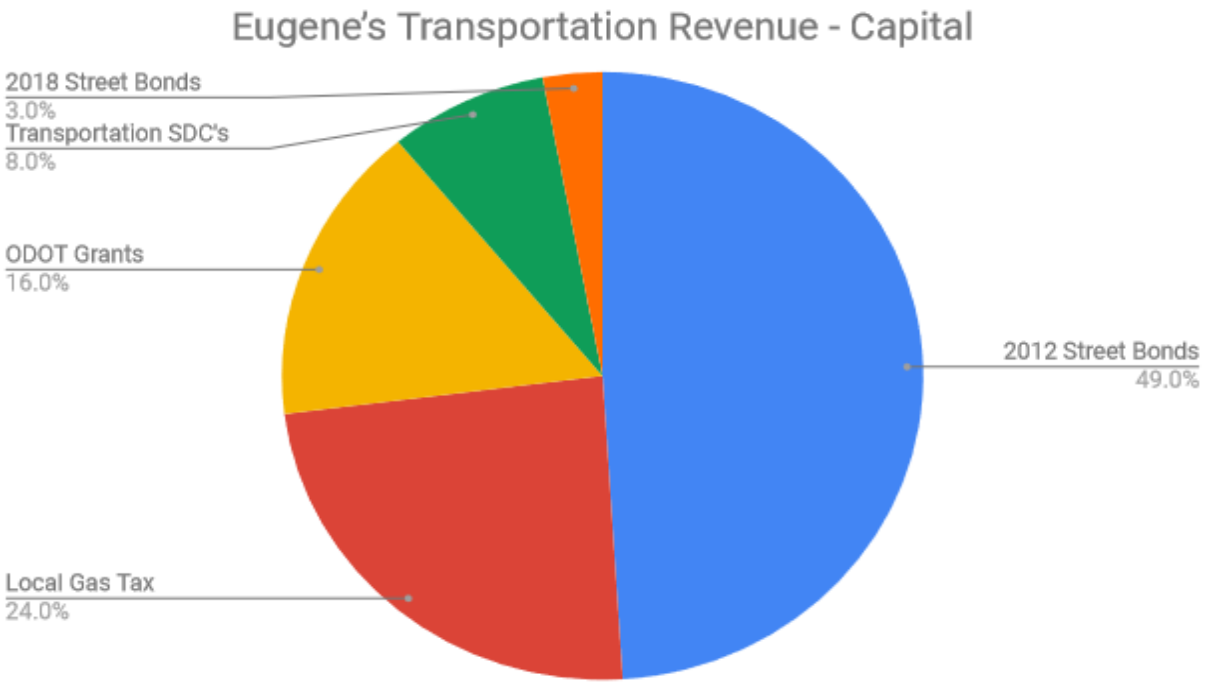
Transportation Planning operates within the Public Works Engineering Division. Currently, transportation revenue for the City of Eugene comes from a variety of sources. In FY 2019, Public Works accounts for a major share of Eugene's Adopted Operating Budget at 27.8% of $351.6 million. Projected operating revenues as part of the Transportation Planning Division total $12,711,724. The State Highway Trust Fund is the largest projected source of revenue for transportation at 78% ($9.919 million). Following this is right-of-way use/city utilities at 12% ($1.525 million), grant revenues and charges for services/fees at 5% ($635,586 each), and other revenue at 1% ($127,117).

Figure 5: *Eugene's Transportation Revenue Sources in FY 2019*.



In FY 2019, the transportation revenue in Eugene's Capital Budget is projected to total $27.23 million. The largest portion of this amount is expected to come from 2012 street bonds, which account for nearly half at 49% or $13.343 million. The local gas tax is expected to total 24% ($6.535 million). The remaining capital revenues include 16% from ODOT grants ($4.357 million), 8% from transportations SDC's ($2.178 million), and 3% from 2018 street bonds ($816,900).

Figure 6: *Eugene's Transportation Revenue in the FY 2019 Capital Budget.*



The City of Eugene collects its own transportation revenue and also receives pass through funding from either the state or federal government. In FY 2019, these two types of revenue amounted to $31.23 million under the current driving environment.

The City's own transportation revenues totaled $17.253 million dollars in FY 2019 or 55.25% of the total. The majority of this money comes from parking fees. The parking fees totaled $9.86 million in FY 2019. Eugene also has a motor vehicle fuel tax of a half-cent-per-gallon. This fuel tax is in addition to Oregon's fuel tax of 30 cents-per-gallon and the Federal 18.4 cent-per-gallon tax on gas. The fuel tax is projected to raise an additional $3 million for the City in FY 2019.

The remaining 44.75% of the City's transportation money is pass through funding. The City receives $9.919 million in State Highway Fund money; a full 70% of the pass-through money it receives. While the remaining 30% of pass through revenue comes from both HB-2017-10 and licenses and permits. Please refer to Appendix B to see our calculations for this. Further, Tables 6 and 7 distinguish between revenue sources that are specific to Eugene's Transportation Budget and revenue sources that are outside of the Transportation Budget but will also be impacted by shifts in technology.

Table 6: *City of Eugene Revenue Sources Affecting Transportation Budget.*

Transportation Budget		
Source	**FY 2019**	**Scenario A**
Motor Fuel	$3,000,000	$187,500
City Utilities	$2,053,000	$2,053,000
State Highway Fund	$9,919,000	$619,937.50
Licenses/Permits	$2,058,000	$2,058,000
Total	**$17,030,000**	**$4,918,438**

Table 7: *City of Eugene Revenue Sources Not Affecting Transportation Budget*.

Extra Revenue Sources Impacted by Changes in Transportation Technology		
Source	**FY 2019**	**Scenario A**
Airport	$989,000	$0
Parking Fees	$9,860,000	$1,356,000
Parking Fines	$1,351,500	$168,750
HB 2017-10	$2,000,000	$500,000
Total	**$14,200,500**	**$2,024,750**

Appendix B - Calculations for Remaining Revenue Under Scenario A

Table 1: *A Comparison of Revenue from Local Sources under the FY19 Adopted Budget and the City of Eugene's Scenario A.*

Source of Revenue	Level	FY19	Scenario A Estimate
Airport Parking Fees	Own Source	$989,000	$0
Eugene Motor Vehicle Fuel Tax (MVFT)	Own Source	$3,000,000	$187,500
City Utilities - Right of Way	Own Source	$2,053,000	$2,053,000
Parking Fees	Own Source	$9,860,000	$1,356,000
Parking Fines	Own Source	$1,351,500	$168,750
Total Revenue		$17,253,500	$3,765,250

Airport Parking Fees: Assume no one will park at the airport, so revenue is $0.

Eugene Motor Vehicle Fuel Tax (MVFT): 75% of cars disappear. Of the remaining 25%, half (12.5%) are non-autonomous. Of those, half use gas, have similar MPG, and drive approximately the same number of miles. Therefore, we would expect 6.25% of the revenue to come in.

$3,000,000*0.0625 = $187,5000

City Utilities – Right of Way: We assume remains unchanged.

Parking Fees: Under Scenario A, the number of cars on the road is expected to decrease by 75%. Of the remaining 25% half will be autonomous, and of that half, 90% will be shared. We assume that 90% of the shared autonomous vehicles will be in constant motion circulating between customers without needing to park. Therefore, we conclude the City will lose $8.50 million dollars, or 86% of FY 2019 projected parking fine revenue.

For non-autonomous vehicles: $9,860,000*0.125 = $1,232,500
For private autonomous vehicles: $9,860,000*0.0125 = $123,250

$1,232,500+ $123,250 = $1,355,750 = $1.36 million

Parking fines: We assume that autonomous vehicles will follow the law and will not incur any parking fines. Therefore, only non-autonomous vehicles (12.5% of the original number of cars) would incur parking fines.

Parking fines for non-autonomous vehicles: $1,351,500*0.125 = $168,750

Table 2: *A Comparison of Revenue from Pass Through Sources under the FY19 Adopted Budget and the City of Eugene's Scenario A.*

Source of Revenue	Level	FY19	Scenario A Estimate
State Highway Fund	Pass Through	$9,919,000	$619,937.50
HB 2017-10	Pass Through	$2,000,000	$500,000
Licenses/Permits	Pass Through	$2,058,000	$2,058,000
Total Revenue		$13,977,000	$3,177,937.50

State Highway Fund: Similar to the Eugene Motor Vehicle Fuel Tax, 75% of cars disappear. Of the remaining 25%, half (12.5%) are non-autonomous. Of those, half use gas, have similar MPG, and drive approximately the same number of miles. Therefore, we would expect 6.25% of the revenue to come in.

$9,919,000*0.0625 = $619,937.50

HB 2017-10: We assume that new cars will be purchased at roughly the same rate. 75% of all vehicles are no longer on the road. Therefore, incoming funds would be 25% of current revenue.

$2,000,000*0.25 = $500,000

Licenses and permits: We assume that the amount paid for licenses and permits will remain the same. This is because of the small difference in cost between drivers' licenses and official government identification.

LOST REVENUE PERCENTAGE

We determined the total loss in revenue using the following calculation:

$$\frac{(\text{Operating Budget FY19} + \text{Capital Budget FY19}) - (\text{Operating Budget Scenario A} + \text{Capital Budget Scenario A})}{(\text{Operating Budget FY19} + \text{Capital Budget FY19}) * 100}$$

$$\$17{,}253{,}500 + \$13{,}977{,}00 = \$31{,}230{,}500$$
$$\$3{,}765{,}350 + \$3{,}177{,}937.50 = \$6{,}943{,}187.50$$

$$\frac{(\$31{,}230{,}500 - \$6{,}943{,}187.50)}{\$31{,}230{,}500} = 0.77767 = \mathbf{77.77\%}$$

Appendix C - Assumptions for Calculations for Future Revenue

We assumed that remaining non-autonomous vehicles use gasoline, that those vehicles maintain similar fuel efficiency, and that individuals driving those vehicles drive them approximately the same amount. We also assumed that the autonomous vehicles will only stop to recharge and pick-up or drop off passengers.

In addition to these decisions, we assume toll and fee revenue projections for Portland can be applied to Eugene based on a ratio of population (Theen, 2018). However, we assume the actual tolls and fees for vehicles would be a similar $.50 per private vehicle rather than $2.

Finally, since we know neither the actual number of parking slots in the city of Eugene nor the property tax value of these parking slots, we assume an average area of parking coverage based on five diverse American cities and use an overall property tax revenue for the City of Eugene (Scharnhorst, 2018).

Appendix D - Calculations for Revenue Packages

Package 1: Traditional Sources of Revenue

Vehicles Miles Traveled (VMT) Tax

In FY19, the City of Eugene projects the local motor fuels tax to raise $3 million in revenue. At $0.05 per gallon, that means 60 million gallons of gas would be sold. If we take the Bureau of Transportation Statistics estimation that average light duty vehicles have an average fuel efficiency of 22 mpg, that means that roughly 1.32 billion miles would be driven.

$\frac{\$3{,}000{,}000 \text{ in revenue}}{\$0.05 \text{ per gallon}}$ = 60 million gallons of gas

60 million gallons of gas * 22 miles per gallon = 1.32 billion miles driven

State motor fuel tax is $0.34 per gallon (“Current Fuel Tax Rates, State of Oregon,” n.d.) Eugene’s local motor fuel tax is $0.05 per gallon (“Budget | Eugene, OR Website,” n.d.)

$$\frac{\text{34 cents per gallon}}{\text{22 miles per gallon}} = \text{1.5 cents per mile}$$

$$\frac{\text{5 cents per gallon}}{\text{22 miles per gallon}} = \text{0.22 cents per mile}$$

Assuming that each Oregon resident drives roughly 14,032 miles per year (“State of Driving, Oregon Car Insurance,” n.d.) and ODOT states there are 3.1 million licensed drivers in Oregon (“DMV Facts & Statistics, State of Oregon,” n.d.). We conclude that Oregon drivers totaled 43,499,200,000 miles last year. If we apply the current motor fuels tax rate of 1.5 cents per mile, the State of Oregon would generate $652.48 million.

43.499 billion miles driven by Oregon state * $0.015 (the 1.5 cents per mile state VMT tax) = $652.48 million state level VMT tax

According to ODOT’s Transportation Fund Apportionment for FY18 (ODOT, 2018). Oregon’s transportation fund generated $427.90 million, $195.90 million of which (45.78%) was purely from the state fuel tax.

$$\frac{\$195.9 \text{ million}}{\$427.9 \text{ million}} = 0.4578 = 45.78\%$$

The same document lists that Eugene’s transportation fund received $4.10 million from the state but does not detail how much was derived from the state motor fuels tax (ODOT, 2018). Assuming the same proportion of motor fuels tax to total transportation funding is applied to Eugene as to the state, we determined that Eugene receives $1.88 million, or 0.96% of the state’s motor fuels tax.

$4.10 million * 0.4578 = $1.88 million

Eugene currently receives 0.96% of state motor vehicle fuel tax, which would mean that -- if the apportionment remained the same -- Eugene would receive: $6.23 million per year.

$652.84 million * 0.0096 = $6,236,884

1.32 billion miles driven * $0.0022 (the 0.22 cents per mile local VMT tax) = $2.9 million in local VMT tax revenue

Therefore, the combined VMT equals $9.16 million per year. If we increase this amount by 50% to better fund road repair, we would get $13.7 million per year in revenue.

($9.16 million * .5) + $9.16 million = $13,740,000

Total: $13.7 million per year

Licensing and Registration Fees for TNCs

If there are 15,200 AVs in Eugene and each is charged $40 annually, $608,000 in revenue would be generated each year.

15,200 AVs * $40 per car = $608,000 in revenue per year

Total: $608,000 per year

TNC User Fee

PeaceHealth bikes established on April 19, 2018. As of June 14, 2018, the system had logged 20,701 rides (Kennedy, 2018). That's approximately 2 months. To be conservative:

20,000 rides per 2 months * 6 = 120,000 rides per year
120,000 rides * 0.25 per ride = $30,000 in revenue per year

Total: $30,000 per year

User Fees (Tolls for Roads and Bridges)

Portland Metro Population in 2017 = 2,389,228
Eugene Metro Population in 2017 = 369,519

$$\frac{\text{369,519 Eugene Metro population}}{\text{2,389,228 Portland Metro population}} = 0.155 = 15.5\%$$

Eugene's Metro Region has 15.5% of the population of Portland's Metro Region.

Portland will charge $2 per toll and estimates that toll roads will generate $300 million in revenue per year.

Assuming that Eugene' charges $.50 and that the toll road revenue in proportion to Portland's toll road revenue would be the same as the population ratio between the two cities, we calculate that 15.5% of $75 million is $11.6 million.

$300 million * (.25) = $75 million

$75 million * 0.155 = $11,625,000

Total: $11.6 million per year

Package 2: Innovative Sources of Revenue

Property Tax

The May 2018 Report by Research Institute for Housing America, "Quantified Parking: Comprehensive Parking Inventories for Five U.S. Cities" calculates the total number of parking spaces per acre for five American cities (Scharnhorst, 2018). Their findings are:

NYC: 10.1 spaces per acre
Philadelphia: 25.3 spaces per acre
Seattle: 29.7 spaces per acre
Des Moines: 28.4 spaces per acre
Jackson, WY: 53.8 spaces per acre

$\frac{10.1 + 25.3 + 29.7 + 28.4 + 53.8}{5}$ = 29.46 spaces per acre on average.

We use this as base assumption for how many parking spaces per acre Eugene has.

