Finance, Economics, and New Mobility: 21st Century Transportation Challenges and Solutions for Troutdale, Oregon

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UNIVERSITY OF OREGON
THE CITY OF TROUTDALE OREGON
SCI Sustainable Cities Institute
SCYP Sustainable City Year Program

Finance, Economics, and New Mobility: 21st Century Transportation Challenges and Solutions for Troutdale, Oregon

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This report represents original student work and recommendations prepared by students in the University of Oregon's Sustainable City Year Program for the City of Troutdale. Text and images contained in this report may not be used without permission from the University of Oregon.

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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 bicycle, 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 that result in on-the-ground impact and expanded conversations for a community ready to transition to a more sustainable and livable future.

About City of Troutdale

Troutdale is a dynamic suburban community in Multnomah County, situated on the eastern edge of the Portland metropolitan region and the western edge of the Columbia River Gorge. Settled in the late 1800s and incorporated in 1907, this "Gateway to the Gorge" is approximately six square miles in size with a population of nearly 17,000 residents. Almost 75% of that population is aged 18-64.

Troutdale's median household income of $72,188 exceeds the State of Oregon's $59,393. Troutdale's neighbors include Wood Village and Fairview to the west, Gresham to the south, and unincorporated areas of Multnomah County to the east.

For the first part of the 20th century, the city remained a small village serving area farmers and company workers at nearby industrial facilities. Starting around 1970, Troutdale became a bedroom community in the region, with subdivisions and spurts of multi-family residential housing occurring. In the 1990s, efforts were made to improve the aesthetics of the community's original core, contributing to an award-winning "Main Street" infill project that helped with placemaking. In the 2010s, the City positioned itself as a jobs center as it worked with stakeholders to transform a large superfund area to one of the region's most attractive industrial centers – the Troutdale-Reynolds Industrial Park.

The principal transportation link between Troutdale and Portland is Interstate 84. The Union Pacific Railroad main line runs just north of Troutdale's city center. The Troutdale area is the gateway to the famous Columbia River Gorge Scenic Area and Sandy River recreational areas, and its outdoor pursuits. Troutdale's appealing and beautiful natural setting, miles of trails, and parkland and conservation areas draw residents and visitors alike. The City's pride in place is manifested through its monthly gatherings and annual events, ranging from "First Friday" art walks to the city's long-standing Summerfest celebration each July. A dedicated art scene and an exciting culinary mix have made Troutdale an enviable destination and underscore the community's quality of life. Troutdale is home to McMenamins Edgefield, one of Portland's beloved venues for entertainment and hospitality.

In recent years, Troutdale has developed a robust economic development program. The City's largest employers are Amazon and FedEx Ground, although the City also has numerous local and regional businesses that highlight unique assets within the area. Troutdale's recent business-related efforts have focused on the City's Town Center, where 12 "opportunity sites" have been identified for infill development that respects the small-town feel while offering support to the existing retail environment. The next 20 years promise to be an exciting time for a mature community to protect what's loved and expand opportunities that contribute to Troutdale's pride in place.

Course Participants

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Executive Summary

The following report reviews and synthesizes work completed by University of Oregon students regarding potential transportation polices for the city of Troutdale, Oregon. Students focused on three categories: transportation finance, transportation economics, and new mobility options.

TRANSPORTATION FINANCE

Students investigated transportation finance in Troutdale, which included current funding mechanisms used by Troutdale such as the State of Oregon Highway Trust Fund and a local gas tax. Students reflected on why there is a need for municipalities to start exploring other funding mechanisms and ultimately recommended pricing parking, implementing payroll taxes, increasing the current system development charge rates, raising the local gas tax, and enacting a street utility fee to enact more secure and sustainable transportation funding for Troutdale.

TRANSPORTATION ECONOMICS

Students researched transportation economics specific to alleviating congestion in Glenn Otto Park. Students began by reviewing the current conditions at Glenn Otto Park, analyzing congestion management literature, and highlighting existing parking pricing approaches at similar recreation areas. Students advocate for a tiered parking fee that has varying rates for residents and non-residents. Specific dollar amounts of the fees are suggested, with Troutdale staff encouraged to make modifications to the pricing structure based on demand. In doing so, students hope this approach will not only reduce congestion in the park, but will help the city raise funds for transportation maintenance and improvements.

NEW MOBILITY OPTIONS

Students turned their attention to the ways new mobility options will impact cities, specifically suburban cities like Troutdale. The catgory defines and provides background on three key areas in new mobility: (1) autonomous vehicles, (2) micromobility, and (3) ride-hailing. A discussion of the major trends in new mobility and the impact that new mobility options will likely have on municipal policy follows. Recommendations include an autonomous vehicles corridor, an autonomous goods delivery service, a bikeshare program and hybrid micromobility system, and an expansion of ride-hailing, among other options.

While all three categories consider different transportation challenges for Troutdale, there is a significant amount of crossover between the three topics suggesting that different areas of transportation policy do not operate independently. This highlights that transportation solutions will likely need to be multi-faceted as well as suggests that collaboration will help bring about transformative transportation change in Troutdale.

Introduction

With the onset of new technologies and changing attitudes, the transportation sector is rapidly evolving. More than ever, cities and municipalities are thinking proactively about their role in responding to the ever-changing landscape of modern transportation. The city of Troutdale, Oregon, seeks to reimagine transportation policy in their suburban community. While there is a plethora of research that relates to transportation policy in urban environments, there are fewer resources on transportation policy in suburban environments.

Through a partnership with the University of Oregon's Sustainable City Year Program (SCYP), Troutdale worked with students tasked with investigating improved transportation policies for Troutdale. Through classroom work, applied learning assignments, and collaboration with the city, students endeavored to help Troutdale achieve its optimal transportation future. Student teams focused on transportation policies related to the three topic areas: (1) transportation finance; (2) transportation economics; and (3) new mobility and autonomous vehicles. Each topic includes an overview, background, questions, and potential solutions.

Transportation Finance

OVERVIEW

Troutdale requested guidance on existing and potential transportation funding sources that could fund city projects. Students were tasked with creating a comprehensive resource guide of transportation finance tools for Troutdale to use in their decision-making. The resource guide includes information on how different funding mechanisms work, examples of cities that have employed such measures, and the benefits and drawbacks of each finance tool. Students also offer recommendations to the city of Troutdale.

GAS TAX DECLINE

The city of Troutdale's transportation funding has historically relied heavily on revenue from federal and state gas taxes. The revenue brought in from these taxes has been gradually shrinking over the past few decades (Taylor, 2017). This is due the increase in average miles per gallon (MPG) new vehicles have, the tax's inability to adjust with inflation (Wachs, 2003), and the threat of climate change motivating automakers to produce more hybrid and electric options. With increased vehicle fuel efficiency and little adjustments to the federal and state gas tax, current funding sources are depreciating and are no longer meet Troutdale's transportation infrastructure needs. Transportation needs for the city of Troutdale are expected to exceed $1.6 million by 2022-23, creating a funding gap that cannot be met by current funding mechanisms (City of Troutdale, 2014).

CURRENT FINANCE MECHANISMS

Currently, Troutdale primarily receives transportation funding via the State of Oregon Highway Trust Fund, a local gas tax, and a local Systems Development Charge (SDC) on developers.

State of Oregon Highway Trust Fund

A large portion of all transportation funding for the city of Troutdale is predominantly secured via The State of Oregon Highway Trust Fund. During the 2017-18 fiscal year, the city of Troutdale received approximately $1,025,171 from the Oregon Highway Trust Fund (City of Troutdale, 2020).

The Oregon Highway Trust Fund is primarily funded via the Oregon statewide fuel tax (currently $0.36 per gallon) and driver and motor vehicle fees. Furthermore, there is a Multnomah County gas tax (currently $0.03 per gallon), a local Troutdale gas tax (currently $0.03 per gallon), and a federal gas tax (currently $0.184 per gallon) that applies to anyone purchasing gas in Troutdale, which total to just over 60 cents per gallon (ODOT, 2020).

While reliance on the gas tax as a user fee has been relatively reliable in the past, the gas tax does not rise with inflation or gasoline prices, making it unsustainable. Additionally, as motor vehicles become more fuel-efficient, less is being paid in gas taxes. Gas tax revenues will not keep pace with the cost of transportation system repairs and construction increases in Troutdale.

