October 2018

ODOT

Autonomous Vehicles

FOCUS GROUPS

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Introduction & Methodology 1

DHM Research conducted six focus groups with 51 Oregon residents to assess awareness and perceptions of automated vehicles (AVs) and provide insight into resident priorities for future transportation planning and regulation. The purpose of the research was to provide insight into resident perceptions to inform future policymaking.

Research Design, Location, and Recruiting

The focus groups were held from October 8–18, 2018 in Portland, Lincoln City, Bend, and Roseburg. Each location had ample parking, and the Portland location was close to transit. Participants were either randomly recruited from a list of registered voters or recruited from a professionally maintained database.

Four groups were composed of Oregon residents, and two commercial groups were held in Portland and included only residents who also have a job connected to driving or the transportation industry, such as rideshare drivers, transportation logistics professionals, delivery drivers, and people who drive as a major component of their job.

Participant Demographics

Efforts were made to ensure the diversity of participants by gender identity, age, income, and ethnicity. Each of the four groups included a balanced mix of gender identities and age ranges. *For full demographic breakdowns, see Appendix A (p. 26–65).*

Equity Considerations

Income: For the resident groups, half of participants had incomes at or below $50,000 per year, to ensure concerns from lower-income residents were heard in all areas of the state.

Ethnicity: Participants were asked to provide their racial or ethnic identity, and multiple responses were accepted. Of the 51 participants, 23 identified as a race or ethnicity other than white, although some of these participants also identified as white.

Statement of Limitations

The focus groups were led by a professional moderator and consisted of both written exercises and group discussions. Although research of this type is not designed to measure with statistical reliability the attitudes of a particular group, it is valuable for giving an anecdotal sense of the attitudes and opinions of the population from which the sample was drawn.

This report highlights key findings from the focus groups. Each section reviews a major topic from the group discussions and includes representative quotations, as well as evaluative commentary. The quotes and commentary are drawn from both written exercises and transcripts produced from recordings of the group discussions.[1] The referenced appendices provide the complete responses to all written exercises.

[1] Quotations were selected to represent the range of opinions regarding a topic, and not to quantitatively represent expressed attitudes. Some have been edited for clarity to ensure correct punctuation and to eliminate non-relevant or intervening comments.

Summary & Observations 2

Initially, opinions about autonomous vehicles were split. While many residents saw AVs as a possible solution to many transportation issues, others expressed concern about their safety.

Residents had positive and negative emotional responses to the idea of automated vehicles. As one participant said, "I didn't realize I had strong opinions about autonomous vehicles." The issue draws on emotions residents have about transportation generally, which include concerns about safety, frustrations with traffic congestion, and difficulty affording or accessing adequate transportation.

Positive initial opinions about automated vehicles came from people who saw their potential to reduce carbon emissions (as most assumed AVs would be electric), improve traffic flow, and provide better options for seniors, people with disabilities, and intoxicated drivers. Negative opinions came from residents who were concerned about the safety of AVs, whether they would be susceptible to hacking, and whether a passenger would be able to override the computer system in case of emergency.

Residents aren't terribly familiar with automated vehicles, or even automated driver-assistance features.

About one-third of focus group participants said they were familiar with automated vehicles, and two-thirds said they were not. Only a few participants could describe technical features of AVs. Additionally, the quantitative survey shows that a majority of Oregonians do not have experience driving or riding in a car with automated driver-assistance features—the closest parallel to automated vehicles currently available to consumers. This low familiarity with the technology has an impact on perceptions; those who are more familiar with AVs typically have more positive opinions about them.

Opinions will shift over time. Residents said what would be most helpful is learning more about how they work. Specifically, if residents can see—either by video or by a test drive—how AVs drive, learn, and communicate, they may feel more comfortable with them.

While residents also asked to learn more about the benefits of AVs, sharing benefits with a population who is not familiar with the technology may not be productive. Many participants expressed distrust in AVs and did not always find explanations of their benefits to be credible. The benefits that residents accepted the most easily were providing transportation options to people who have limited mobility, or to reduce intoxicated driving.

Residents tend to believe the transportation system of the future will look similar to today's roads—even if cars are automated.

Many participants believed that people will spend more time in their cars 20 years in the future, even though people may drive fewer miles. These beliefs were predicated on increasing traffic congestion, both in the Portland metro area and in places like Bend, where the population has grown drastically in recent years.