Eugene is 43.74 square miles.
1 square mile = 640 acres

Thus, 43.74 * 640 = 27993.6 acres
27993.6 acres * 29.46 spaces/acre = 824,691 spaces

The standard parking space is 7.5-9 ft. wide and 16-20 ft. long. We are assuming the standard parking space in Eugene is 8ft x 16ft, which totals 128 square feet per space.

824,691 spaces * 128 square feet = 105,560,448 square feet dedicated to parking spaces in Eugene currently.

27,800,000 square feet equals one square mile.

$\frac{105,560,448 \text{ square feet dedicated to parking}}{27,800,000 \text{ square feet per square mile}}$ = 3.79 square miles dedicated to parking

We thus estimate that Eugene currently dedicates 3.79 square miles to parking.

The Eugene Budget predicts $121,900,000 in property taxes for FY 2018-2019 ("Budget | Eugene, OR Website," n.d.).

$\frac{\$121,900,000}{43.74 \text{ (square miles)}}$ = $2,786,922.72 in property tax per square mile

$2,786,922.72 property tax per square mile * 3.79 square miles = $10,562,437.11 in additional property tax.

We are operating under the assumption that there will be a 75% reduction in cars, not 100%.

$10,562,437.11 * 0.75 = $7,921,827.83

Total: $7,921,827.83 per year

Electric Charging Tax

With current technology, a 2018 Tesla Model 3 will drive 250-310 miles per charge, or around 75kWh total ("Tesla," n.d.). For the purposes of this calculation, we will assume

an AV drives 250 miles per 75kWh. Assuming an average fuel efficiency of 22mpg ("Bureau of Transportation Statistics," n.d.), it takes 11.4 gallons of gas to drive the same distance in a gas car.

75 kWh = 11.4 gallons of gas
6.6 kWh = 1 gallon of gas = 5c tax

$$\frac{5\text{ c}}{1\text{g of gas}} = \frac{5\text{ c}}{6.6\text{ kWh}} = \frac{7.5\text{ c}}{10\text{kWh}}$$

60,000,000 gallons for gas tax
Decreases by 75% assumption of cars no longer driving
Becomes 15,000,000g = 99,000,000kWh x .75 = 74,250,000kWh / 10kWh

7,425,000 kWh x $0.075 (tax)

Total: $565,875 per year

Shared Use Parking Spaces

As described in the scenario, we are predicting that the total number of cars in operation will reduce by 75%. Of the remaining 25%, half would be AVs (12.5% of current number of cars in operation), and 90% of AVs would be shared use vehicles (11.25% of current number of cars in operation).

There are 3,200,000 cars currently in Oregon, and Eugene's inhabitants currently account for 3.8% of the state's total population. Assuming the same percentage can be applied to the number of cars Eugene contains in relation to the state, we calculate that Eugene currently has 121,600 cars.

0.1125 (11.25%) * 121,600 cars = 13,680 shared use cars in operation

The current rate for a downtown parking pass is $60 per month. We suggest raising the fee to $100 per month. If all 13,680 shared use cars were to obtain a monthly parking pass at the same rate, the city could generate $820,800 per month, and thus $9,849,600 per year through shared use parking passes.

13,680 shared use cars * $100 per month = $1,368,000 per month in shared use car parking pass revenue

$1,368,000 per month * 12 months = $16,416,000 per year in shared use car parking pass revenue.

Total: $16,416,000 per year

Congestion Pricing

Oregon Population in 2017 = 4.413 million people
Eugene Population in 2017 = 168,916 people

$$\frac{168{,}916\text{ Eugene population}}{} = 0.038 = 3.8\%$$

4,413,000 Oregon population

Eugene has 3.8% of the population of Oregon

Oregon has 3.2 million cars. Assuming Eugene also has 3.8% of total passenger cars in Oregon, Eugene has 121,600 cars:

3,200,000 cars * 0.038 = 121,600 cars

If 75% of cars are no longer in operation, Eugene would still have a total of 30,400 cars operating.

121,600 cars * 0.25 = 30,400 cars

We assume that half of these are driving during those rush hours per week.

30,400 cars * 0.5 = 15,200 cars

If half of cars operating during weekday rush hours are AVs, then 7,600 cars operating during weekday rush hours would be AVs.

15,200 cars * 0.5 = 7,600 AVs
7,600 AVs x $2 charge x 2 trips per day= $30,400
$30,400 x 52 weeks = $1,580,800 per year

Total: $1,580,000 per year

Appendix E - Summary of All Revenue Packages

Table 8: *Summary of All Revenue Packages.*

Options	New Revenue	ExpectedRevenue A	Total Revenue (new + A)
Package 1			
VMT	$13,745,826		
Licensing TNC	$608,000		
Tolls for Roads & Bridges	$11,625,000		
User Fee for TNC	$30,000		
Total Revenue	**$26,008,826**	**$6,943,187**	**$32,952,013**
Package 2			
Property Tax	$7,921,827		
Electric Charging Tax	$556,875		
Shared Use Parking	$16,416,000		
Congestion Pricing	$1,580,800		
Total Revenue	**$26,475,502**	**$6,943,187**	**$33,418,689**
Package 3			
VMT	$13,745,826		
Licensing TNC	$608,000		
Tolls for Roads & Bridges	$11,625,000		
Congestion Pricing	$1,580,800		
Total Revenue	**$27,559,626**	**$6,943,187**	**$34,502,813**

Figure 7: *Heat Map for All Revenue Packages*

Package 1	Equity	Neutrality	Efficiency	Productivity
VMT	2	3	3	3
Licensing TNC	2	3	3	3
Tolls for Roads & Bridges	2	3	2	3
User Fees for TNC	1	3	2	3
Total	7	12	10	12
				41

Package 2	Equity	Neutrality	Efficiency	Productivity
Property Tax	2	3	2	3
Electric Charging Tax	2	3	3	3
Shared Use Parking	1	2	3	3
Congestion Pricing	3	3	2	3
Total	8	11	10	12

				41
Package 3	**Equity**	**Neutrality**	**Efficiency**	**Productivity**
VMT	**2**	**3**	**3**	**3**
Licensing TNC	**2**	**3**	**3**	**3**
Tolls for Roads & Bridges	**2**	**3**	**2**	**3**
Congestion Pricing	**3**	**3**	**2**	**3**
Total	**9**	**12**	**10**	**12**
				43

Appendix F - Considerations for Future Work

There are some other potential revenue protecting actions the City should explore. However, these options are difficult to quantify and may be more difficult to enact. Long-term, these options may be necessary to ensure continued revenues as well as the vitality of mobility within the metropolitan area and thus are worthwhile to present.

The City of Eugene could work with Lane Transit District (LTD) to keep bus service competitive with these new mobility systems. Research has shown that TNCs often attempt to undercut an area's public transit system through predatory pricing (Speck, 2017). The TNC charges less than the public transit system for its passes, eventually eroding the profitability of the public transit system (Speck, 2017). The TNC's desired end state is to rob an area of public transit service, "addicting" people to the TNC's service. However, once the public transit system is effectively marginalized, the TNC raises prices and creates a monopoly. Washington D.C.'s Metro service is one such example of where this process is occurring (Speck, 2017).

Therefore, Eugene and LTD could come up with a system that penalizes the TNC when they undercut LTD's rates. Since LTD revenues and services are beyond the scope of this project, we cannot predict the monetary impact such an arrangement may have or what would constitute a predatory pricing scenario within Eugene. However, we can consider a theoretical example. A Lyft ride pass (good for 30 rides or 1 month) is currently $299 (Tobin, 2018). LTD's 1 month-pass is $50 ("Lane Transit District," n.d.). Based on the elasticity of ridership and rider preferences, if Lyft were to begin offering its pass for prices closer to the LTD monthly pass within Eugene, this could be seen as predatory pricing.

If such a situation occurs, then the TNC should be penalized. Although the legality of the applied penalty and the government agency who enforces such a penalty are unknown, we believe it is sufficient to assume a 10% rate of the previous year's gross revenue from the TNC's operations within the Eugene Urban Growth Boundary. The threat of the penalty alone may be a deterrent to "predatory pricing" and support continued LTD operations.

Eugene should also consider the following. The City should establish a legally binding intergovernmental agreement with the City of Springfield to ensure that each jurisdiction will establish similar standards and policies to handle the autonomous and electric vehicle future. If Eugene does not pursue such an action, it is likely that location effects will occur. TNCs, residents, and other entities may "vote with their feet" and move operations to Springfield to avoid Eugene's new revenue options. It is necessary to ensure that neither city will attempt to undercut the other's potential tax base. Such an agreement may include some type of revenue sharing option between the two cities. Although this seems difficult, the two cities have successfully cooperated in the past by administratively combining the Fire and EMS departments (Russo, 2010).

Finally, by partnering with other local governments, the City can establish an all-encompassing mobility pass across all types of mobility platforms. Using the pass, a rider could use a single integrated app or computer interface to access mobility options within the local area. This single application would mitigate the possibility of predatory pricing because the regulations for an all-access pass would prohibit certain types of competition.

The technology is established: airlines have code sharing for ticketing, and there are numerous websites that search for fares across competing carriers. Specifically, the Bordeaux, France, transit authority linked 28 separate transit systems from busses to bike sharing into a networked system that operated cooperatively using a single interface (Crawford, 2018). Riders are able to buy a monthly pass for $50, allowing unlimited ridership on any of the area's 28 transit systems (Crawford, 2018). Ridership and revenues have increased since the implementation of the network. Lane County and Eugene could devise a similar system, which incorporates all of the possible rider options into a single integrated network. Any mobility system wanting to operate in the local area would need to join this regulated network.

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Appendix C

Eugene Group B Report

To: Rebecca Lewis
From: Stacy Byas, Emma Land, and James West
Date: December 4, 2018
Re: City of Eugene Revenue Impacts & Recommendations for Alternative Revenue Sources

Overview

The purpose of this memo is to understand what transportation revenues for the City of Eugene might be impacted by shifts in technology or “new mobility”. An assessment of the change in the City’s transportation revenue funding is performed, providing alternative revenue source packages, considering if these alternatives are equitable, neutral, efficient, and productive.

Context

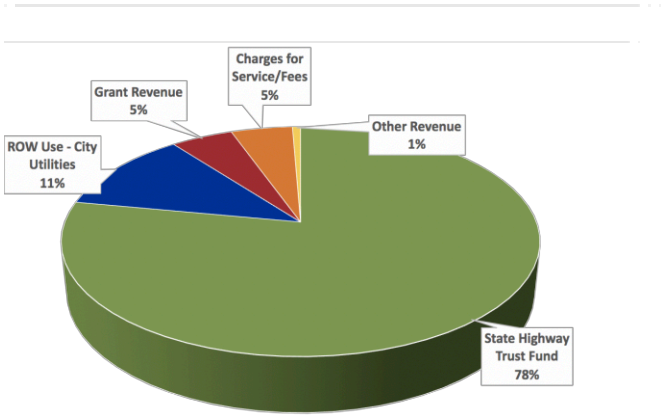
The City of Eugene has recently experienced a transformation of transportation mobility. There has been a 100% deployment of Autonomous Electric Vehicles (A-EVs), where 30% of this fleet is privately owned and the remaining 70% is shared. 100% of these autonomous vehicles are electric. As a result of this change, the total number of cars on the road has declined by 85%. A deeper look into the current revenue sources was conducted to understand to what extent this change to “new mobility” will affect the budget. Based on expected calculations, this change in technology will have a significant impact on the City’s transportation budget. In order to fully prepare to address this change, several alternative revenue packages are proposed. Each package is thoroughly evaluated through the following criteria: Is the alternative revenue package equitable, neutral, efficient, and productive? After careful evaluation of these options, a final recommendation is provided.

Transportation Budget & Revenue Sources

Transportation makes up the largest component of the City of Eugene’s $53 Million FY19 Adopted Capital Budget at 44.4%, which equates to $23.5 million (City of Eugene, 2018). The City of Eugene’s transportation funds are made up of both Operations and Capital revenues. Figure 1 shows a breakdown of the Operations revenue sources and Figure 2 shows a breakdown of the Capital revenue sources.

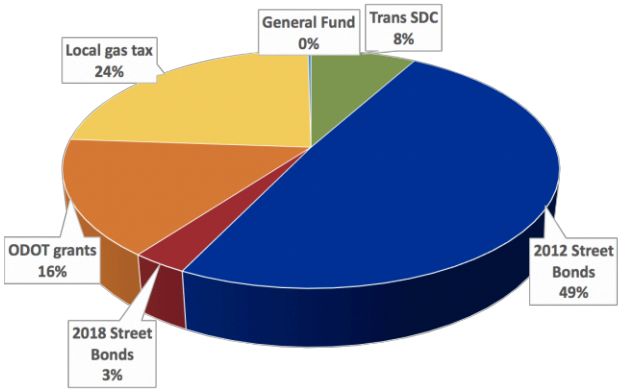
Figure 1: Eugene's Transportation Revenues: Operations Revenue: $15,525,000

(City of Eugene Transportation Funding, 2018)



1

Figure 2: Eugene's Transportation Revenues: Capital Revenue: $12,675,000



(City of Eugene Transportation Funding, 2018)

Table 1 shows the specific funding sources by dollar amount for the City's transportation projects. A full summary of the City's transportation funding can be seen in Appendix A. General Fund Transfers, Local Motor Vehicle Fuel Tax, SDCs, Street Bonds, Stormwater User Fees, and Wastewater User fees are the City's own revenue sources, totaling $11,370,500. The remaining sources of Grants, Intergovernmental Transfer, and Road Fund Transfer are funded by pass through revenue sources from state or federal level, totaling $12,164,000.

Table 1: Eugene's Transportation Funding Recap

Funding Source	Amount
General Fund Transfer	$ 30,000
Grants	$ 2,954,000
Intergovernmental	$ 7,100,000
Local Motor Vehicle Fuel Tax	$ 3,100,000
Road Fund Transfer	$ 2,110,000
SDCs	$ 1,060,500
Street Bonds	$ 6,580,000
Stormwater User Fees	$ 500,000
Wastewater User Fees	$ 100,000
Total	**$ 23,534,500**

(City of Eugene, 2018)

There are several specific funds that the city uses to directly fund transportation. These include the Road Fund (131), the System Development Capital Projects Fund (330), and the Transportation Capital Projects Fund (340). Any additional needed funds come from the General Fund. These are all Governmental fund types which provide financial accounting for most functions of the City, falling under the categories of the General Fund, Special Revenue Funds and Capital Projects Funds (City of Eugene, 2018).

The Transportation Capital Projects Fund (340), holds revenues from dedicated sources as well as expenditures from non-development transportation capital projects. There are four sub-funds within the Transportation Capital Projects Fund:

- Road General Capital Projects Fund (341)
- Pavement Preservation Capital Fund (342)
- 2012 Street Bond Fund (344)
- 2017 Street Bond Fund (345) (City of Eugene, 2018).

Different revenue sources are attributed to different funds. For example, 75% of revenues for the Transportation Capital Projects Fund come from two sources: the $0.05 per gallon local motor vehicle fuel tax and the 2012 and 2017 voter-approved G.O. Bond. Additional revenues are primarily generated from state and federal transportation grants. (City of Eugene, 2018). Regarding the 2012 G.O. Bond, voters

approved a $43 million bond to be used over a five-year period designated to repair city streets. A list of 76 specific streets was included in the measure, and an average of $516,000 per year went towards bicycle and pedestrian projects. $51.2 million has been approved for the 2017 G.O. Bond. (“Bond Measures to Fix Streets”, City of Eugene, 2018).