City of Troutdale Gas Tax

The next largest portion of transportation funding for the city of Troutdale is secured via a local motor vehicle gas tax. During the 2017-18 fiscal year, the city of Troutdale received approximately $836,214 from the local motor vehicle gas tax (City of Troutdale, 2020).

The local motor vehicle gas tax was passed by the city of Troutdale residents in 2015 and added a penny-per-gallon tax over three years from 2016-2018 for a total of $0.03 per gallon at the end of the taxes' implementation. The Troutdale City Council also considered a gas tax of $0.05 per gallon, but ultimately settled on $0.03 per gallon due to gas station owner's fears over the potential loss of business (KOIN).

Challenges with long-term reliance on gas tax revenue are that gas taxes do not rise with the cost of inflation or gas prices and require a city-wide vote for approval and implementation.

Systems Development Charges

Another current transportation funding mechanism utilized by the city of Troutdale is Systems Development Charges (SDC). During the 2012-13 fiscal year, the city of Troutdale received approximately $27,000 from SDC (City of Troutdale, 2020). Over the next 20 years, the SDC is expected to generate roughly $105,000 a year for the city of Troutdale (City of Troutdale, 2014).

The SDC is a fee charged to developers based on the amount of peak vehicle trips expected to be generated from the proposed development. As of 2013, the cost per trip imposed on developers is $723, although this SDC rate is among the lowest in the state (City of Troutdale, 2014). One of the biggest challenges with SDC is that they are not on-going revenue. Instead, they are one-time fees charged to developers, which makes them relatively inconsistent.

County Road Transfer

The last notable transportation funding mechanism utilized by the city of Troutdale is a County Road Transfer partnership with Multnomah County. During the 2017-18 fiscal year, Troutdale received approximately $16,417 from the county road transfer (City of Troutdale, 2020).

The agreement between Multnomah County and the City of Troutdale was finalized in 1995, and Multnomah County transferred 1-mile of county road along with some yearly funding to the city (Multnomah County). In essence, a county road transfer is when a county (like Multnomah County) transfers management of a segment of country road to a local government as per ORS 373.270 (OregonLaws.org).

TRANSPORTATION FUNDING ALTERNATIVES

There are potential funding alternatives Troutdale could utilize to meet transportation funding demands. While all alternatives may not be relevant to the current needs and capacity of Troutdale, they may provide options for the future.

Parking Revenue

Parking revenue is one strategy that cities can use to fund transportation. Parking revenue can be collected in via parking meters, a parking garage, parking tickets, or residential parking permits.

The flexiblity of parking meters can help shape city transportation policy. Meter rates and time limits can be adjusted to control the parking habits street by street (SF County Transportation Authority, 2009).

Prices can vary by the time of day. Additionally, they provide a constant source of revenue with very little management costs. Drivers benefit from more accessible parking and businesses benefit from a more frequently rotating customer base. One consideration is that employees of the businesses may require parking accommodations to avoid large fees from parking meters during their shifts.

Public parking garages are a long-term investment from a transportation finance and city design perspective. If optimally placed, garages can provide a steady stream of revenue while also allowing for more walkable streets as fewer surface parking lots and street parking are required. However, parking structures can often be unattractive and require significant upfront cost—$24,000 per parking spot for above ground parking (Shoup, 2016).

The externalities of parking shortages are often most costly to the city's residents. By charging residents for parking passes within residential neighborhoods, two things can be achieved: residents are guaranteed parking, and the city generates revenue from the cost of the permit. Additionally, some residents, when faced with the choice of paying for a parking permit or walking, may turn to methods of public transportation or active transportation as an alternative. One potential drawback is that there are many non-residents who must pay for parking within neighborhoods, such as visiting relatives or service workers (Moylan et al, 2014).

Mileage-Based User Fees

Mileage-Based User Fees (MBUF) is one of the newest forms of transportation financing in the United States. MBUF is a user fee based on miles driven rather than the traditional gas tax user fee. Mileage fees could be an incentive for individuals to drive less, in parallel with gas taxes as they decline in revenue. However, this system has not been fully realized in many state and local governments across the United States. Although a newer concept in the United States, MBUF systems are used in many other countries like Germany, Switzerland, and Austria. The State of Oregon has undertaken the largest study on Mileage-Based User Fees in the U.S. (OreGo) and has shown the program to be a sustainable and equitable form of financing transportation in the future (Sorensen, 2013). Due to Troutdale's growth, enacting a MBUF system or a partnership between the State and OreGo may not only help raise finances for the city's transportation needs, but also play a crucial role in the development of transportation finance for the entire state.

Street Utility Fees

A street utility fee is a recurring charge that is placed on all residential, commercial, and industrial users that is proportionate to the amount of traffic generated by the entity. The fee tends to be charged monthly or bi-monthly, and typically places the most weight on commercial and industrial users (City of Troutdale, 2014).

General Fund Reallocation
General fund revenues, primarily collected via property taxes and other miscellaneous local taxes, can be reallocated for transportation needs at the discretion of the Troutdale City Council during the annual budget process. General funds can finance any feature of the transportation needs of Troutdale based on the Troutdale City Council's preferences, whether it be infrastructure, maintenance, administration, or improvements to operation (City of Troutdale, 2014).

Employment Taxes
Employment taxes allow for transportation funding through a tax on payroll and other employment taxes. In 2018, TriMet enacted the Employer Payroll Tax where one-tenth of 1% of an individual's pay is withheld by employers for transportation finance purposes. Employment taxes of this nature are collected by the Oregon Department of Revenue and are a promising alternative to reliance on the gas tax (Oregon Department of Revenue).

Local Transportation Tax
Some cities are turning to Local Option Taxes (LOTs) to fund transportation, although the impact of LOTs can vary. Cities have introduced extra vehicle registration fees, a local income tax increase, or a general sales tax. While the products that are taxed may differ depending on the implementation of LOTs, all revenue brought in is earmarked for transportation projects. Some cities earmark the revenue for specific transportation projects or general maintenance.

Other Funding Options
Funding alternatives that are not assessed in detail include:

- Public-Private Partnerships (P3s)
- Fee on Ride-Hailing Services
- Congestion Pricing
- Road Pricing
- Prepared Food Tax
- Local Tourism Tax
- Local Transit Tax
- Traffic Tickets
- Raising Property Taxes
- Special Assessment Districts (SADs)
- Urban Renewal Districts (URDs)
- Local Improvement Districts (LIDs)
- Debt Financing
- Direct Appropriations

POLICY RECOMMENDATIONS

The following recommendations are intended to help the Troutdale increase its transportation revenue. They draw from funding alternatives presented in the previous section and consider Troutdale's built environment, density, and development patterns. Recommendations include paid parking, employment taxes, an increase of the current SDC rates, an increase of the local Troutdale gas tax, and the implementation of a street utility fee.

Paid Parking
Appropriately pricing parking is a way for cities to raise funds for transportation while also disincentivizing car usage. In Eugene, Oregon, the city removed parking meters in 2010 but brought them back in 2018 because of the flexibility they provide with improved technology (Hill, 2018). Installing parking meters in Troutdale could create an incentive

FIG. 1
Credit: Trimet

for locals to walk, bike, or bus to their destination. This can have health benefits as physical activity increases, in addition to exposing residents to more city sites. Additionally, those coming from Portland to enjoy the Troutini restaurant or the Sugarpine Drive-In will be contributing to the transportation budget of Troutdale, benefitting the local economy.

Employment Taxes

Some municipalities have implemented a local payroll tax to help fund transportation needs. Oregon currently has its own payroll tax that specifically funds transit services for Lane Transit District (LTD) in Lane County and TriMet in Multnomah County. The current TriMet rate is 0.007837 and the LTD rate is 0.0076 (State of Oregon). Troutdale could investigate implementing its own small payroll transit tax. This does not necessarily have to be a transit tax; if a payroll tax would be better suited to pay for local road maintenance, Troutdale could earmark the funds for that instead. Ensuring that the funds are earmarked for certain projects may be more politically feasible.

Increase Systems Development Charges Rates

Systems Development Charges (SDCs) are existing funding mechanisms utilized by the City of Troutdale that could be expanded to increase transportation revenue. Currently, the City of Troutdale has one of the lowest SDCs rates of Oregon—$723 per trip. By contrast, the neighboring city of Gresham charges about $2,822.95 per trip in SDCs rate (City of Troutdale, 2014). Gresham's SDCs rate are around the average SDCs rate for many cities in the Portland metro area, with Troutdale as an outlier. By increasing SDC rates in Troutdale, the city would be on par with other cities in the Portland metro area and could help bring in funding for transportation.