Yet participants carefully unpacked the phrase "in their personal vehicles." They noted that people may spend more time riding in cars designed to seat a few passengers, but they may be vehicles operated by

carshare companies like Car2Go and ZipCar or rideshare companies like Uber and Lyft. Several participants across the state expressed interest in the growth of these companies, which they see as improving affordable options for people who often rely on inadequate public transportation.

Although residents see some changes afoot in the state's transportation system, they felt state leaders could safely invest transportation dollars in a number of projects that would improve options now and in the future. Participants believed that AVs are likely to be common in 10–20 years, but that these vehicles will need the same roads, highways, and bridges that human drivers rely on today. Accordingly, participants viewed maintenance and improvements—especially in road quality—as sound investments.

Increasing capacity for transportation was an important priority. Some participants felt strongly this should be achieved by adding lanes and bypasses to the state's existing infrastructure. Several participants in each group also hoped for improved public transportation options in the future, which could better serve low-income residents and also reduce congestion. Many saw AVs as a potential solution, believing that vehicles of a variety of sizes could help residents get to work, school, and do their errands.

People hold fully automated vehicles to a much higher standard of safety than human drivers.

Four in five participants agreed that in 20 years, automated vehicles will be safer than human drivers. However, "safer than humans" was too low of a bar for the majority of participants. They expect AVs to be significantly safer than humans, and they plan to judge the safety of these vehicles by how often they crash or get in accidents and their reaction time compared to humans.

Responses showed that Oregonians may be willing to accept a future where fully automated vehicles are safer than humans—and still not allowed on the roads. In one group, participants said that AVs should rank a 9 or 10 in safety on a scale of 10 before they can be deployed, even though those same participants said that humans are likely a 6 or 7 on the same scale.

Many participants hoped for a cautious approach to deployment that includes strong safety regulations.

Several participants believed that companies who develop automated vehicles are likely to deploy them on the roads without asking for permission. They pointed to past practices of Uber, which began operations in Portland either without any regulation whatsoever. Overall, participants want the state to be ready with regulations designed to protect the physical safety of Oregonians, as well as their data and privacy.

Residents suggested a few ways to regulate AVs and improve transparency. Several hoped automated vehicles would be restricted to AV-only lanes, although no one openly supported funding or dedicating infrastructure for this purpose. A lower-cost approach was to require AVs to label themselves, perhaps with a sticker. Participants were uncomfortable with the idea of looking into a car and seeing no one in the driver seat.

Requiring a driver while AVs "work out the kinks," was a commonly cited solution, although it was unclear whether residents expected a human driver to remain in the driver's seat after AVs were tested and fully deployed. There was also a strong preference to require all AVs to include a "manual override" feature, that would allow a human driver to operate the vehicle if necessary (either during testing, or permanently). Because participants were so wary of giving up "control," these types of regulations helped them feel more secure.

Another approach was testing automated vehicles in certain places. A few suggested small areas, like downtown blocks or college campuses. One participant, who felt that AVs could and should be a solution to inequality in the transportation system, said that AVs should be first deployed in areas where public transportation is inadequate.

Residents' values show consumer protection is a higher priority than innovation, but they don't have strong recommendations for policy issues like licensing, registration, and insurance liability.

Participants were clear about the values that they believed leaders should rely on when it comes to transportation and automated vehicles, but they rarely had specific suggestions for policies regarding licensing, registration, and insurance liability.

Safety was a core value, and people hoped that leaders would not allow any vehicles on the road they themselves did not feel safe riding in. Another key value was equity; many participants expressed concern that the rising cost of owning or accessing a vehicle might only be exacerbated with the advent of fully automated vehicles. Strategies and policies to ensure that all residents, particularly those who are underserved, have access to new technology was also important.

Ultimately, residents expect state leaders to be transparent and up front about automated vehicles and how they are tested and regulated in the state. Policies that protect consumers will help smooth the way for additional innovation.

Key Findings 3

3.1 TRANSPORTATION PRIORITIES IN OREGON

Participants described a variety of transportation priorities for the state, including improving road quality to ensure safe travel.

Road quality is an issue across the state. Residents said poor road quality negatively impacts their ability to travel safely. These concerns include potholes and poor striping that is difficult to see at night.

> *"If I have my baby in the car, you hit a pothole, just all kinds of things can happen."*
> *—Lincoln City*

> *"The roads are not only bad, but they are also not well-lit. The reflection and things. When they first do a road, it's all bright at night. In the winter it's difficult. I'm always out in the evening and the winter is not easy. That would be my biggest concern."*
> *—Portland commercial*

Some residents said their concerns about poor quality of transportation infrastructure extend to inadequate sidewalks or bike lanes, both of which make it more difficult for residents to choose alternative forms of transportation.