Current Revenue Changes

According to the City Manager, in FY19, Eugene’s intergovernmental revenues are projected to decrease by 11.5% from $28.4 million to $25.1 million, as a result of a $7.7 million reduction in transportation capital project grant funding within the Transportation Capital Projects Fund. In contrast, the Road Fund and Municipal Airport Fund are both anticipated to see an increase in intergovernmental revenues in FY19 compared to the previous year (City of Eugene, 2018). The Road Fund is expected to see an increase in revenues due to state legislation passed in 2017 under a transportation package affecting the State Highway Transportation Fund. Revenues are projected to increase annually by approximately $1 million for transportation-related projects starting in FY18 as a result of increases to the following:

- State gas tax
- Motor vehicle registration and title fees
- Bicycle tax
- New light vehicle dealer privilege tax
- A public transportation payroll tax (City of Eugene, 2018).

Current Revenue Sources & Potential Impacts

To fund its transportation needs, the City of Eugene receives funding from both Operations and Capital Revenue. The current transportation budget will be impacted significantly based on the assumption that 100% of passenger vehicles operated in the City of Eugene will be converted to A-EVs, with the total number of vehicles being reduced by 85%. Of the remaining 15%, 30% of those A-EVs are privately- owned and 70% are fleet-owned by companies such as Uber or Lyft.

Evaluating this change in transportation, we believe the local gas tax, ODOT Grants, and the State Highway Trust Fund will be the most affected sources of revenue by this “new mobility” innovation change. Table 2 provides the current revenue versus the predicted impacts in revenue sources, broken up by operations and capital revenues dedicated as pass through versus own source. The predicted impacts reflect an overall 50% reduction in the total Operations Revenue, and an overall 35% reduction in the total Capital Revenue.

Table 2: Eugene’s Current Transportation Revenue by Source v. Expected Change in Transportation Revenue by Source: Operations & Capital Revenue

The local gas tax contributes to 24% of the Capital Revenues, and we expect a 100% reduction in these funds as the new A-EV fleet will be 100% electric. Within the State Highway Trust Fund, the areas of the state gas tax and the motor vehicle registration and title fees are most likely to see a hit in revenue. Although we cannot be certain of the exact proportion these two items make up for the entire State Highway Trust Fund, we assume they hold a significant value and are conservatively anticipating a 50% reduction of these revenues. The same can be said for the ODOT Grants funding. Details of these grant funding allocations are not clear; however, based on the nature of the source, we anticipate a 10% reduction. This will result in an overall 50% reduction in the total Operations Revenue, and an overall 35% reduction in the total Capital Revenue. What this looks like is a 42.5% loss in the City of Eugene’s total transportation budget which equals approximately $11,992,500.

Operations Revenue	Percentage	Dollar Amount	New Percentage	New Dollar Amount
Pass Through Sources				
State Highway Trust Fund -State gas tax -Motor vehicle registration and title fees -Bicycle tax -New light vehicle dealer privilege tax -Public transportation payroll tax	78%	$12,100,000	28%	$4,347,000
Grant Revenue	5%	$765,000	5%	$765,000
	83%	**$12,865,000**	**33%**	**$5,112,000**
Own Sources				
ROW Use - City Utilities	11%	$1,800,000	11%	$1,800,000
Other Revenue	1%	$100,000	1%	$100,000
Charges for Service	5%	$760,000	5%	$760,000
	17%	**$2,660,000**	**17%**	**$2,660,000**
Total Operations Revenues	**100%**	**$15,525,000**	**50%**	**$7,772,000**
Capital Revenue	**Percentage**	**Dollar Amount**	**New Percentage**	**New Dollar Amount**
Pass Through Sources				
ODOT Grants	16%	$2,000,000	6%	$760,500
	16%	$2,000,000	**6%**	**$760,500**
Own Sources				
Street Bonds 2012 + 2018	51%	$6,610,000	51%	$6,610,000
Local gas tax	24%	$3,000,000	0%	$0
Trans SDC	8%	$1,035,000	8%	$1,035,000
General Fund	0%	$30,000	0%	$30,000
	83%	**$10,675,000**	**59%**	**$7,675,000**
Total Capital Revenues	**100%**	**$12,675,000**	**65%**	**$8,435,500**
Total Transportation Revenues	**200%**	**$28,200,000**	**115%**	**$16,207,500**

Furthermore, the most current data available from ODOT provides the number of registered vehicles by county only; therefore, an estimated number of registered passenger vehicles was calculated for the City of Eugene. Through a back of the envelope calculation, there are an estimated 154,100 registered vehicles in the City of Eugene (Appendix B). Those 154,100 registered vehicles contribute to the City's parking revenues in the forms of on and off-street parking, citations, and event parking to name a few. Figure 6 shows the proposed parking revenues for FY 2019 are estimated to be $8,187,245 (City of Eugene, 2018).

Figure 6: City of Eugene's Proposed Parking Revenues for FY19

(City of Eugene, 2018)

When the above assumptions are applied to the estimated registered vehicles of the City of Eugene, the result is a total of 23,115 A-EVs with 6,935 privately-owned and 16,180 fleet-owned. Based on the ratio of vehicles to parking revenue, the total 23,115 A-EVs would be projected to only bring in $1,228,087 in parking revenues (Appendix C). This would be an 85% reduction or $6,959,158 in total parking revenue. However, A-EVs do not operate in the same manner that traditional registered vehicles do as they require a lesser need for parking. Because of this, an additional 10% reduction can be estimated, meaning the current sources of parking revenues can be expected to be almost completely eliminated.

It is worth noting that by having fewer vehicles in the City in need of parking, fewer vehicles will incur parking citations, and less personnel will be necessary to enforce parking regulations. A-EVs will also likely have a major impact on the public safety revenue generated through traffic citation fines. Finally, the parking revenues within the City's Parking Fund help to support other funds including the General Fund, Road Fund, Community Development Block Grant Fund, and the Facilities Fund, which means each of these areas may expect to see a reduction in their funding sources in the future (City of Eugene, 2018).

Parking Services (Fund 520) Six-Year Financial Forecast, FY19 - FY24
Executive Summary

Major Issues for this Fund

The Parking Fund is able to cover its operating costs and highest priority capital maintenance needs. This increased fund stability from prior years is also a result of ending one of the General Fund transfers. High priority capital investments in the downtown parking structures are reflected in the forecast along with gradual increased parking rates.

		Actual FY16	Actual FY17	Estimate FY18	Proposed FY19	Forecast FY20	FY21	FY22	FY23	FY24
Resources										
Beginning Working Capital	(1)	$961,552	$1,930,915	$2,718,245	1,831,379	$1,158,129	$630,729	$131,179	$110,179	$118,429
Revenue	(2)									
On-Street	(3)	2,661,479	2,817,569	2,736,540	3,010,140	3,100,400	3,193,400	3,289,200	3,387,900	3,489,500
Off-Street		1,788,135	2,014,285	1,929,000	2,343,000	2,413,300	2,485,700	2,560,300	2,637,100	2,716,200
Citations		1,473,179	1,220,453	1,151,500	1,351,500	1,392,000	1,433,800	1,476,800	1,521,100	1,566,700
Commercial Space Rentals		540,672	570,140	555,230	520,605	536,200	552,300	568,900	586,000	603,600
Event Parking	(4)	199,518	204,492	190,000	190,000	190,000	190,000	190,000	190,000	190,000
Other Revenue	(5)	9,512	78,883	62,465	772,000	25,000	25,000	25,000	25,000	25,000
Total Revenue		6,672,495	6,905,822	6,624,735	8,187,245	7,656,900	7,880,200	8,110,200	8,347,100	8,591,000
Total Resources		7,634,047	8,836,737	9,342,980	10,018,624	8,815,029	8,510,929	8,241,379	8,457,279	8,709,429

Evaluation of Alternative Revenue Packages

To fully and adequately evaluate the proposed alternative revenue packages, four main criteria were considered, asking if and to what extent the alternative revenue packages are equitable, neutral, efficient, and productive.

Equity: When addressing equity, the fairness and impartiality of a revenue source are considered. It is important to assess whether the revenue source reflects an individual's ability to pay or if it reflects the benefits received from the method of payment. Both horizontal and vertical equity is considered. Horizontal equity refers to the distribution of a tax burden among individuals or businesses in comparable circumstances, and vertical equity refers to the variation of a tax burden across the spectrum of income (Bland, 2013).

Neutrality: When considering the neutrality of a revenue alternative, it should not change the way an individual or community would otherwise make decisions or use resources unless it is socially desirable (Bland, 2013).

Efficiency: We must not only consider the cost-effectiveness of each alternative but also whether the alternative maximizes individual utility. The administering of these revenue alternatives should be feasible, and the overall costs should remain in proportion with the revenue (Bland, 2013).

Productivity: The productivity of an alternative revenue source evaluates the resulting yield of this alternative. A tax or fee should produce sufficient and stable revenue in order to meet the desired levels of expenditures (Bland, 2013).

Alternative Revenue Packages

Package 1: Franchise Fees and Electricity Tax The City of Eugene could introduce a franchise fees levy on fleet vehicle service providers. As fleet vehicle services will comprise approximately 70% of A-EVs on the road, and the operation of these fleet vehicles will cause the majority of wear and tear on public roadways, it is essential to recoup the costs for road maintenance and upkeep from the businesses that are gaining the benefits. This is a fee that is based on the VMT traveled by shared fleet A-EVs, which have been initially estimated to be at least 45,000 miles and could vary in subsequent years depending on each company's fleet size and average VMT per year.

An electricity tax is equitable in the sense that it can be applied to everyone who uses electricity in the jurisdiction to charge their A-EV based on their consumption. Since the gas tax in Eugene is likely to be completely eliminated, an electricity tax or surcharge is a comparable alternative. Gas tax revenues have already been declining for years and

will continue to decline as vehicles become more fuel-efficient and more vehicle owners transition to electric vehicles (Jones, Bock, & ODOT, 2017). This tax would be applied only at charging stations for A-EVs and not applied as a utility tax so that the benefits received principle is upheld capturing all those relying on the transportation system.

Package 1 will yield an overall expected revenue of $13.65 million dollars per year as shown in Table 3. Per year, a franchise fee will likely produce $3.7 million in revenue (Appendix D) and an electricity tax will likely produce $9.95 million in revenue (Appendix E).

Table 3: Expected Revenues from Package 1

Table 4 shows the evaluation of Package 1 based on the four criteria discussed above.
Table 4: Package 1 Scores

Package 2: Vehicle Miles Traveled (VMT) Tax and User Fees VMT is a tax that has been proposed in many states in the U.S. as a replacement or supplement to fuel taxes. The gas tax in Oregon and the City of Eugene is expected to be eliminated, or nearly so, in the event of 100% adoption of electric vehicles. This will result in a significant revenue shortfall as identified in Table 2. The Oregon Department of Transportation (ODOT) piloted a test program for VMT starting in 2006. ODOT found the program to be successful, and it was described as being easy to implement, monitor, and collect funds (Jones, Bock, & ODOT, 2017). Furthermore, a recent case study into the operations of a shared, autonomous, electric vehicle (SAEV) fleet examined the operation of SAEVs under various vehicle range and charging infrastructure scenarios in a gridded city modeled roughly after the densities of Austin, Texas. The study found that approximately 7.1% - 14% more vehicle miles

Package 1			
	Fee Per Fleet A-EVs in Operation per Year	Est. Number of Fleet A-EVs	Estimated Annual Revenue
Franchise Fee	$230	16,180	$3,700,000
	Avg. Annual Fees per Year per A-EVs	Estimated Number of A-EVs in Eugene	Estimated Annual Revenue
Electricity Tax	$430	23,115	$9,950,000
			$13,650,000

Package 1	Equity	Neutrality	Efficiency	Productivity	Score
Franchise Fee	A flat rate charge will be regressive.	Knowing there may be a user fee, some consumers may opt for a different transportation option, and businesses may choose not to enter the market.	The fees are collected from the fleet operators and there is already administration in place to manage the collection of funds.	A good, stable source of revenue. Easy to collect.	1
Electricity Tax	Will act as a comparable replacement to the current gas tax, which is applied to consumers based on usage.	Should not affect decision making as it is applied based on usage.	Infrastructure already exists for the collection and distribution of electricity taxes.	A good, stable source of revenue. Easy to collect.	3
Total					4
- = -1		0 = 0		+ = 1	

traveled may be generated because of SAEV's ability to journey unoccupied to the next traveler, reinforcing a VMT tax as an effective revenue source (Chen, Kockelman and Hanna, 2016).

Additionally, fleet-owned A-EVs are well-situated to replace public transportation. User fees could help make up for losses in public transportation revenues. We can expect with 70% of A-EVs on the road belonging to companies that provide fleet vehicle services that there will be an overall decrease in the use of public transportation services, as seen in a previous case study by Clark, Larco, & Mann (2017).

Package 2 will yield an approximate total revenue of $15.9 million dollars as shown in Table 5. Per year, implementing a VMT tax will produce an estimated $15,722,000 in revenue (Appendix F) and user fees will produce approximately $119 thousand in revenue (Appendix G).

Table 5: Expected Revenues from Package 2

Table 6 shows the evaluation of Package 2 based on the four criteria discussed above.
Table 6: Package 2 Scores

Package 3: Income Tax and License/Register Other Modes of Alternative Transportation A shift to 100% adoption of A-EVs may significantly impact income tax revenues, not only for the municipality but also for the entire state. A-EVs have the potential to impact certain job classifications that are built upon our vehicle-dependent society. Driving jobs, gas stations, vehicle maintenance and

Package 2			
	Tax Per VMT	Eugene Est. Annual VMT Avg.	Estimated Annual Revenue
VMT Tax	$0.015	1,048,123,780	$15,722,000
	Avg. Fee Accrued/Day	Estimated Number of Riders per Day	Estimated Annual Revenue
User Fees	$1.00	118,250	$118,250
			$15,840,250

Package 2	Equity	Neutrality	Efficiency	Productivity	Score
VMT Tax	A more equitable replacement to the current gas tax. Applied to consumers based on usage.	A fee based on VMT may sway users to change their transportation habits to avoid the fee. May affect fleet users and private owners differently.	Previous studies of VMT tax found successful implementation and collection.	Will provide healthy yields of revenue as miles traveled will not decrease along with the number of vehicles and people may actually travel more.	3
User Fees	Only affects consumers who choose to use the service.	May sway user choices in an effort to avoid the fee.	Integrated within existing billing structures.	Easy to roll into single ride fee or subscription fee for fleet users.	2
					5
- = -1		0 = 0		+ = 1	

repair shops, and drive-through restaurants are immediately threatened by this transition and may considerably affect low-skill workers and affect the overall equitability of A-EVs (Clark, Larco, & Mann, 2017). But, this could be offset by A-EVs being able to transport workers from farther away and help mitigate those losses by transporting those workers to jobs in areas that were previously considered too far or too long to commute. Regardless, income taxes in Oregon are the third highest in the United States and the feasibility of increasing income taxes is unlikely.

A-EVs will continue to need registration but will no longer require a license. The revenues from license fees will be eliminated completely, and the revenue from

registration will decrease significantly, as the number of registered vehicles will drop by 85%. Bicycle use in Eugene has been growing as an easy and inexpensive mode of year-round transportation. Eugene has adapted to this growth by creating established bicycle lanes on many city streets and providing numerous bicycle racks for cyclists to safely lock their bikes. Most of the funds to create this bicycle infrastructure has come from transportation revenues in the past, but now may be the time for the City to consider registering and licensing bicycles as a strategy to generate revenue and help pay for transportation-related costs. Honolulu implemented a one-time bicycle registration fee of $15 that nets roughly $100,000 a year in revenue (City of Eugene, 2014). Using this case study as reference, the City of Eugene could implement a similar one-time registration fee.