Local Gas Tax

By raising the local Troutdale gas tax, the city of Troutdale could benefit from increased funds for transportation initiatives. The local motor vehicle gas tax was passed by City of Troutdale residents in 2015, in addition to a penny-per-gallon tax from 2016-2018 for a total of $0.03 per gallon. While the gas tax has brought revenue for the city, the Troutdale City Council had considered a 5-cent per gallon increase (KOIN). Due to concerns from gas station owners that high prices would turn customers away, the city council ultimately decided on the 3-cent per gallon increase. As the "Gateway to the Gorge", the city of Troutdale is uniquely positioned as the first city that drivers encounter as they enter the Portland metro area from the Gorge, and the last city drivers pass as they leave the Portland metro area toward the Gorge. With its prime location, drivers may not be deterred from stopping in Troutdale even with a higher gas tax.

Street Utility Fee

A Street Utility Fee may help Troutdale fund transportation-related expenses. A street utility fee is a recurring charge that is placed on all residential, commercial, and industrial users that is proportionate to the amount of traffic generated by the entity. Street Utility Fees are not uncommon in Oregon and several local governments including Lake Oswego, Tualatin, and Wilsonville have implemented the fee. If enacted, the Street Utility Fee could provide a reliable revenue stream for the City of Troutdale that could potentially bring in about $300,000 per year, or about $6.0 million over the next 20 years (City of Troutdale, 2014).

CONCLUSION

Students found that there are transportation funding options available to the city of Troutdale. Students highlighted current funding mechanisms utilized in Troutdale and potential funding mechanisms utilized by similar cities. Ultimately, students recommend that the city of Troutdale price parking, implement payroll taxes, increase the current systems development charge rates, raise the local gas tax, and enact a Street Utility Fee. These options will help equip Troutdale with possibilities for increasing its transportation-related funding. Furthermore, the breadth and range of the proposed recommendations provide a multi-pronged approach to transportation finance in Troutdale.

Transportation Economics

OVERVIEW

Troutdale asked students to consider solutions and develop policy recommendations to help manage parking at Glenn Otto Park. The preferred policies should address supply, demand, and how users should pay for parking, if at all.

EXISTING CONDITIONS AND CONGESTION MANAGEMENT LITERATURE

The following section details the current conditions of the parking facilities for Glenn Otto Park parking facilities, parking policies for nearby municipal and state parks, and literature that addresses the benefits and strategies of paid parking. Students researched the area's existing infrastructure, parking policies at 33 municipal and state parks, and national forests in Washington and Oregon to evaluate the cost of parking and fee assessment criteria.

Glenn Otto Park

Glenn Otto Park is located off East Historic Columbia River Highway (EHCRH) in Troutdale. EHCRH is two-way, with one vehicle travel lane in each direction and painted bike lanes in both directions. The road is classified as a Collector and the roadway jurisdiction is under Multnomah County (City of Troutdale, 2014).

The parking facility is shared with the popular Sugarpine Drive-In restaurant, which leases its building from the City. The Glenn Otto parking lot has approximately 84 parking spots as well as a TriMet bus stop. According to the Troutdale Transportation Systems Plan, EHCRH is slated to receive a multi-use path. While private vehicle parking at Glenn Otto Park is currently free, nearby state parks and recreation areas charge $5 per vehicle per day, $30 for a one-year day-use permit, or $50 for a two-year permit (Oregon State Parks, 2018).

Congestion Management Literature

Chatman and Manville suggest that pricing parking efficiently allocates parking spaces, minimizes externalities of driving, and encourages would-be drivers to use other travel modes to reach destinations (Chatman et al, 2014).

Parking lots, like other markets, are subject to the laws of supply and demand. According to Anderson and de Palma, parking offered at no cost causes congestion because free parking is sought by drivers until it is unavailable (Anderson et al, 2004). In comparison, requiring drivers to pay a fee to park assures parking spaces are efficiently allocated to those who value parking the most. For this model to work, parking lot managers must assess a reasonable fee.

When determining the parking fee amount, Donald Shoup, a prominent transportation economist, recommends using "the Goldilocks principle of parking prices" (Shoup, 2011). This principle states the cost of parking should not be too high or too low. Failure to set the right price will result in either parking lot congestion or underuse (Auchincloss, 2014). Additionally, such conditions prolong a driver's search for parking.

This is called circling. When available parking is scarce, drivers may engage in circling until a desirable parking space becomes available. The external costs of circling are "increased fuel consumption, congestion and emissions" (Anderson et al, 2003). The negative externalities of circling can be reduced by pricing parking appropriately because "drivers willing to pay for parking will easily find spaces, while price conscious drivers will use cheaper spaces off-street or farther away" (Chatman et al, 2014).

Research reveals that drivers who are unable or unwilling to pay for parking are inclined to use other modes of transportation. For this reason, another way of managing parking congestion is "making public transit a more viable alternative" (Shoup, 1999). Encouraging would-be drivers to use other modes of transportation reduces the number of cars on the roads and makes locating parking efficient.

Existing Parking Pricing Approaches at Recreation Areas

Research indicates parks or national forests that charge a "user fee" do so on a per vehicle, per day basis. The most common fee amount is $5 per vehicle, per day. Some parks also offer patrons the option to purchase annual passes for $30 or biennial passes for $50. Furthermore, national forests offer free annual passes to select groups including military personnel, senior citizens, and national park volunteers (USDA, 2021). Parking fee structures are included in Appendix A.

Texas City, Texas and Coeur d'Alene, Idaho both employ policies that could be effective in Troutdale. Both charge for parking at city parks, but the implementation and structure of parking fee assessment vary. Texas City residents are given a parking sticker by the city's water department upon registering for utilities. The sticker grants residents' free access

FIG. 2
Source: cnbc.com

to the dike. In contrast, non-residents seeking access to the dike pay $10 per vehicle, per day on the weekends March through October. The price of access doubles to $20 per vehicle, per day on weekends during federal holidays March through October (City of Texas City, 2021). Coeur d'Alene city residents may purchase an annual parking permit for $10 and county residents may purchase the same annual parking permit for $20. The annual parking permit allows "one, two-hour parking session per day" at two of the five city-managed parking lots (City of Coeur d'Alene, 2021). One of the predetermined lots is McEuen Park, described as "the city's largest playground" (City of Coeur d'Alene, 2021). Non-residents are required to pay the hourly rate of $1 for a "single stall" and $2 for an "oversized stall" (Downtown CDA Parking, 2021).

An alternative to charging a flat rate or a daily fee for parking is using peak pricing. With peak pricing, the fee to park increases during periods of high demand. This method of pricing parking is commonly found in metered street parking and commercial parking lots. While this option could be viable, this report excluded peak pricing because it is not typically implemented at parks and recreation areas.

Fee Collection and Administration

Troutdale should consider its capacity to administer parking fees, which could include staff salaries or installing a pay-per-license plate meter, or the city could apply an "honor system" collection approach. Appendix B outlines the benefits and drawbacks of different fee collection approaches, which may inform Troutdale's preferred fee structure.

POLICY RECOMMENDATIONS

Following are recommendations to mitigate congestion at Glenn Otto Park. The first section highlights recommendations for Troutdale to properly price parking at Glenn Otto Park. The second and final section offers other recommendations for the city to consider relating to transit and parking supply.

Pricing Parking at Glenn Otto Park

The student team recommends that Troutdale implement a tiered parking fee at Glenn Otto Park, effective Memorial Day to Labor Day. This schema charges Troutdale residents a slightly lower parking fee than the fee charged to non-residents. The team recommends Troutdale begin by utilizing an honor system payment box before assessing the efficacy of this payment system and allocating revenue toward staffed or metered payment if needed. Assessing marginally higher rates for non-residents to promote local use of Glenn Otto Park and mitigate the appearance of residents being "priced-out" of the park is suggested.

Determining an efficient pricing mechanism at Glenn Otto Park requires oversight from the City of Troutdale. Modifications to pricing structure could be influenced by circumstances such as the demand for parking, economic growth and development in Troutdale, or changes in fee structures and rates at neighboring recreation areas. Troutdale should evaluate the parking fee structure and rate every three years. City staff should evaluate patrons' response to imposed parking fees and pay particular attention to whether pricing relieves congestion or significantly deters patrons from

parking at Glenn Otto Park. To determine patrons' willingness to pay the parking fee, Troutdale may introduce a low, medium, and high fee structure over time. As supported by Donald Shoup, the objective of this approach is to determine the "Goldilocks" pricing for parking. If circling and congestion continues, the fee may need to be increased to the "high" tier, whereas if there is a significant reduction in parking utilization, the fee may need to be lowered.

It is recommended that Troutdale initiate both daily and hourly rates at the "medium" tier, outlined in Appendix C. This rate structure would charge residents $2 per day, $7 per weekday for nonresidents, and $10 per weekend day for nonresidents. Drawing from policies in Coeur d'Alene, residents may also purchase a $20 summer pass, which is time restricted to two hours per day. Hourly rates should also be used to accommodate restaurant patrons, encouraging some turnover.

Students also recommend Troutdale facilitate payment exemptions for low-income patrons. To operationalize this exemption, the City should refer to existing discount bikeshare programs. Lime, JUMP, and Spin offer discounted fares with proof of enrollment in a government assistance program such as the Supplemental Nutrition Assistance Program (SNAP), energy assistance, or Medicaid (Lime, 2020). Additionally, the team recommends that Troutdale coordinate with nearby cities, like Gresham, to allocate parking stickers to low-income residents. Key to this recommendation is ensuring that partner cities apply the same process for assessing low-income parking sticker eligibility.

Implementing a paid parking system at Glenn Otto Park may also be a way for the City to generate revenue. Using the pricing structure in Appendix D, Troutdale could raise up to $87,864 in parking fees in a single summer. The figures in Table 4 assume every parking space at Glenn Otto Park is occupied from Labor Day to Memorial Day, a total of 99 days. Therefore, the amount of revenue generated depends on the combination of residents, low-income residents, and non-residents, and whether patrons park Monday through Friday, Saturday and Sunday, or Monday through Sunday. Revenue for hourly parking is also variable and is not modeled because of the number of parking outcomes varies substantially. Parking revenue can facilitate fee administration and may also be allocated toward non-vehicle Transportation Demand Management strategies, such as enhanced bike infrastructure.

Finding the "Goldilocks" parking fee is an iterative process. During this time, City staff should assess whether the existing parking fee structure and rate are alleviating parking congestion or discouraging parking at Glenn Otto Park. If either circumstance is occurring, City staff should consider adjusting the fee amount. Persistent parking congestion warrants increasing the fee, whereas underuse signals the fee is too high and should be reduced.

After conceptualizing the paid parking recommendation, the team created criteria to evaluate the initiative's impact. The criteria selected include equity, administration, neutrality, certainty, and convenience. Analysis of pricing parking is provided in Appendix E. City staff are encouraged to adjust the evaluation

criteria as they see fit, using the pre-identified criteria that addresses the impacts of pricing parking felt by the City and patrons. Furthermore, including patrons in the evaluation process will promote transparency and may mitigate any unintended consequences.

Other Approaches

While pricing parking will likely be the most effective way to mitigate congestion in Glenn Otto Park, other student recommendations include building more parking supply near the busy park and incentivizing transit travel to the area.

Currently, the land across the street from Sugarpine Drive-in is a vacant lot. The land is presently owned by a Troutdale property owner who occasionally rents out the land for parking during peak times. If this land was converted to a parking lot, there could be a place for Sugarpine Drive-In guests to park that does not take parking away from Glenn Otto Park. To accomplish this, the city would have to work with the city councilor and the restaurant management to determine the most effective way to facilitate that conversion. Additionally, Troutdale should assess the risk of environmental problems and pollution that could occur to the nearby Sandy River.

Bolstering public transit can be an effective way to reduce congestion. Improving the existing bus stop at Visionary Park, just one-quarter mile away from the parking lot, is another policy action that could potentially help with the current congestion in Glenn Otto Park. Improving the bus stop would make it more of an attraction and encourage more residents and visitors to frequent it, and subsequently visit Sugarpine and Glenn Otto Park. The addition of a shelter and lights to the stop would also make the bus stop more desirable and safer, encouraging more use. However, another factor to consider with this proposal is how the transit improvements will be funded. One potential method is to use the parking revenue that would result from the first policy recommendation, where parking is paid in the Glenn Otto lot. The funding that the city receives from pricing parking could be put towards transit improvements that help reduce car travel and congestion in this area.

CONCLUSION

Academic literature highlights the benefits of charging a fee to reduce parking congestion. This approach relies on the assumption that patrons must be willing to pay for parking at Glenn Otto Park. Finding the "Goldilocks" price can take time, therefore starting with a medium fee amount and adjusting the fee as needed is recommended. Indicators the parking fee needs adjusting include parking lot saturation and underuse. Additionally, implementing a pay-for-parking structure is not a static process. The parking structure and fee should be evaluated every three years, and, if possible, including patrons in the process. Lastly, it is recommended that the city use the revenue to bolster transit services to this area and potentially explore increasing the parking supply in this heavily congested area.

New Mobility & Autonomous Vehicles

OVERVIEW

New mobility options and transportation technologies are reshaping how people travel, but many of these new modes and technologies have been limited to urban settings. The city of Troutdale is seeking recommendations on policies that would support new mobility and autonomous vehicles in more suburban communities. Students examined existing evaluations, case studies, and research from other locations to determine solutions that may be appropriate for Troutdale.

BACKGROUND AND DEFINITIONS

The following section provides background on three key areas in new mobility: (1) autonomous vehicles, (2) micromobility, and (3) ride-hailing.

Autonomous Vehicles

Autonomous vehicles (AVs) can be defined as vehicles with autonomous technology that can drive without active physical control or monitoring by a human operator (Rojas-Rueda, Nieuwenhuijsen, Khreis, & Frumkin, 2020). AVs may provide access to disadvantaged groups, improve traffic safety, and decrease non-exhaust emissions (Fagnant & Kockelman, 2015; Rojas-Rueda et al., 2020). Compared to the high density urban environment, low density suburban cities with relatively uncomplicated road conditions may be ideal places to implement AVs.

Universities, Transportation Network Companies (TNCs), think tanks, governments, and other organizations have been publishing papers and reports on the prospect of the future of AVs. Many researchers focus on the nexus between AVs and urban development. Fagnant and Kockelman (2015) review the opportunities and barriers of policy recommendations for AVs. The authors emphasize AV cost, liability, security, and privacy issues, and recommend policymakers should reach federal-level consensus to direct future AVs development. Duarte and Ratti (2018) investigate how AVs might impact cities and suggest that

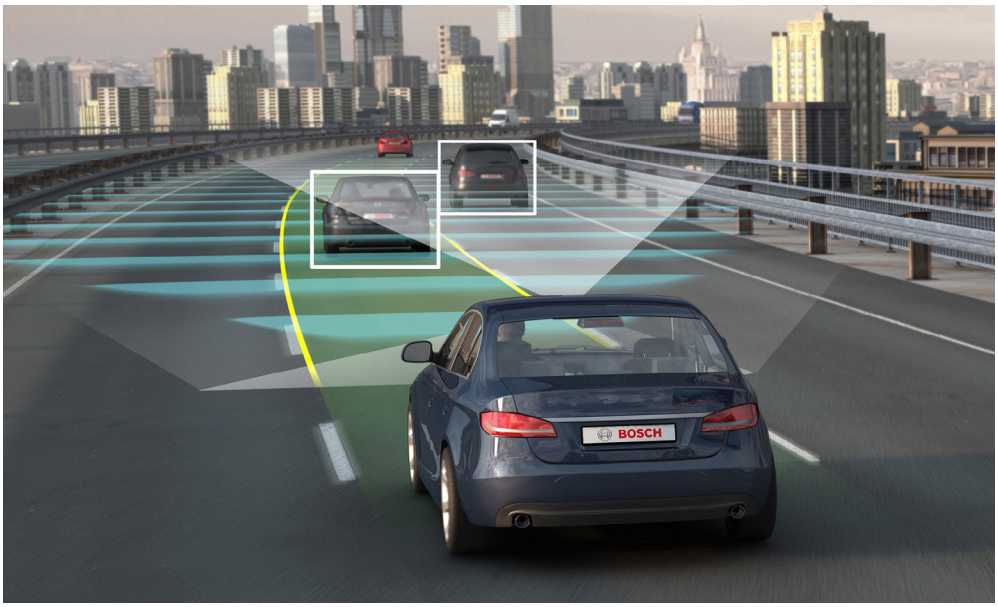

FIG. 3

Source: The Economic Times (Auto.com)

FIG. 4

urban planners should embrace AVs as a catalyst of urban transformation, focusing on the potential urban sprawl, infrastructure transformation, and the connection between AVs and shared mobility. Rojas-Rueda, et al (2020) suggest that AVs can benefit public health if cities can promote AV-oriented, healthy urban planning and design.