Package 3 will yield an overall expected revenue of approximately $14.4 million dollars as shown in Table 7. Per year, implementing an income tax will likely produce $12.7 million in revenue (Appendix H) and bicycle license/registration fees will likely produce $1.7 million in revenue (Appendix I). Additionally, a bicycle registration fee will also act as a one-time revenue source with a potential for additional yearly revenue, although that amount is difficult to estimate.

Table 7: Expected Revenues from Package 3

Package 3		
	Increase in Effective Tax Rate	Estimated Annual Revenue
Income Tax	0.2%	$12,700,00
	Fees per Bicycle	Estimated Revenue
Bicycle License/ Registration Fees	$430	$1,700,000
		$14,400,000

Table 8 shows the evaluation of Package 3 based on the four criteria discussed above.
Table 8: Package 3 Scores

Recommendation

Based on our above predictions, the City of Eugene could expect to lose an estimated 42.5% of its transportation budget due to the deployment of 100% A-EVs. The City of Eugene should therefore begin adapting their budget and planning for new revenue sources locally and in partnership with the State of Oregon to accommodate the loss of transportation revenues in the following areas: the Local motor vehicle gas tax, ODOT funding, and State Highway Trust Fund.

After completing a thorough evaluation of the three alternative revenue packages considering the equitability, neutrality, efficiency, and productivity of these options, as well as the total amount of expected revenue generation, Package 2 proves to be the best alternative. Package 1 produces slightly less revenue than Package 2, as well as a lower overall score than Package 2 based on our evaluation of criteria under equity and neutrality. Package 3 generates the second highest amount of revenue but scored negatively overall in our evaluation in comparison to Packages 1 and 2.

Package 2 does generate the most revenue at $15.9 million which exceeds the revenue needed by $4 million, but it should be noted that there is likely to be unexpected expenses related to changes in infrastructure and administrative organization. This $4 million surplus could provide a budgetary buffer in light of any unpredicted expenses or shortfalls.

Package 3	Equity	Neutrality	Efficiency	Productivity	Score
Income Tax	Equity is good here as long as income tax structure remains progressive.	Could potentially cause some people from moving to the city/state to avoid higher income taxes.	Infrastructure already exists for the collection and distribution of income taxes. Little overhead needed.	Yields from income taxes are typically good, however, Oregon already has one of the higher income tax rates in the US, so yield may not be able to meet needed expenditures.	2
License/ Registration Fees	Can affect low-income communities at a regressive rate.	Fees could sway users to no longer own personal bicycles and opt for bikeshare or alternative transportation options.	Infrastructure already exists - DMV. Administering and monitoring would not require a significant increase in personnel.	Revenues from this source will likely be small, unstable, and will taper off at a certain point.	-3
					-1
- = -1		0 = 0		+ = 1	

Considerations for Future Work

The analysis contained within this document only considered the implications for the City of Eugene's transportation budget. It is apparent that the impact of A-EVs in this scenario will have a much broader impact on the City's budget beyond just transportation dollars. There are several areas that will require further study and evaluation to get a better idea of the true impact upon the city's revenue.

One significant area is parking revenue and how Eugene will plan for public and private parking lots, garages and spaces will be developed or used in a scenario with an 85% reduction in vehicles. Current public transportation revenues and infrastructure could be

significantly impacted, especially by shared fleet A-EV services if they are competitively priced.

The nature of public safety will also change dramatically. The need for traffic patrols would be reduced and traffic citations would be near eliminated. Would the city need to reduce personnel in public safety, or could they, and related infrastructure, be reassigned or repurposed to other areas in public safety?

IT infrastructure and personnel will also be an area that will have a large impact as the city will need to expand on its current IT infrastructure to accommodate the huge growth in data generated by A-EVs. Eugene will also need to develop a plan on how this data will be managed and used.

The City of Eugene will also have a front seat to closely monitor the AV pilot program that is launching in Portland, Oregon in 2019. Portland's expectations for the pilot program is to enable the private sector provision of a broad range of mobility services via a permitting process (NLC, 2018). Eugene may also want to consider establishing its own pilot program based off of community values and see how A-EVs will work at the local level, but also how it may integrate regionally and statewide.

Lastly, there is a clear critical knowledge gap regarding the long-term effects of automated vehicles on energy consumption and emissions. Further research could assess the impacts of travel demand changes, effects of vehicle automation, sharing, and electrification and possible changes in vehicle size. These results could allow for a better assessment of the balance between the short-term benefits and the long-term impacts of automated vehicles on energy consumption and emissions. (Dimitris Milakis, Bart van Arem & Bert van Wee, 2017).

Appendices

Appendix A:

Appendix B: According to 2017 information, 351,715 passenger vehicles are presently registered in Lane County with an estimated total population of 320,865 (ODOT, 2018). This information provides a ratio of 0.91 registered vehicles per Lane County resident. When this ratio is applied to the population of the City of Eugene at 168,916, there are an estimated 154,100 registered vehicles.

Appendix C: If 154,100 registered vehicles are expected to contribute to $8,187,245 in parking revenues, that is roughly $53 in revenue per vehicle. With an 85% reduction in registered vehicles, 23,115 vehicles will now be registered. To maintain current parking revenue projections, each vehicle would be expected to contribute roughly $354 in revenue, which is highly unlikely. Taking the ratio of vehicles to revenue, 23,115 vehicles would only be expected to contribute $1,228,087 in parking revenues.

Appendix D: Franchise Fee Eugene Population (Census Bureau, 2017) = 168,916
Annual VMT in Eugene (Central Lane Metropolitan Planning Corp.) = 1,048,123,780
Total Fleet VMT in Eugene per year = 1,048,123,780 x .70 (fleet share percentage of AEVs in Eugene) = 733,686,646

Transportation Projects	Fund*	Funding Source	Amount
Enhanced Walking Network	340	Grants	$1,130,000
	330	SDCs	130,000
Ferry Street Bridge and Viaduct Repair	330	SDCs	329,000
Highway 99 Charnelton to Beltline	340	Intergovernmental	2,800,000
I-5 to Walnut Street Paving Project	340	Intergovernmental	4,300,000
Illicit Activity Mitigation in Right of Way	340	Road Fund Transfer	190,000
Neighborhood Transportation Livability	340	General Fund Transfer	30,000
		Road Fund Transfer	70,000
Pavement Preservation Program	539	Stormwater User Fees	500,000
	530	Wastewater User Fees	100,000
	340	Local Motor Vehicle Fuel Tax	3,100,000
	330	SDCs	96,000
Pavement Preservation Program – Street Bonds	340	Street Bonds	6,580,000
Railroad Quiet Zone	340	Road Fund Transfer	1,300,000
Roosevelt Boulevard Path Extension	340	Grants	701,000
	330	SDCs	77,000
Seismic Bridge Strengthening	340	Grants	1,123,000
	330	SDCs	128,500
Traffic Controller Signal Replacement	340	Road Fund Transfer	50,000
Traffic Operations Improvement Program	330	SDCs	150,000
	340	Road Fund Transfer	250,000
Traffic Signal Improvements and Upgrades	330	SDCs	150,000
Traffic Signal Strain Pole Replacement	340	Road Fund Transfer	250,000
Total Transportation			**$23,534,500**

Funding Recap	Funding Source	Amount
	General Fund Transfer	$30,000
	Grants	2,954,000
	Intergovernmental	7,100,000
	Local Motor Vehicle Fuel Tax	3,100,000
	Road Fund Transfer	2,110,000
	SDCs	1,060,500
	Street Bonds	6,580,000
	Stormwater User Fees	500,000
	Wastewater User Fees	100,000
		$23,534,500

*Please see Fund Descriptions at the end of the Capital Budget section.

Total Number of Fleet Vehicles in Eugene = 16,180 VMT per Fleet Vehicle in Eugene per Year = 45,344 Charge per VMT (ODOT, 2017) = $0.015 Franchise Fee Per Vehicle = (VMT Charge) x (Annual VMT per fleet vehicle) x $680.16 = $0.015 x 45,344

Total Revenue = (Franchise Fee Per Vehicle) x (# of Fleet Vehicles in Eugene) $11,004,969.59 = $680.16 x 16,180

Appendix E: Electricity tax According to the U.S. Department of Energy, “If electricity costs $0.11 per kilowatt-hour, charging an all- electric vehicle with a 70-mile range (assuming a fully depleted 24 kWh battery) will cost about $2.64 to reach a full charge.” Using this number as a base, 23,115 A-EVs will cost $61,023.6 to reach full charge. From the calculations for the VMT tax, an estimated 1,048,123,780 vehicle miles will be traveled in one year in Eugene. If one fully charged A-EV can travel 70 miles before needing to be recharged, the A-EVs will need to be charged approximately 14,973,197 times to travel that many miles a year. 14,973,197 miles X $2.64 in electricity costs = $39,529,240.08. Taking $39,529,240.08 / 23,115 A-EVs will cost roughly $1,710.11 in electricity charges a year. (“Alternative Fuels Data Center: Charging Plug-In Electric Vehicles at Home,” n.d.)

Appendix F: VMT Tax Assume $0.015 per mile charge based on ODOT’s OReGO pilot program. Assume 1,048,123,780 VMT based on Central Lane County Planning Corp. estimates. Total VMT revenue $15,721,856.70. Rounded up for simplicity.

(“Traffic Volumes | Lane Council of Governments, OR - Official Website,” n.d.)

Appendix G: User Fees Taking the population of Eugene at 168,916, 70% will be using fleet-owned vehicles. Estimating that each rider accrues an average user fee of $1 a day, 168,916 X .70 = $118,241.20 in user fee revenues a year.

Appendix H: Income Tax Average Oregon AGI $61,430 (Oregon DOR) 102,700 working individuals in Eugene Increase effective tax rate to 6% (up from approx. 5.8%) Avg. OR AGI x 0.06 = Tax liability – (OR AGI x old eff. Tax rate 5.8%) x 102,700 = $12,617,722

Appendix I: License/Registration Fees Taking the population of Eugene at 168,916 and estimating a one-time bicycle registration fee of $10 X 168,916 = $1,689,160 in revenue.

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Appendix D

Eugene Group C Report

Budgeting for New Mobility

Autonomous, electric, and shared vehicles in Eugene
December 2018
Prepared for the City of Eugene by: Maya Lazaro, Will Anderson, Megan Winner, and David Sotelo Escobedo

Once the domain of speculative science fiction, autonomous vehicles are now at the forefront of breakthrough developments in transportation. By 2025, eight million Level 3 autonomous vehicles will be in production; by 2040, sales of autonomous vehicles (AVs) are expected to break $33 million (Kenwell, 2018; Gibson, 2018). This rapid growth and investment in AVs is expected to transform the transportation landscape of America's cities. However, while AVs are predicted to have beneficial impacts on road safety, traffic and parking congestion, increased mobility, and energy conservation and pollution (Fagnant and Kockelman, 2015; Litman, 2018), they pose a potentially significant financial challenge for jurisdictions.

This report presents projected financial impacts to Eugene's transportation budget that might occur in the event of broad-scale adoption of AVs, as well as novel and evidence-based funding recommendations to recoup lost revenues that position the city to enjoy long-term financial stability.

What would Eugene's transportation system look like if AVs became the norm? For the purposes of this report, our analysis used the following conditions:

- 50 percent of vehicles on the road are autonomous
- 100 percent of AVs are Level 5 (fully autonomous, with no driver monitoring required)
- 10 percent of AVs are privately owned and operated
- 90 percent of AVs are "shared" and operated as taxi services
- 100 percent of AVs are electric
- 50 percent of non-autonomous vehicles are electric
- The total number of cars on the road declines by 75 percent

Budget calculations were made referring Eugene's FY19 Adopted Budget. While a 50 percent AV adoption rate is several decades away, and we cannot predict what other economic, environmental, or political factors may influence Eugene's budget, this report assumes this scenario would take place under the city's current budget environment.

This section addresses revenue sources for the city's capital and operating transportation budgets, the proportion of revenues that are "own source" versus pass-through for each respective budget, the revenue sources that will be impacted by a transportation economy dominated by AVs, the proportion of revenue sources that will be impacted, total loss projections for each budget.

Operating Budget

The city's transportation operations are paid for by the city's Road Fund, a Special Revenue Fund that "accounts for the operations and maintenance of the City's street transportation system" (Ruiz, 2018, p. 165). Revenues from the Road Fund are currently used to pay for street surface repair, transportation planning and engineering, traffic signal maintenance, signing and striping, street tree maintenance, and street lighting (Ruiz, 2018). Five percent of funding comes from fees and charges for services, 5% from grant revenue, 12% from Right-of-Way Use permits and charges and city utility fees, 78% from the State Highway Trust Fund, and 1% from other sources. A total of 17% of the budget is funded by own-source revenues, while 83% is funded by pass-through revenues.

If we return to our scenario, Eugene would face a budget shortfall of $15,310,173 in operating revenues, the majority of that deficit (>75 %) stemming from reductions to intergovernmental transfers (excluding grants) and fees for licenses and permits (see Table 1).

Table 1 - Overview of Impacted Versus Non-Impacted Transportation Operations Budget

FY19 Transportation Operations Budget	Impacted Transportation Operations Budget	Total Revenues Lost	Percent Change
$18,586,874	**$3,276,701**	**$15,310,173**	**82%**

The reason for these reductions is two-fold: first, there will be far fewer privately owned vehicles under an AV-based transportation system, reducing the total number of cars on the road by three quarters, which in turn will impact the number of licenses and permits that are administered; second, only 25 percent of the remaining vehicles traveling city roads will use internal-combustion engines (ICE), which cuts into revenues collected via the state fuel tax. (See Figure 3.)

Table 2 - Changes in Individual Revenue Sources, Transportation Operations Budget

Revenue Source	FY19 Budget	Impacted Budget	Total Revenue Lost	Percent Change
Licenses & Permits	$2,058,000	$514,000	$1,544,000	75%
Intergovernmental Transfers (excluding Grants)	$11,973,000	$700,500	$11,272,500	94%
Grants[1]	$765,000	$765,000	$0	0%
ROW Rental Fees	$103,000	$103,000	$0	0%
Fees for Services	$347,500	$347,500	$0	0%
Miscellaneous[2]	$183,800	$183,800	$0	0%
Working Capital (Reserve Funds)[3]	$3,921,574	$662,401	$3,259,173	83%

[1]Grants revenues estimate sourced from the City of Eugene.
[2]Miscellaneous revenues include recoveries from insurance claims on damage to private property and interest earned on the Road Fund's cash balance at the City's portfolio rate.
[3]Working Capital (reserve funds) will not be impacted by AVs; however, Eugene will have fewer reserve funds going into an AV transportation economy budget scenario because the city tapped into its reserve funds to make up for a budget shortfall in FY19.

By relying on fuel-based pass-through revenues to fund most of its ongoing operating costs, Eugene is in a financially unstable position to support transportation operations should autonomous vehicles come into large-scale use.

Capital Budget

The city's capital transportation budget is informed by Eugene's Transportation System Plan and the Regional Transportation Plan, as well eight additional transit-related plans or policies. Of the city's capital transportation budget, 3 percent of funding comes from 2018 Street Bonds, 49 percent from 2012 Street Bonds, 16 percent from Oregon Department of Transportation grants, 24 percent from the city gas tax, and 8 percent from the Trans-Systems Development Charge fund. Of capital expenditures, 84 percent are funded by own-source revenues, while 16 percent are funded by pass-through revenues. These funds are used to pay for projects such as bridge and viaduct repair, illicit activity mitigation in the right of way, neighborhood transportation livability projects, the development of railroad "quiet zones," seismic bridge strengthening, traffic controller signal replacement, traffic operations improvement, traffic signal improvements and upgrades, traffic signal strain pole replacements, pavement preservation, paving projects, and enhancement of walking and pedestrian areas.

The replacement value of Eugene's transportation system is estimated to cost $387 million as of FY19 (Ruiz, 2018). The city passed a local fuel tax in 2003 priced at $0.05 per gallon, which was followed by the approval of two General Obligation Bonds in 2012 and 2017, respectively, to fund pavement preservation. However, as of 2017, Eugene's pavement preservation backlog was $79.8 million, making budget impacts from AVs all the more critical.

Should AVs become the norm, Eugene would encounter a deficit of $4,426,443 in capital transportation funding (see Table 3). Almost one-fifth (19 percent) of the city's capital transportation budget could be negatively impacted by AVs, due to decreases in the city's gas tax revenue.

Table 1 - Overview of Impacted Versus Non-Impacted Transportation Capital Transportation Budget

FY19 Capital Transportation Budget	Impacted Capital Transportation Budget	Total Revenues Lost	Percent Change
$23,534,500	**$19,108,056**	**$4,425,944**	**19%**

For the same reasons described above--namely, that there will be few privately owned and even fewer ICE vehicles in production--the city will see significant reductions in revenue collected from its local fuel tax, which brings in approximately $3 million per year, as well as a steep decline in the Road Fund Transfer, which gets most of its funding from Intergovernmental Transfers that would likewise be negatively affected by AVs (see Table 3).

Table 3 - Changes in Individual Revenue Sources, Capital Transportation Budget

Revenue Source	FY19 Budget	Impacted Budget	Total Revenue Lost	Percent Change
General Fund Transfer	$30,000	$30,000	$0	0%
Grants	$2,954,000	$2,954,000	$0	0%
Intergovernmental Transfers	$7,100,000	$7,100,000	$0	0%
Local Fuel Tax	$3,100,000	$193,750	$2,906,250	94%

Road Fund Transfer	$2,110,000	$589,806	$1,520,194	72%
SDCs	$1,060,500	$1,060,500	$0	0%
Street Bonds	$6,580,000	$6,580,000	$0	0%
Stormwater User Fees	$500,000	$500,000	$0	0%
Wastewater User Fees	$100,000	$100,000	$0	0%

Discussion

With three-quarters of vehicles using electricity as their sole source of power under this scenario, Eugene's local (own source) fuel tax revenues would quite literally dry up, for lack of a better phrase, if AVs were adopted. The city would also lose a significant portion of its operating budget funding via the pass-through revenues it receives from the State Highway Trust Fund, which is entirely derived from gas, diesel, and related excise taxes. Additionally, with fewer vehicles on the road, the city will see significant declines in revenue from permits and licensing fees. However, we do not anticipate the city would lose funding from its rental fees and service charges, as homeowners and private developers would still need to access these city services. Utility fees and private construction projects requiring Right-of-Way Use permits and service charges will likely not be impacted by AVs for the same reasons. Trans-System Development Fees will not be affected assuming Eugene continues to grow.

It can be assumed that bonds will be unaffected, as road activity as measured by vehicle miles traveled (VMT) is expected to remain unchanged (Fagnant and Kockelman, 2015), and transportation infrastructure will require the same degree of maintenance and repair. While there will be substantially fewer vehicles using the transportation system, AVs will be making more trips per day than non-autonomous vehicles and will therefore be inflicting continual wear-and-tear on city roadways.

It is always possible though unlikely that Eugene could lose out on funding from state and federal grants, should an RFP depend on conditions unfavorable to AVs or electric vehicles (EVs). However, we think it is more probable that Eugene would lose grant funding for other reasons such as economic conditions or political climate.

Based on this evaluation using criteria for revenue sources as well as Eugene's planning goals and guidelines, we designed 3 packages of options to generate revenue, which will be explained in the following section.

For our recommendations, we evaluated each funding option with regards to Equity, Neutrality, Efficiency, and Productivity (see Table 4). In this way, these funding mechanisms can be compared not only as it relates to their potential yield (Productivity) and ability to be administered (Efficiency), but also as it impacts local economic decision making (Neutrality) and economic fairness (Equity).

Table 4 - Changes in Individual Revenue Sources, Capital Transportation Budget

Policy Option	Equity	Neutrality	Efficiency	Productivity
Vehicle Miles Traveled (VMT)	**Moderate**	**High**	**High**	**Very High**
Shared Vehicle Per Use Surcharge	**Low/Moderate**	**Moderate**	**High**	**High**
Pick-up/Drop-off Zones	**Moderate**	**Low**	**Low**	**Moderate/High**

Shared Vehicle Registration	**High**	**Low**	**Low**	**Moderate**
Franchise Fee	**High**	**Low**	**High**	**Low**
Data Sharing Fee	**High**	**Moderate**	**Moderate**	**Low**
Vacant Land Tax	**High**	**Low**	**Moderate/High**	**Low/Moderate**
Locker Fees	**Moderate**	**High**	**Moderate**	**Low**

The projected revenue yields from each funding options are included in the table below (Table 5).

Table 5- Revenue Projections for Individual Funding Options

	Projected Revenue	Assumptions & Evidence from Case Studies
Vehicle Miles Traveled (VMT)	**$20,857,241**	Uses a tiered payment structure for privately owned AV, shared AV, ICE, and low-income road users (see Figure 12). OReGO is a VMT program currently being piloted by the Oregon Department of Transportation. The program charges participants "1.7 cents per mile traveled, credits 34 cents per gallon consumed for state fuels tax paid and calculates the net balance due. Participants then remit payment or receive a refund" (OReGO, 2018).
Shared Vehicle Per Use Surcharge	**$1,152,800**	Portland generated $4.4 million in 2017 from its city and airport surcharge fees (Iboshi, 2018). Riders are charged $.50 per trip for trips that begin or end within city limits in addition to a $2.00 airport surcharge. Eugene's population is approximately 26 percent of Portland's population.
Pick-up/Drop-off Zones	**$1,300,000**	Assumes thirteen transportation network companies will pay $100,000 annually for exclusive access to designated Pick-Up/Drop-Off Zones. Currently thirteen taxi and ridesharing companies are licensed to operate in the city of Eugene.
Shared Vehicle Registration	**$2,960,600**	Assumes 19,744 AVs are registered at a one-time charge of $150 per vehicle. Vehicle number was calculated as a proportion of the 390,012 vehicles currently registered in Lane County under scenario conditions.
Franchise Fee	**$6,500**	Assumes thirteen transportation network companies will pay an application fee of $500 annually. Currently thirteen taxi and ridesharing companies are licensed to operate in the city of Eugene.
Data Sharing Fee	**$1,974,400**	Assumes payment of annual data fees for 19,744 AVs at a rate of $100 per vehicle. Vehicle number was calculated as a proportion of the 390,012 vehicles currently registered in Lane County under scenario conditions.
Vacant Land Tax	**Variable**	A vacant land tax can be viewed as an economic development tool that incentivizes the sale of underutilized land that in this case would have been formerly dedicated to parking.
Locker Fees	**$182,500**	Assumes the city rents 100 lockers throughout high-traffic areas for $5 per day, at an 100 percent occupancy rate for 365 days per year. Locker rate is comparable to luggage storage rates in New York City.

Given the number unanticipated variables of the future scenario outlined by our assumptions, we found it useful to organize our funding packages based upon a maximization of each area of the evaluation criteria. Rather than attempting to rely too heavily on highly speculative budget

estimations of every funding option, we can focus our analysis of funding packages based on more salient considerations. Moreover, this exercise will allow us to take note of the trade-offs and deficiencies that come with an emphasis on one criteria over the other. The highlights of each of these packages helped us arrive at a final recommendation that was balanced in each of its impacts.

The first package option was selected to maximize productivity, the second to maximize equity, while the final selected to maximize neutrality. Each package was compiled by assembling a list of options that ranked high on the criteria in question. As there was significant overlap with the high efficiency funding options, we did not craft a separate funding package based on that criteria.

While Funding Package A include policies that were ranked high in revenue yields. A well-crafted Vehicle Miles Traveled (VMT) tax would likely more than cover the potential budget deficit. However, maximizing the productivity of these options will have definite impacts on equity and neutrality. Also, this represents a missed opportunity to utilize charges as a way to incentivize certain behavior over others.

Table 6 - Evaluation of Individual Funding Options by Criteria - Funding Package A

Policy Option	Equity	Neutrality	Efficiency	Productivity
Vehicle Miles Traveled (VMT)	**Moderate**	**High**	**High**	**Very High**
Shared Vehicle Per Use Surcharge	**Low/Moderate**	**Moderate**	**High**	**High**
Pick-up/Drop-off Zones	**Moderate**	**Low**	**Low**	**Moderate/High**

Vehicle Miles Traveled (VMT) Tax

As will be explained in greater detail in our final recommendation, a VMT would most likely provide a large and sustainable yield; we therefore scored it very high in productivity. The state of Oregon is even trying a pilot program, OReGO, which uses the same concept. Should Eugene choose to follow suit, implementation would be highly efficient as the city could dovetail on the efforts of the state. Second, the per-mile fee is horizontally equitable, as it applies to all drivers equally. However, assuming that lower-income riders live a greater distance from highly trafficked sites, and high-income riders live closer to amenities, it is likely that the former will produce a larger number of vehicle miles traveled, and therefore bear the burden of the tax, making the tax less equitable vertically. Finally, the road user fee would capture revenue from all drivers, including those operating electric vehicles, as well as the significant mileage accumulated by self-driving vehicles in transit to pick up and drop off users.

Shared Vehicle Per Use Surcharge

Cities like Portland are already experimenting with this type of Shared vehicle per use surcharge, charging $.50 for each ride beginning in the city limits (Uber Portland). The City of Portland has raised $6.7 million since 2016 from the per trip charge, collecting $4.4 million in 2017 alone (Iboshi, 2018). Using population estimates from the US Census Bureau, we calculate Eugene could potentially generate $1.1 million annually based on the size of the population, which is 26% of Portland's population. With systems already in place in several major metropolitan areas, establishing the administration of the new tax should be relatively simple to establish using the lessons learned and models used in other cities. With the assumption at least 45% of vehicles will be shared AVs, high usage would yield a large number of transactions to tax. Although the ride sharing industry may oppose the additional charges, "This is just taxing something that should have previously been taxed", according to

Richard Auxier from the Urban Institute. Neutrality may not be the only problem, as per use fees may distort existing pricing mechanisms. Additionally, an additional fee can potentially create a problem of equity for users who already see fees as a barrier to use.

Pick up/Drop off Zones for Transportation Network Companies

Autonomous and shared vehicles will be pulling over frequently to drop off and pick up passengers; while many of these passengers will be traveling to private residences, a large portion will be traveling to the same, highly-frequented destinations. The city has an opportunity to charge transportation network companies a fee to pull over curbside at these destinations, the justification being that frequent stops disrupt the flow of traffic. The amount of revenue generated will largely depend on how Eugene chooses to apply the charge. For example, companies could pay a high fee annually, meaning neutrality would be low or the city could choose to charge companies per "stop." The latter may be more neutral and equitable, but costlier to implement and administer. Overall, pickup and drop off zones would be advantageous for the flow of traffic and the safety of riders and other pedestrians in addition to generating revenue.

This funding package includes policies that received high equity ratings. The new technologies produced by AVs and shared vehicles could be leveraged to produce a more equitable transportation system for many users. As private AV companies will, on aggregate, produce most impact to existing infrastructure (while also being allocated public space to produce profits), it seems fair that they bear the brunt of maintenance and repair. While these more favorable to voters this package produces lower revenues. Moreover, as these fees are mostly levied on private companies themselves, then tend to score lower on neutrality. Given the realities of business decision-making, these costs will most likely be passed on to users, thereby undercutting these very goals.

Table 7 - Evaluation of Individual Funding Options by Criteria - Funding Package B

Policy Option	Equity	Neutrality	Efficiency	Productivity
Shared Vehicle Registration	**High**	**Low**	**Low**	**Moderate**
Franchise Fee	**High**	**Low**	**High**	**Low**
Data Sharing Fee	**High**	**Moderate**	**Moderate**	**Low**
Vacant Land Tax	**High**	**Low**	**Moderate/High**	**Low/Moderate**

Shared Vehicle Registration Fees

Much like all other vehicles, autonomous vehicles will be registered with the Department of Motor Vehicles. This will be a secondary fee applied to each vehicle in operation by a transportation network company. This fee follows the benefits-received principle by charging private firms for access to profit, making it equitable. At the same time, the cost will be passed down to passengers, which may impact user riding habits. Given the large number of shared vehicles, this may incentivize the use of alternative transportation options. A shared vehicle registration fee will provide a moderate source of revenue at first when companies register their shared fleets, but that number will diminish over time as fewer new vehicles are brought into operation. However, shared vehicle registration does not score well on neutrality if nearby jurisdictions do not charge a similar fee. Transportation network companies are already refusing to expand services to nearby Roseburg due to burden of additional requirements and regulations (Max, 2018). Further, setting up and administering a new system at the local level for shared vehicle registration could be burdensome in terms of efficiency.

Franchise and Licensing Fees

As private companies are gaining access to city infrastructure to make a profit, we find it equitable to potentially charge franchise and license fees on those companies for operation. However, as they are one-time fees, they would not yield a large amount of revenue. Even after a five time increase of the current $100 transportation network company business license application fee Eugene charges, only $6,500 a year would be generated by 13 companies. Additionally, business licensing fees can deter transportation network companies from providing service in certain areas when multiple fees for applications and operations are required, as Roseburg is currently experiencing with Uber and Lyft (Max, 2018)

Data Sharing Fees

It can be presumed that Eugene will need to monitor AVs and shared vehicles to evaluate traffic patterns, congestion, and collisions. While we can't predict what technology will exist in the future, we can assume that data sharing will be an integral part of the transportation network and therefore would benefit public safety, travel efficiency, and revenue. The city would presumably require private transportation network companies and private owners of autonomous vehicles to share their data for safety monitoring; therefore, a data fee is recommended to recover the costs associated with this type of infrastructure. While the start-up costs of developing a data center that could receive and transmit information in real-time are high, the costs of maintaining the system will diminish over time. The data fee should be comparable to that of other similarly sized Oregon cities in order to retain neutrality.

Vacant Land Tax

In the future with 75% fewer cars on the road, parking lots will create even more negative space than already exists. Therefore, to spawn a more efficient density and deter speculation, a vacant land tax would encourage development in a way that does not detract from equity criteria... A levy can be an equitable way to recapture value from public investments given inflation trends. Parking lot owners will be incentivized to sell their land to developers, which will help Eugene meet its destiny goals and reduce speculation. Assuming land values continue to appreciate, high yields can be expected. However, land value taxes have not been widely implemented elsewhere, and voters unfamiliar with how such levies work may be unsupportive. Moreover, if it achieved its goal, it would not generate revenue long-term, but it could promote non-vehicle transportation like bikes and walking as well as increased density, all of which are aligned with Eugene's goals and vision for the future. Therefore, passing a levy will require intensive planning and resources from the city. Lastly, if space is at a premium, it is fair to charge transportation network companies higher rates for shared vehicle storage within high-density areas. City-owned parking garages and lots can be repurposed for shared vehicle storage.