Additionally, several news reports depict that suburban areas with low density public transit may benefit from AVs that offer flexible mobility-on-demand door-to-door trips. Currently, suburban cities, such as Reston, VA, have launched autonomous shuttle testing projects to solve the first-/last-mile connections between transit stops, communities, and employment centers. However, the pilot program is controversial due to security concerns and low travel speed.

Micromobility

Micromobility can be broadly defined as the shared use of low speed, fully or partially human-powered, two-wheeled vehicles, including docked and dockless bike-sharing and dockless e-scooters (NACTO, 2018; Shaheen & Cohen, 2019). The Bureau of Transportation Statistics, part of the U.S. Department of Transportation, shows that the majority of micromobility systems are suited for urban areas, whereas only a few systems serve the suburban communities within larger multi-city settings, such as the Bay Wheels Bike Share system in San Francisco, Capital Bike Share in Washington D.C., and Bluebikes in Boston.

Only a few studies focus on the use of micromobility in suburban areas. Co, Witte, Machell, Enns, and Judelman (2017) examine bikeshare ridership in suburban systems, revealing that system service geography and station density are positively related to docked system's ridership. Yang, Liu, Wang, Li, and Zhao (2016) investigate how to combine docked bikeshare systems (DBS) with public transit to provide a green and efficient mode of transportation in the outskirts of a large city. The results suggest that affordability, reliability, and a user-friendly environment are the key factors for use of DSB-transit in suburban areas. Brezovec and Hampl (2021) use a survey to assess consumer preferences for e-scooters as a part of Mobility-as-a-Service

(MaaS) packages in a suburban area, showing that cheap, large, and diverse MaaS bundles are more attractive to suburban residents. Wu, Wang, and Li (2018) reveal that bikeshare trips are connected to public transit in suburban districts in Shenzhen, and the lag in bicycle infrastructure and jobs-housing mismatch may result in the inefficiency of docked systems.

Bluebikes is the docked bikeshare program for Greater Boston, covering the city of Boston and several suburban cities. In the past few years, Bluebikes has been launching system expansion projects that add more municipalities and stations to the regional docked bikeshare system. The new stations in these suburban cities are generally in proximity to the public transit system (Appendix F), which aims to solve the first-/last-mile connections to public transit services.

City of Portland 2019 e-scooter findings report states that companies have deployed more vehicles in disadvantaged communities in suburban areas than last year (PBOT, 2019). The report suggests that a considerable proportion of e-scooter trips have the potential to replace car trips. Planners should focus on active transportation infrastructure improvement in east Portland neighborhoods to eliminate barriers for people of color (Appendix G). As Troutdale becomes more racially and ethnically diverse, the experience of expanding the dockless system in east Portland may set an example.

Ride-Hailing

Ride-hailing is a ride service in which a rider orders a customized ride online or on an application for a personalized driver to pick up and drop off at a specific location. These transportation networking companies include Uber and Lyft and are primarily app-based. Car sharing is a model of car rental where people rent cars for short periods of time. Zipcar and Car2Go are examples of these modes. The membership basis via the app allows a rider to reserve a car for a certain amount of time and use it at their convenience. Carpooling between networking companies has become a new option within ride-hailing apps to promote reduced emissions. Carpooling with others is a less expensive option within the app, creating more of an incentive for use.

Troutdale's public transportation system consists of four fixed routes that run in the morning and evening. Peak hour service provides residents with the ability to use public transportation for daily commuting. During less frequent times such as mid-day, Saturday and Sunday, services provide residents with fewer opportunities to use public transportation. For those who do not own vehicles, ride-hailing is an alternative travel mode. The article "Lyft Is Reaching L.A. Neighborhoods Where Taxis Wouldn't" shows ride-hailing accommodates for the entire population of Los Angeles as 99.8 percent of Los Angeles County was accounted for by drivers. It was subsequently concluded that low-

income individuals used ride-hailing services the most in the study. “Users living in low-income neighborhoods may have low—or zero—personal car access and therefore use Lyft to provide rather than supplement auto-mobility” (Bliss, 2018). With limited public transportation in Troutdale, ride-hailing can provide an alternative for those without private vehicle access.

Previous studies have recommended policies that emphasize more equal ride-hailing services. Increases in concurrent ridesharing will likely benefit low-income groups, allowing for access to cheaper trips and an efficient mode of transportation. Additional recommendations include “considering strategies to mandate the reporting of basic trip data from TNCs to gain more information about whom TNCs are serving and where rides are being arranged” (Moorman, 2018).

TRENDS IN NEW MOBILITY

The following section details three emergent trends in new mobility that will likely impact municipalities.

Information is the New Infrastructure

Infrastructure has historically been considered to be physical, for example, roads, bridges, and traffic lights. However, data and connectivity have become just as valuable and necessary to successful transportation systems (Seattle Department of Transportation, 2017). As more data are collected on streets and highways, it will be crucial to have the capacity to store and transmit that data for analysis. No single company has the expertise necessary, so information companies, car manufacturers, security specialists, and more, are forming alliances on a global scale (Neef, 2019).

FIG. 5

Source: betanews.com

Basic automated features like collision detection or cruise control are computed within the car itself. Highly automated vehicles will collect a vast amount of data from ultrasonics, radar, lidar, video cameras, internal and external sensors, upload the data to the Cloud, and return a response to the vehicle. The data transfer requires extremely low latency times to work properly and safely. Current 4G internet is not capable of supporting data speeds, thus the upgrade to 5G is necessary (Deutsche Telekom Group, 2021). If Troutdale decides on an AV supportive infrastructure, it should immediately pursue upgrades to information technology (Neef, 2019).

The Rise of Shared Mobility

Shared mobility includes public transit, ride-hailing, or car-share services. Ride-hailing has dramatically increased in popularity in the last decade. Transportation Network Companies (TNCs), such as Uber and Lyft, are working to develop AV technology that will allow them to eliminate drivers, thereby cutting their overhead costs considerably.

For public transit, Troutdale is within TriMet's service area, although it is an endpoint for some routes, and not served by high-frequency or high-capacity transit (City of Troutdale, 2014). Ride-hailing companies can serve those mobility gaps but may also compete with public transit services rather than complement them. Micromobility options, like the low-tech options of walking and traditional bicycling, can serve as complements by covering for short trips and help people make connections to transit for longer trips (Zipper, 2019). Public and private needs will need to be synchronized to solve this "last-mile" problem that currently undermines transportation networks (Neef, 2019).

Electric, Connected, and Automated

Profit-seeking private companies are driving the personal mobility market towards autonomous vehicles. Companies see immense opportunity in the data available from a vehicle fleet connected to the internet; in the productivity gains possible from advanced coordination of vehicles; and in the onset of new travel conveniences that consumers will quickly adapt to (Neef, 2019). Therefore, the task for planners will be to ensure the technology is shaped to the needs of the community.

As recently as 2017, researchers believed that AVs would include hybrid vehicles (Hawkins, 2017). However, this year, General Motors (GM) announced a new line of electric vehicles, promising a lineup of 30 electric car models to be available by 2025. Furthermore, GM has committed to ensuring that all AVs will also be electric, indicating a market shift towards electric-powered vehicles (General Motors, 2020). Plans for electric charging infrastructure should be laid as soon as possible, especially on the local level.

Autonomous vehicles are likely to be deployed more rapidly for goods movement and commercial trucks than personal vehicles. In 2020, UPS ordered 10,000 new electric trucks with "advanced driver" assistance systems, including the potential for automated movement in UPS depots to be tested this year (Yamanouchi,

2020). Some AVs are much smaller than a car and may be better suited to bike lanes or multi-use paths. Amazon and FedEx have started testing their delivery robots in selected areas. In response to these rapid developments, some jurisdictions are crafting legislation regarding the size, speed, and accessibility of these robots (Marshall, 2020). Troutdale has a significant advantage in this area, hosting the Amazon Logistics Center and FedEx Ground facility in its industrial district. There may be an opportunity for Troutdale to lead the region in policymaking and public-private partnerships regarding AVs.