This funding package includes policies that received high neutrality ratings. As most of our policies levy AVs or users in some way that would impact business behavior, we only found two policies that ranked high in this criterion. As this includes the VMT option that was previously discussed, this package would likely produce high revenue, however this would come at the cost of equity and other undesirable outcomes.

Table 8 - Evaluation of Individual Funding Options by Criteria - Funding Package C

Policy Option	Equity	Neutrality	Efficiency	Productivity
Locker Fees	**Moderate**	**High**	**Moderate**	**Low**
VMT	**Moderate**	**High**	**High**	**Very High**

Locker Rental Fees

Anticipating people will need a place to keep their belongings in lieu of a personal vehicle to use

for storage, installing lockers and charging a fee could be a way to make a small amount and provide an important amenity to people frequenting popular destinations in the city. Those who no longer own a personal vehicle may desire a secure space to store their personal belongings when immersed in multi-hour trips or errands. By charging a per-hour or per-day usage fee for locker access in Eugene's business districts, the city could incentivize residents to spend more time (and therefore more money) in those locations and create a self-sustaining project. This option would not generate revenue for transportation so much as it would be part of a general economic development strategy stemming from the emergence of autonomous vehicles. This project would be moderately costly to install and implement due to the need for tamper-proof lockers and security monitoring.

Table 9: Balancing Equity, Productivity, and Neutrality

Policy Option	Equity	Neutrality	Efficiency	Productivity
VMT with Tiered Rates	**High**	**High**	**Moderate**	**Very High**
Data Sharing Fee	**High**	**Moderate**	**Moderate**	**Low**
Vacant Land Tax	**High**	**Low**	**Moderate/High**	**Low/Moderate**
Locker Fees	**Moderate**	**High**	**Moderate**	**Low**

In formulating a final recommendation, our team began our analysis by taking into account the City of Eugene's triple bottom line initiative. As part of this effort, the City of Eugene formed a Sustainability Commission with the goal of building a "more sustainable community." The core of the "Sustainable Eugene" initiative is captured in a mission statement that reads: "A Sustainable Community is one that meets its present environmental, economic, and social needs without compromising the ability of future generations to meet their own needs." With this mission statement firmly in mind, our team looked for funding options with compatible characteristics. (City of Eugene)

A second consideration in formulating a final recommendation is the need for a funding package to be simple, efficient and productive. Our team recognized too much complexity can result in a tax package being unworkable and inefficient. For example, our team understood as the number of vehicles with internal combustion engines plummets, maintaining a tax on gasoline becomes less feasible. Not only will continuing a tax on gasoline become less productive, it will also become too expensive to administer. As a result, our team opted for a single primary funding mechanism that excluded a gasoline tax.

Our team selected four funding options that meet the goals of the City of Eugene's triple bottom line. Our recommended package includes a Vehicle Miles Traveled (VMT) tax, a data sharing fee, a vacant land tax and locker fees. The revenues from data sharing and locker fees are not expected to be significant, and our team expects net revenues generated by these fees will be used to fund and maintain related infrastructure. Likewise, the vacant land tax is intended to provide an incentive for owners of underutilized parking lots to look for alternative uses for their land and is not expected to be a long term or consistently productive tax. As a result, a detailed analysis and revenue projections are only provided below for the VMT tax.

The problem with a basing revenue on VMT is the regressive nature of this type of tax. Left unmodified, a VMT tax will result in low income individuals paying a higher percentage of their income for transportation than high income individuals. As a result, our team is recommending a VMT tax with five tiers based on (1) individuals continuing to use privately owned, non-autonomous vehicles, (2) autonomous vehicles that are privately owned, (3) shared use of autonomous vehicles (4) use of autonomous vehicles by individuals classified as low-income,

and (5) users of autonomous vehicles who are 67 years of age or older. Table 10 below provides the project total miles per day, and annual revenues from each rate tier.

Table 10 - Vehicle Miles Traveled (VMT) Tiered Fee Structure and Total Revenues

From a public policy perspective, a VMT tax must incentivize behavior that is beneficial to the community. Privately owned, non-autonomous vehicles have the greatest negative impact on the transportation system, so it is logical these types of vehicles should pay a tax rate that is punitive. Figure 9 shows this tier (1) will provide 71% of the revenues in this package at a rate per mile of 2.5 cents per mile, producing nearly $15 million per year. While privately owned autonomous vehicles have less negative impact on the transportation system than non-autonomous vehicles, there should be financial incentive to use shared vehicles as it will reduce the overall number of vehicles on the road. Therefore, the tier (2) will pay a rate of 2.2 cents per mile or $1.3 million per year. Users of shared autonomous vehicles noted in figure 9 as tier (3) should be charged the most reasonable rates since their behavior is best aligned with the policy goals of the community. At 1 cent per mile tier (3) is projected to generate $4.1 million per year. In attempting to reduce the regressive nature of the VMT tax, our revenue projections assumed low-income users in tier (4) will be granted a fifty percent discount. Likewise, recognizing most users over the age of sixty-seven are retired and on affixed income, our revenue projections assumes tier (5) will be exempt from the VMT tax.

The emergence of AVs and other advances in mobility will no doubt alter the transportation landscape for U.S. metropolitan cities, forcing them to pursue innovative strategies to fund ongoing and inevitable transportation costs as well as identify incentives that motivate activities such as carpooling in shared vehicles to further reduce pollution and road congestion. While this presents a unique hurdle, it is not insurmountable. By investing in research and development exploring evidence-based and more experimental revenue-generating solutions to projected budget shortfalls, Eugene will be poised to not only meet its transportation spending needs but have the reserves to make investments that can be used to enhance the wellbeing and livability of its community.

More specifically, we suggest Eugene prioritize future research into vacant land tax law and the cost and practicality of locker installations for day use rental. The vacant land tax revenue projections are complex calculations that go beyond the scope of this report--however, we believe it offers a promising potential source of revenue for the city. The city should also consider refining a tiered VMT system that includes further research into user groups, such as those over the age of 65, and their propensity to travel using shared vehicles. For example, some evidence shows that shared vehicles impact the travel behavior of seniors because they feel more comfortable traveling at times when they would normally not have driven independently, such as at night or in poor weather conditions (Hensley et al., 2017). This uptick in shared vehicle ridership could increase the tax base and therefore the amount of VMT tax generated, but it is also important to consider that with a tax waiver that seniors would may experience an increase in quality of life (Raphael, 2018). In terms of equity, not all individuals over the age of 65 earn an equivalent income, so providing the senior discount presents vertical equity challenges. In that same vein, the city should also consider a possible option to discount rides for disabled users.

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Appendix E

Gresham Group A Report

Executive Summary

This report will explore the reasonably foreseeable effects of an increase in autonomous and electrically powered vehicles upon different aspects of the transportation budget of the City of Gresham. A substantial decline in funding from the reduction of gas tax revenue will be the most significant loss for Gresham. To counteract this loss of revenue, a variety of funding sources are proposed and presented in three potential funding packages.

The recommended funding package includes a mix of existing and innovative revenue sources with taxes, charges and fees applied at various rates in each package. Registration and licensing fees are included at rates comparable to existing fees. A vehicle miles traveled (VMT) tax is applied to all vehicles traveling on the road to make up for the significant loss in motor fuel tax. Similarly, a VMT tax on "zombie" autonomous vehicles that drive without passengers is applied to all shared autonomous vehicles when they travel empty. An increased utility license fee is also included in this package, as it can be easily adjusted to the appropriate rate of new development in Gresham. These alternative revenue sources were evaluated for their equity, neutrality, efficiency, and productivity.

The recommended funding package offers the most diverse and high-performing set of funding options, and collectively meets the assorted evaluation criteria. Ultimately, the preferred funding options provide the most flexibility and adaptability in their application, while offering the most resilience for Gresham to maintain a positive revenue stream if unexpected shifts in revenue occur.

Background

As transportation network companies and autonomous vehicles (AVs) are driving a shift in technology, or "new mobility" in our cities, local municipalities are facing a new challenge. Cities must develop new ways to sustain sources of revenue to provide adequate transportation services to the public. Many cities balance their transportation budgets using money collected by private cars: gas taxes, vehicle registration fees, traffic tickets, and parking revenue. The advent of AVs poses a problem for cities in this way, because driverless cars do not require the items from which cities typically collect revenue. Many cars will be electric and therefore require no gasoline, and fewer drivers will exist to pay for vehicle registration, licensing fees, or traffic tickets.

The City of Gresham is exploring these potential impacts to its operating budget. The scenario for this report provides assumptions for the number and type of vehicles traveling on the road in the City of Gresham. Vehicles are both electric and gas powered, and a portion of vehicles are autonomous. Based on this scenario, a significant portion of Gresham's transportation revenue will be lost and additional funding sources need to be identified to fill the funding gap. This report will explore alternative revenue sources for the City of Gresham to consider and evaluate how they will be affected as AVs are introduced. Assumptions about future transportation trends and their impacts are explained in the following section.

Assumptions and Definitions

This report relies on the following assumptions and definitions:

Scenario Assumptions

The total number of cars on the road will decline by 75%. Of the remaining vehicles:

- 50% of the total will be autonomous vehicles
    - 10% of autonomous fleet is private (single-occupancy, privately owned)
    - 90% of autonomous fleet is shared (privately owned TNC operating)
    - 100% of autonomous vehicles are electric
- 50% of non-autonomous vehicles are electric
- 50% of non-autonomous vehicles

Revenue Loss Assumptions

Currently, the Gresham Transportation program is comprised of three distinct funds: The Transportation Fund (general transportation), the Transportation Construction Fund (capital projects), and the Footpaths and Bikeways Capital Improvement fund. The Transportation Construction Fund is funded via interfund transfers, various charges for service, other resources including municipal lines of credit, and intergovernmental transfers. However, there are no current funds accounted for in the Transportation Construction Fund via intergovernmental transfers. Given this we do not anticipate the Transportation Construction Fund to be negatively affected by changes in vehicle fleet given by our scenario. The Footpaths and Bikeways Capital Improvement fund receives 1% of gasoline taxes transferred to the City of Gresham and the remainder of its funding from interfund transfers and other sources. While vehicle fleet changes will have a minimal effect on revenue in this fund, there will be an approximate 1.4% reduction from current funding levels. The most pronounced revenue reduction will take place in the Transportation Fund.

The Transportation Fund, which accounts for general operating funding for transportation, totals $39.5 million for fiscal year 2019. However, of that total, approximately $18.6 million is categorized as “Beginning Balance,” which is comprised of carried-over funds from the previous year. In order to provide a better picture of future revenue realities, we have subtracted off this amount, so that we are examining only a single year’s revenue. This leaves a single-year revenue (SYR) total of approximately $20.8 million.

The only SYR sources expected to be affected by the scenario conditions fall under the State Transfer and County Transfer categories, which together make up approximately 60.4% of the SYR total (the rest is sourced from various own-source revenues, which are assumed to remain stable).

Approximately $8.1 million, or 39% of the SYR total, comes from the State Transfer category. 85% of that $8.1 million — i.e. approximately $6.9 million — is ultimately sourced from gas tax revenues. The remaining 15% — or $1.2 million — of the State Transfer revenue is listed in the sources available to us as originating from “Driver and Vehicle Registration” fees but is not broken down beyond that. As a result, we have assumed that these revenues are

split evenly between driver license fees and vehicle registration fees and have calculated expected outcomes accordingly.

The County Transfer portion of the fund provides nearly $4.5 million, or 21.4% of the SYR total, all ultimately stemming from gas tax revenue.

When applying the scenario parameters to gas tax revenues, we discover the following:

- With a 75% decrease in overall vehicles on the road, gas tax revenues drop by 75%.
- With half of the remaining vehicles being autonomous (and thus electric), gas tax revenues drop by another 12.5%.
- With the remnant split in half yet again, as half of the "manual" vehicles still on the road being electric, that leaves only 6.25% of the original gas tax revenues in play; in other words, a total reduction of fully 93.75% of gas tax revenues is expected.

Driver licensing is a special case, as it relies on another assumption: that the State of Oregon will not require a licensed driver to occupy autonomous vehicles during operation, but will require owners of autonomous vehicles to be licensed as "operators" of such vehicles. In this case, the 75% drop in vehicles overall applies to driver licensing fees, and thus said revenues also drop by 75%.

Vehicle registration is also affected by scenario conditions, and with a 75% drop in vehicles on the road, a corresponding 75% drop in vehicle registration fee revenue should be expected. All of these losses together, when applied to Gresham's current revenue sources, lead to an expected Transportation Fund shortfall of approximately $11.8 million. Table 1 provides further breakdown along with our expected revenue loss resulting from our scenario assumptions.

Table 1. Current Single-Year Revenue (SYR) Sources, City of Gresham

	% Transp. Fund Single-Year Revenue	***$ Transp. Fund Single-Year Revenue***
Gresham Transp. Fund (less Beginning Balance)	100.00%	$20,887,600
State Transfer (Total)	39.00%	$8,146,164
- Gas Tax (85%)	33.15%	$6,924,239
- Registration Fees (7.5%)	2.925%	$610,962
- Licensing Fees (7.5%)	2.925%	$610,962
County Transfer	21.40%	$4,469,946
Total % of SYR	60.40%	
Expected transfer scenario loss	-56.66%	-$11,827,603

Source: City of Gresham. (2018). Adopted Budget for Fiscal Year 2018-19. City of Gresham.

Share of Registered Vehicles by Population

Under this scenario, the total number of registered passenger vehicles in Gresham is expected to decline. Vehicle number estimates are derived from Oregon Department of Transportation (ODOT) vehicle registration data for Multnomah County in the year 2017.[1] Vehicle share by population for the county was calculated as a percentage and carried over to the city of Gresham, as seen in Table 2. This assumes that the percentage of people in Gresham with registered vehicles matches that of Multnomah county.

Table 2. Current Gresham Vehicle Registration

Current Gresham Vehicle Registration				
Jurisdiction	***Population***	***Registered Vehicles***	***Percent Share***	***Projected Total****
Multnomah County	807,555	574,128	71.09%	-
Gresham	**111,053**	**-**	**-**	**78,953**

Source: ODOT. December 31, 2017. Oregon Vehicle Registrations by County.
**Vehicle registration projection for Gresham are based on the percentage of Multnomah County population residing in Gresham.*

Applying the scenario assumptions to Gresham vehicle registrations results in the totals seen in Table 3.

Table 3. Total Number of Vehicles Registered in Gresham

Total # Vehicles Registered Gresham (Reduction of 75%)	**19,738**
Autonomous + Electric	**9,869**
Electric	4,935
Gas	4,935
Private use *(10% total AV)*	**987**
Shared Use *(Privately Owned, TNC) (90% total AV)*	**8,882**

Source: Assumptions given in Scenario A.

Vehicle Miles Traveled (VMT) Share by Registered Vehicles in Gresham

Projected VMT for the city of Gresham was calculated using county VMT estimates from ODOT; see Table 4. The most recent year data (2017) for Multnomah VMT was multiplied by the percentage of county registered vehicles in Gresham. This provides an estimate of the Gresham VMT share for 2017. Estimates are likely to be below the actual because ODOT VMT estimates are only done for state jurisdiction roads and do not include city/county surface roads.

Table 4. Oregon State Highway VMT by County*

COUNTY	2017	2016	2015	2014	2013	2012
Multnomah	3,048,100,000	3,096,300,000	3,059,600,000	2,933,200,000	2,895,200,000	2,884,700,000

Source: ODOT. December 31, 2017. Oregon Vehicle Registrations by County.