THE ROLE OF THE CITY

Federal, state, and local entities all have roles to play in the implementation, regulation, and promotion of AV technologies. Seattle's New Mobility Playbook explains the expected framework: the federal government will focus mainly with infrastructure funding, manufacturing and safety standards, and cyber security issues (Seattle Department of Transportation, 2017). State governments will facilitate motor vehicle registration, local infrastructure, and traffic laws and regulations. Cities may be at risk of reacting too slowly to rapid advances in AV technology, therefore proactive planning is essential. On the local level, Troutdale should consider establishing establish a vision for the community that incorporates the coming AV and new mobility revolution and evaluate how AVs could change the community. Much of the local planning is likely to be around land use issues, and include at least the following list:

- Demand and system management for local streets
- Parking and curb space
- Curb and road use fee setting
- Local transportation financing
- Traffic laws and regulations
- Land use regulations
- Data-sharing for system planning and real-time operations

IMPACTS ON MUNICIPAL POLICY

The following section highlights impacts that new mobility will have on municipal policy. In preparation for the integration of AVs and new mobility in Troutdale, planners should consider how the new mode will affect street design, multi-modal transportation, supporting infrastructure, and finance.

Street Design

The integration of AVs into the road system has long been a point of contention among experts. In 1994, the Federal Highway Administration published a document that discussed a highway designed to have separate lanes for different levels of automation (Congress, 1994). In 2020, Michigan announced that it was proceeding with a new corridor project with an AV-only vehicle lane included (Grzelewski et al, 2020).

On local streets with less right-of-way, however, AVs will be sharing lanes with human-operated vehicles for the time being. Current AV technology has been developed for high velocity, structured environments like highways and low speed situations like residential neighborhoods under 15 miles per hour. The ability to safely travel at middling speeds, roughly between 20 and 50 miles per hour, has not been

fully developed yet, therefore it is likely that cities will need to reinforce the "readability" of streets with infrastructure changes or street paint updates.

Another aspect of the street that will need to be updated is curb use. During the COVID-19 pandemic, U.S. cities have seen curbside pick-up for retail and restaurants become ubiquitous; flexible curb space can improve this function. In the future, cities should rethink how curb space is dedicated (Shetty, 2020). It is likely that cities will need fewer parking spaces (Harper, 2019), which could allow the curb to entirely become loading zones or allow reallocation of the right-of-way for active transportation. However, differentials in parking prices could entice robot-taxis to become "zombies"— zero-occupant vehicles that cruise the streets waiting to be summoned. The Finance section that follows discusses how to disincentive this behavior.

Multi-Modal Transportation

Troutdale will benefit from upgrades that TriMet might implement with automated buses or Automated Rapid Transit ("ART"). According to the 2018 TriMet New Mobility Study, consultants recommend that TriMet begin to pilot such technologies (Nelson\Nygaard, 2018). These upgrades may pressure the City of Troutdale to redesign or upgrade their streets to accommodate such changes.

Since AVs would use less of the road, other uses could be integrated into designs such as increased space for pedestrians, bicycles, and other new mobility modes. COVID-19 has proven that the practical process of reforming streetscapes for people is relatively simple (Schlossberg, 2021). Troutdale should continue to plan for more multi-modal infrastructure on its streets including bike lanes, micromobility infrastructure, and pedestrian-friendly design. Multi-modal transportation that includes AV technology is consistent with existing values in the Troutdale Comprehensive Plan and Transportation Plan.

Supporting Infrastructure

Troutdale currently has two electric car charging stations (two to three stalls each), both located in the parking lot of the Columbia Gorge Premium Outlet Mall. The transition to electric vehicles can be supported with more charging stations in other parts of Troutdale. Halsey Street and 257th Avenue would be good additions as major streets with shopping opportunities for drivers while their cars charge.

Supporting infrastructure will also include a network of 5G connections. Distributing transponders along streets is easier with public right-of-way, and new sensors can be integrated into pre-existing light poles or traffic signal infrastructure (Deutsche Telekom Group, 2021). Using streets as the physical framework for 5G will create a well-connected network with low latency, in which AVs can function safely.

Finance

Troutdale currently levies a gasoline tax of $0.03 per gallon and receives a share of the State's Highway Fund funded by gas tax revenue (ODOT). Fuel standards and electric vehicles already have an impact on revenue collected, which has been exacerbated further by the COVID-19 pandemic slowdown (Poehler, 2020). Oregon raised its gas tax in 2009 and will again in 2024, but it is inevitable that gas taxes will become a nonviable source of revenue. An alternative more appropriate to

electric cars are fees based on mileage. Mileage-based fees can be prohibitively difficult to administer today but will be much easier with cars connected to the Cloud and sharing data across platforms (Sorensen, 2013).

Because it is generally free to use public streets, new AV technology may present a risk of excessive "zombie" cars that roam the streets with zero human occupants. These robot-taxis may have an incentive to circle the block, waiting to be summoned and avoid parking. Cities like Seattle are developing mileage-based fees that include elevated surcharges for zero-occupant AVs and discounts for vehicles carrying three or more human passengers (Seattle Department of Transportation, 2017). Troutdale can also use finance levers to establish similar incentives and disincentives.

Fully autonomous vehicles will likely be very expensive and out of reach for the average consumer. The expert consensus is that the first AVs will probably be a fleet owned by a TNC or public transit service (City of Austin, 2017), or by large retailers like Wal-Mart and Amazon, logistics companies, and institutions like hospitals and airports (Neef, 2019). Over time, more of the transportation network will shift to fleets and away from individual ownership.

POLICY RECOMMENDATIONS FOR TROUTDALE

Autonomous Vehicles

Autonomous vehicles are recommended to have two multi-dimensional policies that work as complements with each other. The first, an autonomous vehicle-only corridor along I-84 from Troutdale to Portland to provide AV research and practices. The manufacturing facilities that reside in Troutdale provide extensive opportunities for practices of delivery methods of these products with autonomous vehicles. Portland provides numerous single transportation mode only roads, for example the Tilikum Bridge connecting the southeast and

FIG. 6

Credit: Lane Transit District

southwest over the Willamette River only allows public transportation, cyclists, and pedestrians on the bridge. This policy provides innovative future transportation modes and allows for safety of the public.

The corridor policy is a bold and complicated process involving multiple cities' planning committees. Providing a less intricate, straightforward policy may be a better start for implementing autonomous vehicles into Troutdale. At a micro level, using AVs as a goods delivery service in Troutdale will provide mobility and innovation. This will introduce alternative transportation modes and with the other recommended policies, could provide a culture shift of new increased mobility and dynamic transportation modes. This micro-level policy allows for new research on autonomous vehicles in America and local Portland communities. Low speed suburbs provide a more controlled environment for transport. Currently, there is a lack of studies on the effect of autonomous vehicles and current policy recommendations remain subjective. The implementation of these two policies will ultimately allow for increased research on autonomous vehicles, bring the Portland, Oregon area to the map of innovative healthy transportation modes, and create mobility and connectivity of Troutdale.

Micromobility

Introducing a hybrid micromobility system into Troutdale's transportation system plan may be the most appropriate choice for Troutdale's transportation system moving forward. Docked stations could be placed at the community center, town center, industrial parks, and catchment area of transit, providing another option for travel within the city. Planners can combine the planning of docked stations with the bicycle infrastructure plan and prioritize the infrastructure improvement along the potential route from station to station. On the other hand, policymakers could plan several public bicycle racks along the 40-Mile Loop in Troutdale to facilitate recreational trips by micromobility. The hybrid system can serve commuters on weekdays and provide bicycle access for tourists and residents who are active on weekends, which requires fine-level management for the system.

Currently, Biketown has expanded to east Portland neighborhoods, making it is possible for several suburban cities in the metro area to cooperate with Biketown. The 40-Mile Loop and MAX line may connect the whole Biketown hybrid system; cooperation among municipalities is needed to improve the connectivity of active transportation infrastructure.

Additionally, the city may develop a specific micromobility system for delivery service from the distribution center to communities. Many areas in Troutdale are within bikeable distance from the industrial park, so it is feasible to use non-motorized mode for local delivery, which would reduce congestion and pollution.

Ride-Hailing

An emphasis on marketing ride-hailing options to those in Troutdale with policy mandates on data collection and reporting trip data could be the focus for increasing mobility in Troutdale. Static modes of transportation exclude low-income individuals of Troutdale. Giving Troutdale a more dynamic mode of transportation through ride-hailing and carpooling can give individuals daily access for necessities. Previous studies have shown that low income individuals capitalize on

ride-hailing options. Furthermore, the surge of carpooling could allow for these low income individuals a more cost-friendly option while also reducing car emissions. If this mode of transportation becomes effective, it may put pressure on other modes of transportation, such as public and pedestrian transportation, allowing for more dynamic long-term changes that benefit low-income individuals.

Other Considerations

Some other policy recommendations that transportation policy students highlighted but that aren't incorporated in detail into this report, include:

- Prime the public to the importance of data-driven decision-making for the common good. Then take advantage of subsequent pre-exposure by organizing real-time data collection from autonomous/electric vehicles in the city. This will allow Troutdale to target specific changes in its built environment in distinct neighborhoods and zoning areas (NACTO, 2017). Possible downsides include public backlash over privacy concerns and the cost of data collection and analysis on a more frequent basis.
- Start a dialogue with citizens and create a working group of local and metro contacts who can stay abreast of the AV transition.
- Move towards 5G infrastructure and connectivity.
- Inventory prime curb space and manage curb demand.
- Consider a strategic overhaul of bicycle and pedestrian paths in the city, especially to allow for efficient routing from single-family residential areas to employment centers. Possible downsides include the direct costs of construction and NIMBY-related backlash to highly proximate development.
- Institute a bikeshare program to increase mobility and active transit use within the community.
- Utilize autonomous transit systems while expanding public transit routes in Troutdale.
- Reevaluate speed limits to reflect multimodal transportation design that incorporates bicycling, walking, and public transit. The National Association of City Transportation Officials, for instance, states that a 20-MPH speed limit "is plenty." Setting benchmarks for lowering speed limits should reflect certain proportions of the population using AVs, bicycles, or walking paths. For example, if 40% of a predominantly 30 MPH area is walking or biking, then lower its speed limits by 5. Possible downsides include the inherent difficulty of plotting area-specific targets and the political feasibility of lowering speed limits based on technological change.
- Introduce an excise tax for use of electric charging stations under Chapter 3.20 of the Troutdale Code. The tax should be minimal at first introduction so as not to spark outrage. Once the public eases into the idea of a charging tax as being like the former fuel tax, the rates can be changed. Polling should be conducted to gauge perception beforehand.
- Eliminate or significantly reduce parking minimums, in line with a national trend towards opening built environment design space (Henaghan, 2018). Students recommend that the 2014

Transportation Plan's target of "Continued implementation of motor vehicle minimum and maximum parking ratios for new development" be removed immediately from the Transportation Demand Management (TDM) action plan. This will introduce greater flexibility into Troutdale's planning philosophy in preparation for the changes of AV and new mobility.

- Incorporate a mileage-based fee system for Internet-connected electric vehicles, and:
  - Exempt them from the gas tax
  - Allow internet-connected combustion engine vehicles to opt-in
  - Incorporate elevated surcharges for zero-occupant passenger AVs
  - Incorporate reduced or zero surcharges for AVs with three or more passengers
- Revise the following components of the Transportation section of Troutdale's current Capital Improvement Plan (2016):
  - Project 11 (pg. 14): Elaborate on the specific geographic targets of pedestrian connection accessways. Provide visuals. Identify additional funds if needed following the next review.
  - Project 15 (pg. 18): Update Timeframe to Medium or Short Term to reflect a higher priority given the original posted date of this project or reevaluate plan for a more limited implementation or lowered costs to expedite the completion of this project.
  - Project 17 (pg. 20): Update Timeframe as Short or Medium Term to reflect the importance and benefits of comprehensive transportation planning. Elaborate on which aspects of the plan need updating and propose alterations for the next iteration.

CONCLUSION

In summary, the team found there is a plethora of considerations for the city of Troutdale to consider with the new mobility options that are quickly emerging. The team defined new mobility terms, discussed trends in emerging new mobility options, and considered the impacts new mobility will have on cities and municipal policy. Following this, recommendations to the city of Troutdale include proactively responding to new mobility challenges and changes. Responding to these new challenges will require flexibility and foresight, but by starting the planning process now, Troutdale has the chance to preemptively respond to what the community will look like for decades to come.

Conclusion

The purpose of this report was to provide the city of Troutdale with transportation solutions in three challenging areas: transportation finance, transportation economics, and new mobility. To determine solutions, students worked collaboratively with Troutdale city staff to reimagine the community's transportation potential. Ultimately, students proposed a variety of options that Troutdale could enact to address current and future transportation challenges and needs.

Regarding **transportation finance** and finding transportation funding alternatives, the' main recommendation for the City is to price parking across the city. Regarding **transportation economics** and congestion at Glenn Otto Park, students recommend that the City manage and price parking in the congested area. Regarding **new mobility** options and their impacts on cities, students recommend a variety of policy options related to the areas of autonomous vehicles, micromobility, and ride-hailing. While each section offers different final recommendations based on each situation, students hope the city of Troutdale will be able to successfully reimagine their transportation policies for the future.

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Appendix A

Parking Fee Structures at Recreation Areas in Washington and Oregon				
Recreational Areas	**Fee**	**No Fee**	**Total**	**Fee Amount**
City Park	1	6	7	$8 - $10 per day/per vehicle
County Parks	1	3	4	$5 per day/per vehicle or $30 annual pass
State Parks	6	0	6	$5 per day/per vehicle, $30 annual pass, or $50 biannual pass
National Forests	16	0	16	$5 per day/per vehicle, $30 annual pass
Total	24	9	33	

Sources: Lindsay Cook, City of Portland, City of Gresham, Clastop County, U.S. Forest Service, and Oregon State Parks

Appendix B

Payment Method	Benefits	Drawbacks	Equity Implications
Staffed Kiosk or Booth	With this option, it may be feasible to vary fees based on the number of vehicle occupants. Vehicles with more occupants would be assessed a lower fee. This option also facilitates multiple payment options.	This option would require paying one or more staff members and perhaps installing permanent infrastructure like a kiosk.	While displaying proof of SNAP benefits or another form of documentation to demonstrate someone has low income, park goers may be hesitant to express this to a staff member.
Pay-by-License Plate Meter	The meter may be remotely monitored and permit both cash and card payments. The fees may also be dynamically adjusted to reflect fluctuating demand.	The machine requires infrastructure investment, maintenance, and staff monitoring.	Park attendees with low income need to secure fee exemption permits prior to arriving at the park.
Honor System Payment Box	Park goers may pay using cash or check. Staff workload for fee collection would be minimal.	Processing cash and check payments may be onerous for staff. An honor system may not apply adequate pressure to alleviate congestion.	A parking sticker for attendees with low income would reduce stigma and increase park access.

Source: Aliza Whalen

Appendix C

Proposed Daily Parking Rates for Residents				
Local Patrons	**Low**	**Medium**	**High**	**Summer Pass (2 hr/day)**
Residents	$0	$2	$5	$20
Low-income Residents	$0	$0	$0	$0
Proposed Hourly Parking Rates for Residents				
Local Patrons	**Low**	**Medium**	**High**	**Summer Pass (2 hr/day)**
Residents	$0	$1	$2	$20
Low-income Residents	$0	$0	$0	$0
Proposed Daily Parking Rates for Non-Residents*				
Non-Residents	**Low**	**Medium**	**High**	**Summer Pass**
Monday-Friday	$5	$7	$10	Not Available
Saturday - Sunday	$6	$10	$12	Not Available
Proposed Hourly Parking Rates for Non-Residents*				
Non-Residents	**Low**	**Medium**	**High**	**Summer Pass**
Monday-Friday	$2	$3	$4	Not Available
Saturday - Sunday	$3	$4	$5	Not Available

*Attendees with low income will not be required to pay parking fees.