**Oregon Vehicle Miles of Travel for state owned highways within each county*

Limitations

The City of Gresham receives revenue from gas tax as well as license and registration fees from Multnomah County. It is not clear what portion of revenue stems from gas tax as opposed to license and registration fees. The calculations in this memo assume that all revenue from the County is generated from gas taxes. Likewise, a 15% share of the revenue transferred from the State of Oregon — labeled simply as "Driver and vehicle licensing" – is a combination of drivers' license fees and vehicle registration fees. The exact proportion of these components is not included in the information available to us. Therefore, we have added the assumption that these revenues are equally split between driver's license and vehicle registration fees. Each of these is therefore assumed to account for 7.5% of the state transfer revenues.[2]

Alternative Revenue Source Definitions

In order to recover projected revenue shortfalls under our given scenario, five distinct funding elements were examined and combined to form three different revenue packages. The five elements are defined as follows:

- **Licensing and Registration fees**. The State of Oregon currently collects fees in exchange for the issuance of driver's licenses and vehicle registrations. A portion of these fees are then transferred to municipalities.
- **Vehicle Miles Traveled (VMT) Tax.** A fee assessed on road miles driven in lieu of a gasoline tax. The tax or fee is assessed on each vehicle/owner operator, based on number of miles driven in a given year. Oregon is currently piloting a program to impose a tax on vehicle miles traveled. The pilot program charges a tax of $0.015 per mile, which was set to roughly match the cost of Oregon's 30 cents-per-mile gas tax.[3] The state program is voluntary and the City of Gresham does not impose a city-wide a tax for VMT.
- **Transportation Network Company (TNC) ride-specific fees and tax.** Transportation network companies – also known as ride sharing and ride hailing services – provide taxi-like services to consumers. They are most often operated through private vehicles contracted by a larger company. Specific per-ride fees, registration and licensing fees, or tax structures can be applied to TNC services, vehicles, and owner/operators.
- **Zombie Autonomous Vehicle VMT Tax**. Autonomous vehicles (AV), which are defined as self-driving vehicles that may or may not have a driver or passenger present, are predicted to be empty for a portion of their daily VMT, particularly if operating under a TNC. A Zombie Autonomous Vehicle Tax is a special tax applied to AVs when driving empty as opposed to parking.
- **Utility Licensing Fees.** The City of Gresham established a utility license fee in 2017 to maintain and repair city streets as utility construction activities have an impact on local conditions.[4] Currently, utility license fees are collected from customers for Gresham's Water, Wastewater, and Stormwater utilities. These fees are set at 7% of gross revenues.

Proposed Funding Packages

Several alternative revenue sources have been considered in order to make up for a projected decline in existing transportation funding. The scenario assumes a 75% reduction in automobiles, and existing automobiles are less reliant on gasoline to function. Alternative sources of revenue to fund the City's transportation budget were examined to maintain transportation infrastructure from taxing vehicle registration, licensing, and gas.

The following section proposes various alternative revenue sources to supplement Gresham's transportation budget and organizes them into three individual funding packages. Each revenue source was researched for accuracy as applied to this scenario and explained in detail. The target amount of revenue obtained in each package aims to match the estimated reduction in revenue that Gresham will experience from the discussed changes of mobility trends.

Zombie Package

To supplement the loss of revenue from decreasing gas tax, the Zombie Package introduces a mix of existing and innovative revenue sources, including increased licensing and registration fees for shared AVs, a general VMT tax on all vehicles, and a Zombie AV tax on autonomous vehicles when they travel without passengers.

Table 5. Total Revenue – Zombie Package

Total Revenue Zombie Package		
Registration Fees	$2,637,030	22%
Licensing Fees	$1,539,584	13%
VMT Tax	$2,279,231	19%
Zombie AV Tax	$5,422,998	46%
TOTAL	**$11,878,843**	**100%**

The revenue in this package is largely generated by the shared portion of AVs, which are privately owned and operated by TNCs in this scenario. Non-AVs and private AVs are not impacted, except with the addition of a universally applied VMT tax. It is assumed that shared AVs are used for commercial purposes, like ride hailing and ride sharing, and higher fees will likely be passed on from the vehicle owner to the passenger paying for its services. By imposing higher taxes and fees on shared AVs, the impact to transportation infrastructure and the environment is distributed across a larger share of passenger trips.

The Zombie Package proposes a modified fee structure for licensing and registration for private and shared autonomous vehicles. The amount of revenue from shared licensing fees is substantially higher than for private licensing fees, because there is more assumed responsibility and liability involved in owning and operating a shared AV. The most significant source of revenue is generated from the Zombie AV tax. This tax is imposed in addition to the general VMT tax applied to all vehicles, only when AVs are traveling without passengers. This package proposes a $0.23* tax on shared AVs when they are driving empty, and estimates a total of $5.4 million in revenue will be generated.[5] The estimated revenue from Zombie AV tax makes up 46% of the total transportation budget.

Finally, the Zombie Package imposes a VMT tax of $0.015 per mile on all non-AVs, as well as on the private share of AVs. As previously stated, shared AVs are taxed at a higher rate because it is assumed they will be used commercially by the vehicle owner. The VMT tax will then effectively be a tax on the profits of ride sharing and hailing services. The estimated VMT

tax generated from all vehicles on the road is $2.3 million, or 19% of the total transportation budget in Gresham. A full analysis of the Zombie Package can be found in Appendix A.

The Zombie Package offers a variety of benefits to generate revenue due to its flexibility and adaptability to the future circumstances in Gresham. Registration and licensing fees generated from the charges in this package are on par with revenue the city currently receives as pass through funds from Multnomah County. The VMT tax is applied at the standard rate the state is currently piloting and can be adjusted by the City of Gresham as necessary. Similarly, the proposed rate for the zombie AV tax suggested by academic research is relatively high. The City of Gresham might consider either lowering the zombie AV charge or waiving the general VMT tax for all vehicles, to reduce the overall taxes levied upon shared AVs.

TNC Package

The TNC Package relies on a combination of registration and licensing fees applied to all vehicles and vehicle owners, along with additional charges applied to shared vehicles operating with a TNC, a VMT tax applied to all vehicles with an additional VMT applied to shared TNC vehicles, and a TNC per-ride charge applied to all rides that originate within the city of Gresham. All taxes and fees are based on existing charges being used within the state of Oregon or other jurisdictions. Table 6 provides a funding breakdown by source.

Table 6. Total Revenue – TNC Package

Total Revenue Funding Package #2		
Registration Fees	$1,924,479	16%
Licensing Fees	$241,794	2%
VMT Tax	$2,305,429	20%
TNC Per-Ride Fee	$7,340,990	62.%
TOTAL	**$11,812,692**	**100%**

The TNC Package proposes a modified registration and licensing fee structure. This would increase Oregon driver's license fees from the current $6 annualized cost to $10 per year. Additionally, it would apply an additional $5 annually for TNC licensing/permitting. This change would provide approximately $241,000 in additional funding each year.

Registration fees would likewise be increased for TNC vehicles; the current $75 annualized fee for all vehicles would be maintained, with an additional $50 per year fee added for TNC-specific vehicles. This change would provide approximately $1.9 million in annual revenue.

Similar to the Zombie Package, the TNC Package proposes a universally applied VMT tax to make up for the loss of gas tax revenue. This tax amounts to $0.015 per mile for electric vehicles, $0.025 for gas vehicles (to help mitigate additional carbon emissions), and an additional $0.01 VMT tax is imposed on vehicles operating under a TNC. VMT revenue in this package is approximately $2.3 million annually.

The most flexible and largest revenue source in the TNC Package is a per-ride TNC fee. The proposed fee of $0.78 is based on a currently applied fee of $0.50 per TNC ride in the city of Portland. Gresham would apply a fee to all TNC rides that are generated within the city limits. Under our scenario, using trip generation assumptions drawn from Gresham's existing Transportation System Plan, a TNC per-ride fee of $0.78 yields over $7.3 million annually.

The TNC Package provides the city with several flexible revenue options. A shared vehicle specific VMT for travel within the city gives the city the ability to adjust revenue projections based on VMT estimations. Additional tax charges would then be applicable only to shared (TNC) vehicles. This increase will most likely be transferred to ride rates though only small increases. The charge is completely under the city's control and can be adjusted accordingly based on VMT trends. Under this scenario 62.1% of total revenue comes from a TNC per-ride fee charged at $0.78 per ride initiated within the city. Small changes to this fee can yield large revenue gains or reductions without substantially impacting ride fares. Licensing and registration fees are largely kept consistent with current Oregon and Multnomah regulation and only slight increases are applied to make up for lost revenue resulting from vehicle number reductions. Gresham is able to charge additional fees for TNC/Shared vehicle permitting and operating. While these fees make up a smaller proportion of overall revenue projections they are likely the easiest to collect.

Recommended Package

The Recommended Package incorporates both the Zombie AV Tax and the TNC Per-Ride Fee from the previous packages, as well as an increase to the City of Gresham's recently implemented Utility License Fee.

Table 7. Total Revenue – Recommended Package

	Total Revenue Recommended Package	
VMT Tax	$2,305,429	19%
Licensing Fees	$241,790	2%
Registration Fees	$1,924,450	16%
Zombie AV Tax	$2,122,043	18%
TNC Per-Ride Fee	$3,764,610	32%
Utility License Fees	$1,487,520	13%
TOTAL	**$11,845,842**	**100%**

The Vehicle Miles Traveled (VMT) tax structure that is used in the TNC Package carries over to this proposal. Similar to the State of Oregon's pilot VMT program, and mirroring the Zombie Package, this package charges a tax of $0.015 per mile traveled for all non-autonomous vehicles, as well as non-shared autonomous vehicles. The VMT portion of the Recommended Package also adopts the increased tax on non-electric vehicles, found in the TNC Package, of $0.025 per mile to offset carbon emissions. Similarly, the additional $0.01 VMT tax on the share of TNC-owned vehicles is applied here, in order to account for their larger share of the total vehicles on the road. All told, the VMT tax would cover 19% of the Transportation Fund budget.

Both the Licensing and Vehicle Registration fee structure implemented in the TNC Package are featured in the Recommended Package as well. Only 2% of the overall Transportation Fund budget would be made up of licensing fees while 16% of the budget would come from Vehicle Registration fees. This distribution mirrors that of the TNC Package.

Like the Zombie Package, the Recommended Package uses the Zombie AV Tax, but this package only relies upon this tax for 18% of the overall Transportation Fund budget.

Likewise, the Recommended Package takes advantage of the TNC Per-Ride Fee from the TNC Package as well. In this case, the per-trip charge is set at $0.40, which results in the TNC Per-Ride Fee comprising 32% of the Transportation Fund budget.

Finally, the Recommended Package makes use of the City of Gresham's recently implemented Utility License Fee structure. In 2017, the Gresham City Council voted to adopt a 7% Utility License Fee to account for increased reconstruction and maintenance on city streets due to utility construction activities.[6] The Utility License Fee is collected from customers of the city's three water utilities: Water, Wastewater, and Stormwater. Current rates, at 7% of total gross revenues, make up over $826,000 of Gresham's total transportation fund. Yearly rate increases would push utility license fees to 10% of total user fees collected by 2020.[7] The Recommended Package further increases the utility license fee rates to 12.6%, which would account for approximately $1.5 million of the proposed transportation fund.

The Recommended Package emphasizes diversity of funding streams. In this package, no single revenue source approaches or exceeds 50% of the total Transportation Fund revenue, thus spreading the costs of transportation over as wide a swath of the system users as possible. In this way, the Recommended Package should prove both resilient and adaptable to unexpected changes.

Evaluation

All proposed funding sources have been evaluated under the following categories:

- Equity: The source is distributed fairly across populations.
- Neutrality: The source is unlikely to distort consumer decision-making.
- Efficiency: The source is relatively simple to assess and collect.
- Productivity: The source provides sufficient revenue after costs have been considered.

Within each of these categories, each proposed funding source has been rated as one of Excellent, Very Good, Good, Moderate, or Poor. Note that, as this is an inherently subjective evaluation procedure, different readers may come to different conclusions.

See Table 8 for the evaluations of each proposed funding source. For more details, the complete breakdown can be found in Appendix F.

Table 8. Evaluation of Alternative Revenue Sources

	VMT Tax	***Zombie AV Tax***	***License and Registration Fees***	***TNC Tax***	***Utility License Fees***
Equity	Excellent	Excellent	Good	Poor	Poor
Neutrality	Excellent	Good	Very Good	Very Good	Excellent
Efficiency	Very Good	Poor	Excellent	Good	Excellent
Productivity	Excellent	Good	Good	Excellent	Excellent

Recommendation and Conclusion

Overall, we recommend the adoption of the third funding package. As each of the proposed revenue sources has strengths and weaknesses, we believe that the best course of action is to

take a broad-based approach favoring many small revenue sources over just a few large ones. This has two primary advantages. First, by "spreading the pain" it ensures that no one population ends up disproportionately burdened by these costs. Second, if ensures that, should one or two sources of revenue become non-viable due to unforeseen technological or societal changes, the majority of the revenue sources would still be in place and functional, thus ensuring continuity of funding.

Additionally, it is important to periodically revisit all included assumptions to reevaluate how well they hold up as a description of emergent reality. As this project is based on an extrapolation of current technology trends into the future, there is a very good chance that conditions will change in unexpected ways, which will necessitate modifications to and perhaps wholesale replacement of elements of this proposal. Nevertheless, considering the information currently available, we believe the recommended package is the best option to maximize the probability of long-term success and revenue stability.

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Appendix F

Gresham Group B Report

Executive Summary

Gresham's current transportation operating fund totals $39,508,900. Of this, $20.8 million makes up the transportation operating revenue while the remainder is carryover from the previous year. At 100% deployment of autonomous electric vehicles, we anticipate the greatest losses in the fund to come from cuts to the Gas Tax ($8.1 million) and County Roads Transfer ($3.8 million). Comprising approximately 60% of transportation revenues, to maintain its current funding status, Gresham would need to secure approximately $11.9 million from new revenue sources. This memo offers alternative revenue sources, an evaluation of each funding strategy, three potential packages, and a final package recommendation.

Current Budgeting Practices

The total operating revenue available for transportation in 2018-2019 is $20,877,600[1]. The majority of Gresham's transportation revenue comes from intergovernmental sources. The largest portion is funded by a state level gas tax (39%)[2]. The state of Oregon gives the city a portion of the revenue it collects from this tax. Gresham is only permitted to use these funds for road operations and maintenance costs. The second highest source of revenue comes from County Road Transfers (21.4%)[3]. The transfers are part of an agreement with Multnomah County and are used to pay for street maintenance expenses.

The remaining sources of transportation revenue are interfund transfers (18.8%), other sources (9.9%), internal service charges (7.2%), utility license fees (4%), and charges for service (0.1%)[4]. Interfund transfers come from other funds allocated by the city. Other sources are defined as interest revenue that accrue from the overall transportation fund. Internal service charges are funds for engineering reimbursements from capital improvement projects. The utility license fees are comprised of electric and natural gas costs for users. Figure 1 displays these values visually.

Figure 1: Gresham Transportation Revenue (p.59)

Projected Budget Changes

Self-driving vehicles have perked the ears of city planners in recent years, and not just out of curiosity, but because this shift could cause radiating effects in how cities budget. With adequate preparation, Gresham could be a transportation pioneer for the United

States by discovering new and creative ways to fund their city in ways our country has never seen. However, to arrive at a renaissance period in city funding to accommodate this anticipated shift, we must use certain assumptions to conclude how current funding sources might be impacted. If the total number of cars on the road declined by 85%, then transportation funds may be impacted in the following way:

State Fuel Tax
We can assume that 100% of the autonomous fleet will be electric, meaning that there will be a complete reduction in gas tax revenues. For fiscal year 2018-19, this would be a loss of over $8 million – 39% of total the transportation revenue.