Source: Lindsay Cook & Aliza Whalen

Appendix D

Parking Calculations*						
Patron Category	**Days**	**Spaces**	**Low**	**Medium**	**High**	**Range**
Residents	99	84	$0	$2	$5	$0-$41,580
			$0	$16,632	$41,580	
Low-income Residents	99	84	$0	$0	$0	$0
			$0	$0	$0	
Non-Residents: Monday - Friday	71	84	$5	$7	$10	$29,820-$59,640
			$29,820	$41,748	$59,640	
Non-Residents: Saturday - Sunday	28	84	$5	$10	$12	$11,760-$28,224
			$11,760	$23,520	$28,224	
Non-Residents: Monday - Sunday	99	84	$41,580	$65,268	$87,864	$41,580-$87,864
Total Revenue Range						$0-$87,864

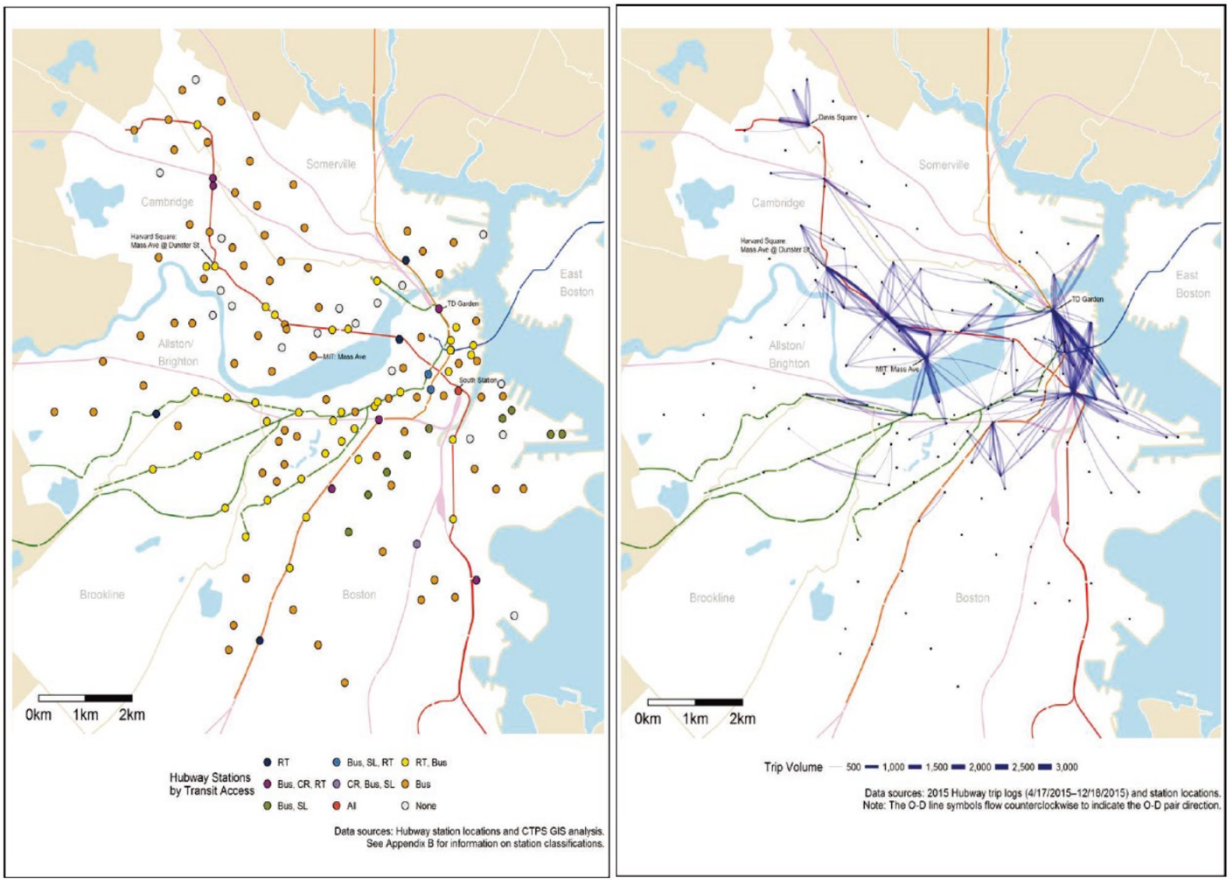
*Table 4 outlines the fee structure for parking at Glenn Otto Park. In 2021, there are 99 days between Memorial Day and Labor Day. Weekdays account for 71 days. Weekends include 28 days. The total number of parking spaces at Glenn Otto Park is 84. The shaded grey cells represent the maximum amount of revenue a price tier, either low, medium, or high, can generate. Revenue = Number of Days x Number of Parking Spaces x Parking Fee Amount. The Monday – Sunday revenue range for non-residents was calculated by adding revenue amounts within each price tier for Monday – Friday and Saturday – Sunday.
Source: Lindsay Cook

Appendix E

Parking Fee Evaluation Matrix		
Criteria	**Rating**	**Rating Explanation**
Equity: Fee structure should facilitate park usage by various demographics. This is primarily achieved by assessing a parking fee to those who can pay the fee.	Excellent	• Fee is benefits-based and addresses residents' ability to pay. • Price structure facilitates resident access to the park.
Administration: Knowledge of parking policies and fee structure should be easily accessible to residents and non-residents. Fee collection should also be feasible and efficient.	Good	• Fee collection and parking management efforts can be scaled to the city's desire and available resources. • Parking stickers may be issued by the city to differentiate residents from non-residents. Stickers can be mailed to residents. Or residents may opt to pick-up their sticker at a designated municipal building.
Neutrality: Prices for parking should be comparable to other parks and recreation areas.	Good	• The fee amount for non-residents is higher than nearby parks and recreation areas with river access. However, nearby parks with river access do not offer lifeguard services.
Certainty: Parking policies and fee structures should be easy to understand and applied fairly.	Excellent	• Information and initial notification about fee implementation can be provided via mailers to residents, posted online, and signage in the parking lot.
Convenience: Paying for parking at Glenn Otto Park should be simple	Good	• Methods for collecting parking fees vary. Use of a fee payment box at Glenn Otto Park may be an easy and low-maintenance option. One potential drawback is this method of collecting payment relies on the honor system. More advanced approaches to collecting parking fee payments could require more administrative oversight and/or city investment in technology (i.e., parking meter).

Source: Lindsay Cook

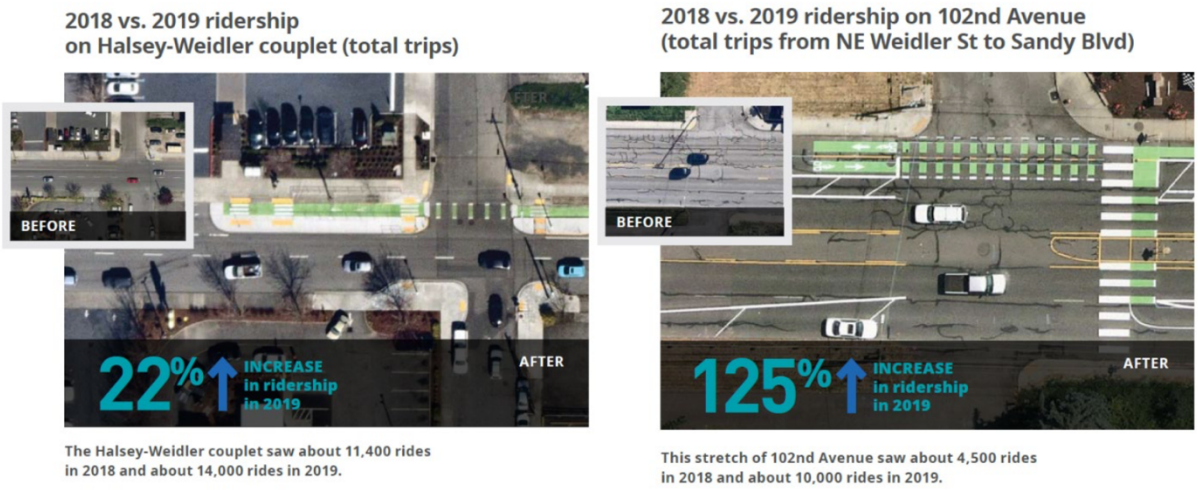
Appendix F



*Appendix F outlines Bluebike Stations by Transit (left) and OD pairs (right)

Source: Exploring Shared-Use Mobility through Hubway Bikeshare, MDOT

Appendix E



*Appendix G outlines the Before/After Ridership on Streets in East Portland

Source: 2019 Portland E-scooter Findings Report, PDOT

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