County Roads Transfer
Overall, an 85% reduction of passenger vehicles in Gresham will result in a significant impact in the funds received from Multnomah County. This fund is sourced from vehicle registration fees, the state gas tax, and other miscellaneous transportation fees. We predict this reduction in vehicles would cut this revenue source by $3.8 million. The city will need to explore new ways to increase revenues in the future in order to meet the needs of the city.

Other Revenue Sources
The remainder of the funds in the transportation operating revenue are sourced in such a way that dramatic shifts in vehicle count and usage are unlikely to have a noticeable impact. We thus move forward with the assumption these funds will remain the same.

Alternative Revenue Sources
This section provides a number of alternative revenue sources public officials may consider pursuing to make up lost revenue. These recommendations are based on current practices and models utilized primarily on a small scale by other jurisdictions across the United States. The majority of the items listed below are means of securing own source revenue, though there are some statewide alternatives. Please note: all calculations and figures are estimations and carry a reasonable margin of error.

User Fees
With autonomous vehicles in full deployment, most citizens will depend on transportation network companies (TNC) to receive rides rather than owning their own private vehicle. TNC's will charge their own user fees, much like how Uber and Lyft currently do. The city of Gresham could require TNC's to pay a portion of these user fees to the city as part of their terms for operating in Gresham. If TNC's charged a $50 monthly user fee per each eligible rider in Gresham (excluding children under 10), TNC's would earn $4,851,150 monthly based on 97,023 riders (10 years old and up)[5]. If the city charged a 5% cut of these user fees, Gresham could earn $242,558 monthly, or $2,910,698 annually..

Total Yield: $2,910,698

Requiring a cut of these TNC user fees would be extremely productive and efficient. The TNC's would be handling the bulk of the administrative work and costs required to charge users while Gresham receives a large new revenue source. This policy would be neutral because the portion that Gresham would collect is so small that TNC's would not be disincentivized to operate in the city. Lastly, charging these fees would be fairly equitable. Gresham's cut of the fees would be charged to the TNC's rather than riders. Though TNC's may have the power to relay that burden back to riders in the form of increased user fees, we predict that 5% is such a small amount that it wouldn't pose an undue burden on either party. See Table #1.

Table #1: Evaluation of User Fees

Equity	Medium
Neutrality	High
Efficiency	Very High
Productivity	Very High

Licensing and Operating Fees for Transportation Network Companies

Oregon would pass a transportation network company law to legalize and regulate the companies which own and operate the autonomous fleets at the state level. We suggest a measure which establishes an application fee for license to operate and an annual operating fee.

The application fee is set at $75,000. TNCs have 45 days from time of establishment to apply for the license and may operate while the application is pending. If the application is denied, $70,000 is returned while a non-refundable $5,000 is kept for administrative costs.

The annual operating fees will be tiered based on the number of the vehicles in the company's fleet. This is based off a similar statewide model used in Pennsylvania wherein TNCs are taxed based on their number of active drivers[6]. We recommend the following model:

Table #2: Tiered operating charges for TNCs

Vehicles in Fleet	**Annual Operating Fee**
Per 20,000	$4,000,000
15,001-20,000	$3,000,000
10,001-15,000	$2,000,000
5,001-10,000	$1,000,000
2,501-5,000	$750,000
1-2,500	$500,000

These fees were established using a rather conservative increase to the Pennsylvania

model. This could yield an average of $123,000,000 for the state. Gresham would receive approximately $3,310,906.

Total Yield: $3,310,906

Licensing and operating fees score very high in equity. The tiered system allows smaller and presumably less profitable companies to pay less each year while ensuring the largest companies are paying a comparable rate. By ranking the top tier as “Per 20,000”, it also ensures a larger revenue in the case of an oligopoly. Neutrality is also ranked very high due to the statewide implementation – there is little encourage or discourage companies from behaving differently. Efficiency is expected to be high once the regulations are in place and a governing body is established. Productivity is considered high because of the revenue brought in relative to the administrative work involved.

Table #3: Evaluation of licensing and operating fees

Equity	Very High
Neutrality	Very High
Efficiency	High
Productivity	High

Regulation and Charges for AV Charging Stations

Gresham will own and regulate all autonomous vehicle charging stations within the city. Using the assumption that at a rate of 2 riders per autonomous vehicle at any given time, the annual miles travelled within Gresham is 480,359,751 – an annual rate of 40,417 miles/autonomous vehicle[7]. The average mileage of current electric vehicles is around 160 miles/charge[8]. We thus anticipate each vehicle needing approximately 252 charges/year for a combined total of 3,002,248 charges. Gresham will charge $8/charge to produce a revenue of $24,017,987.

Total Yield: $24,119,204

Regulating the charge stations has high equity as the costs will fall more directly on the companies that own AVs rather than the consumers. However, both fleets and individuals would need to rely on the city’s stations to charge their vehicles. We argue that individuals who own private AVs are likely to be in a higher socioeconomic class, so the charges will have little impact on their assets. Neutrality is high as it will likely influence few people to take less trips because of the overall affordability, especially compared to the current cost of gasoline. It could potentially score low if surrounding jurisdictions offered charging stations and a competitive price, but this seems rather unlikely given the top competitor would be Portland who we assume is unlikely to offer a lower rate. Efficiency ranks at either high or medium, depending on the system to monitor and collect fees is established. Productivity is very high as the total yield is large compared to the work involved.

Table #4: Evaluation of charges for AV charging stations

Equity	High
Neutrality	High or Low
Efficiency	High or Medium
Productivity	Very High

VMT Tax

Other cities that are investigating ways to offset the estimated lost revenue from an anticipated autonomous vehicle boom have considered implementing a Vehicle Miles Traveled (VMT) tax. This tax would impose a rate, which could either be a benefits-received flat rate or an ability-to-pay sliding scale rate, onto autonomous vehicle rides. This analysis explores a benefits-received flat rate of 7% which could be divided equally among riders, thus incentivizing higher vehicle occupancy. The table below breaks out how much Gresham could receive per capita with a lower occupancy versus a higher occupancy. While the city, under these assumptions, would collect less money from higher occupancy autonomous vehicles, they would require less maintenance and infrastructure from having fewer private vehicles on the road. This VMT tax encourages more ride sharing practices and would work most effectively if there were established pick up and drop off stations for more popular routes throughout the city.

By implementing a VMT in the way that is laid out in this memo and assuming the state would keep 10% of total revenue, Gresham could receive as much as $30.3 million if every trip made in a year was made with two people in the vehicle. For a more conservative estimation of four riders per vehicle, the total revenue would be around $15.1 million.

Table #5: VMT Tax Estimated Revenue

	Miles per Capita (2 riders)	**Miles per Capita (4 riders)**
Total Miles	17,920,546,500	8,960,273,250
State Total	$1,254,438,255	$627,219,127
90% of Total	$1,128,994,429	$564,497,214
Gresham %	**$30,390,197**	**$15,195,099**

Total Yield (4 Riders): $15,195,099

Implementing a VMT tax in Gresham would likely result in some pushback from the public, especially from individuals and families who live outside of the city center. If an individual lives outside of the city center away from any other possible ride-sharing companions, that individual, only due to location, would have to pay the VMT tax in its entirety, which could be considered horizontally inequitable. However, the likelihood that individuals would use an autonomous vehicle over their own personal vehicles to travel to and from work is low and may not be considered a burden at all to those living outside the city center. A VMT tax would be efficient and productive because it would administratively resemble any other benefits-received tax that is imposed on residents.

Table #6: Evaluation of VMT Tax

Equity	High
Neutrality	Low
Efficiency	High
Productivity	High

Data Fees

Just like charges for GIS layers (e.g. City X charges $0.12 per parcel or $3,600 for all 30,000 parcels), Gresham could charge a fee for certain data that is collected from the autonomous vehicle riders. In order to reserve a ride from an autonomous vehicle, riders would have to download a mobile application and provide information about themselves that the city or a contractor with the city could collect. Data from these collections could be housed in a server at the city and converted into GIS data. This information would be useful particularly to private companies who are trying to target their marketing to specific kinds of people, and it is likely that ads will inundate the interior and exterior of these vehicles. Companies would have the opportunity to collect demographic and ridership information and patterns to understand how to better market to their potential audience. Non-profit organizations may find this data useful when they consider their own fundraising strategies and marketing for services, for example. However, acquiring this information should come at a price.

If there are close to 12,000 autonomous vehicles in Gresham in the future, it may be a fair to require $15,000 for a bundle of data to private companies, and to request half that rate for non-profit groups. This rate could fluctuate according to the administrative costs of collecting this data. With this estimate, the city could obtain $15,000 from a single private company and $7,500 from a single non-profit. Combined, the city could collect $22,500 from both sources from a single transaction.

Table #7: Data Fees

	Demographic Information	**Total AV Miles Traveled per Rider**	**Stop Frequency per AV**	**Total**
Private Rate	$5,000	$5,000	$5,000	$15,000
Non-Profit Rate	$2,500	$2,500	$2,500	$7,500
Total	$7,500	$7,500	$7,500	**$22,500**

Total Yield: $22,500 (Expected minimum)

Charging for data collected by the city at a scaling rate is not uncommon nor is there much pushback from the public. It is a benefits-received charge that is equitable and neutral, as only those who may benefit from the information can choose to purchase it.

Like a sales tax, it is highly efficient because it does not require robust administrative legwork to develop a body of data and sell it.

Table #8: Evaluation of Data Fees

Equity	High
Neutrality	High
Efficiency	Very High
Productivity	Somewhat Low

Zombie Mile Charge

The concept of a zombie car simply refers to a vehicle that has no passengers in it appearing as though it were a ghost car. Whether traveling to pick up a rider or to a central fleet pool, they could be a low-hanging fruit for Gresham to develop a source of revenue.

If Oregon charged $0.50 per zombie mile, or, for every mile an autonomous vehicle has no occupants, the city could collect an estimate of $137,800 to $413,401 annually assuming 10% to 30% of the statewide autonomous vehicle miles traveled were done without occupants.

Table #9: Zombie Mile Charge

Charge per Zombie Mile	**Avg. Miles per Capita Traveled in OR (2011)[9]**	**Avg. AV Mileage Estimate**	**10% Zombie Miles Scenario**	**30% Zombie Miles Scenario**	**Gresham Percentage (30% Scenario)**
$0.50	8,651	102,817,135	$5,140,856.8	$15,422,570.3	**$415,144**

Total Yield: $413,401

A zombie mile charge is complicated to evaluate because data on zombie miles does not exist. Based on these estimates derived from analyzing average miles driven per capita in Oregon and assuming that a range of 10% to 30% of miles from autonomous vehicles could potentially be zero occupancy, it can be concluded that the charge would be very equitable and neutral. However, it could be variably productive because estimating potential revenue is nearly impossible at this time.

Table #10: Evaluation of Zombie Mile Charge

Equity	Very High
Neutrality	High
Efficiency	Somewhat Low

Productivity	Low/High

Late Charge
Inefficiencies in an autonomous vehicle's route should be discouraged and prevented, which is why we propose implementing a late charge to passengers who are late to their pick up. By calculating the number of annual minutes spent operating an autonomous vehicle (which, for this analysis, is the total number of minutes in a year), we estimate that 10% of the total minutes an autonomous vehicle spends driving is spent waiting on passengers in Oregon, and with a $0.50 charge per late minute, Gresham could receive $3.1 million from late fee charges.

Total Yield: $3,100,000

Administratively, implementing this charge could be quite simple. It would also be equitable, neutral, and potentially very productive for Gresham. It is unlikely that the city would experience public backlash from a late fee, as our society generally values punctuality.

Table #11: Evaluation of Late Charge

Equity	Very High
Neutrality	Very High
Efficiency	High
Productivity	Very High

Package A - Own Source Revenue

This package is made up of sources which would be controlled exclusively by the city of Gresham. Because Gresham relies heavily on non-local revenues, we thought a package comprised completely of own-source revenue options may appeal to the city. These would likely have more stability and predictability which officials could utilize in forecasting.

Table #12: Package A

User Fees	$ 2,910,698
VMT Tax	$ 15,195,099
Data Fees	$ 22,500
Late Charges	$ 3,100,000
Combined Yield	**$ 21,228,297**

Package B - State Revenue

Comprised of only two state-level sources, this package reflects the potential scenario should Gresham continue to rely primarily on non-local revenue. We predict that should there be an 85% reduction in vehicles with only electric vehicles remaining, the state would likely generate such a significantly smaller amount it would only equate to Gresham receiving a fourth of what it receives currently.

Table #13: Package B

Licensing and Operating Fees for TNCs	$ 3,310,906
Zombie Mile Charge (30% Zombie Rides)	$ 415,144
Combined Yield	**$ 3,726,050**

Package C - Single Source Revenue

This package was put together for a few reasons. The first being that this single source revenue is enough to double to estimated loss of this scenario. Second, it's an incredibly stable and reliable source of revenue once established. It would require a relatively large investment upfront but this could potentially be funded by revenue bonds.

Table #14: Package C

Charges for AV Charging Stations	$ 24,119,204
Combined Yield	**$ 24,119,204**

Table #15: Evaluation of Package C

Equity	High
Neutrality	High or Low
Efficiency	High or Medium
Productivity	Very High

Considerations for Future Work and Recommendations

We recommend Gresham implement Package C – Single Source Revenue. Gresham currently relies heavily on non-local revenue sources to support their transportation fund. This package adds in a reliable means of own-source revenue charges for AV charging stations. While other alternative sources are likely to remain consistent over the years, should shifts in technology lead to longer mileage capabilities for electric vehicles, the city would be able to adjust the cost of using charging stations accordingly. We also expect there would some statewide revenue sources which would trickle down to Gresham, with the licensing and operating fees both likely and politically feasible. This package also scores highly in equity, neutrality, efficiency, and productivity though

it does carry some risk for low neutrality should neighboring jurisdictions offer a more competitive rate for charging stations.

References

City of Gresham, “City of Gresham Adopted Budget Fiscal Year 2018/19” (Gresham, OR: Budget and Financial Planning Division, n.d.).

Appendix

Calculations for User Fees:
Population 111,521
87% eligible riders for user fees
111, 521(.87) = 97023.27
97,023 riders x $50 monthly fee = $4,851,150 monthly for TNC’s
$4,851,150 x .05 = $242,558 for Gresham

VMT Tax Estimated Revenue

	Miles per Capita (2 riders)	**Miles per Capita (4 riders)**
Total Miles	17,920,546,500	8,960,273,250
State Total	$ 1,254,438,255	$ 627,219,127.5
90% of Total	$ 1,128,994,429.5	$ 664,497,214.75
Gresham %	$ 30,262,664.34	$ 15,131,332.17

Data Fees

	Demographic Information	**Total AV Miles Traveled per Rider**	**Stop Frequency per AV**	**Total**
Private Rate	$ 5,000	$ 5,000	$ 5,000	$ 15,000
Non-Profit Rate	$ 2,500	$ 2,500	$ 2,500	$ 7,500
Total	$ 7,500	$ 7,500	$ 7,500	**$ 22,500**

Zombie Mile Charge

Charge per Zombie Mile	**Avg. Miles per Capita Traveled in OR (2011)[10]**	**Avg. AV Mileage Estimate**	**10% Zombie Miles Scenario**	**30% Zombie Miles Scenario**	**Gresham Share of Statewide Charges (30% Scenario)**
$ 0.50	8,651	102,817,135	$ 5,140,856.8	$ 15,422,570.3	$ 413,401

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