Congestion is a top issue in Portland, and traffic came up in the Bend and Lincoln City groups as well. Bend residents pointed to the area's increasing population and construction, which have clogged roads. In Lincoln City, residents explained that there are few alternatives to Highway 101. Participants talked about congestion somewhat emotionally, explaining that driving in traffic causes stress and increases the chance of accidents.

> *"Congestion, especially in the inner city. I think more people increases the chance of accidents. It's more stressful driving." —Portland*

> *"You all probably know about the congestion we have on 101. We have hit and runs. We have tourists driving through, not paying attention to what's going on. We have a lot of accidents on 101 here during the summer." —Lincoln City*

> *"It's too crowded, and then road maintenance…and therefore, traffic gets five times more backed up because certain roads are closed." —Bend*

Outside the Portland metro area, participants lamented a lack of transportation options. Limited options leave these residents feeling unsafe; one participant described losing friends because no meaningful options existed.

> *"There's no alternative to public transport. We don't have Uber or Lyft or any backup when my car breaks down and the bus doesn't come when I need it to come."*
> *—Lincoln City*

> *"Transportation for impaired drivers. Oregon has one of the highest rates of accidents caused by drunk drivers or drivers under the influence of intoxicants. And a lot of the times, many of the times that I lost friends to accidents, it was simply because there*

was not a mode of transportation other than calling a taxi and possibly paying $50 to get home." —Lincoln City

3.2 PERCEPTIONS OF THE FUTURE OF TRANSPORTATION

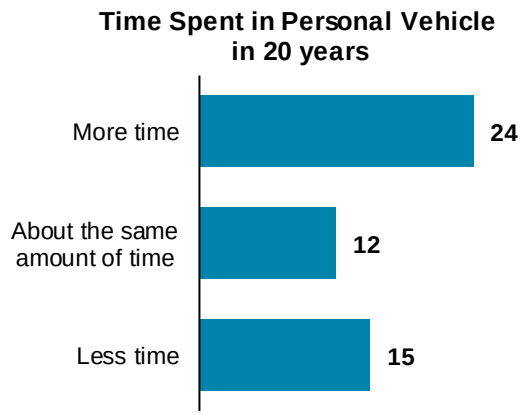
Many residents anticipated that congestion will continue to be an issue in the future, and that people will spend more time in their cars—even to drive fewer miles.

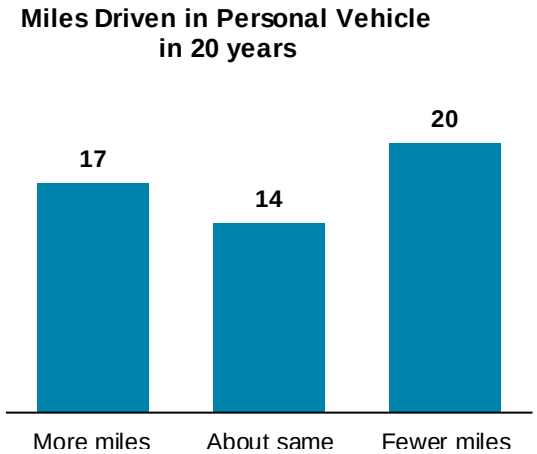
More than half of participants believed that, 20 years in the future, Oregonians will spend *more time* in their personal vehicles. These beliefs appear to be based primarily on concerns about congestion and Oregon's growing population.

> *"I kind of thought we would travel the same [number] of miles but spend more time in our vehicles from congestion. That's kind of concerning." –Portland commercial*

Notably, participants believed that time spent in personal vehicles would increase in the future, even as a plurality believed miles driven in those vehicles would decrease. This makes sense, considering how commute times have risen recently, especially in Portland.

> *"My commute over the last four years—I went from half an hour to get to work, now it takes an hour, sometimes longer. And that is only in four years."*
>
> *—Portland commercial*





DHM Research, October 2018: Charts 1–2

Perceptions of Oregon's future transportation system often reflected today's transportation system, options, and culture.

In their visions for the future, many participants spoke about driving on roads in personal vehicles. Some participants, particularly those over the age of 35, felt strongly that American car culture will forge ahead. They tied car ownership to values like freedom, independence, and the need for personal space.

> *"Everybody is used to their personal vehicle. It is a culture. We don't necessarily want anybody in our personal space, and we have our personal car and we don't want to share." —Roseburg*

"People in Portland are adventurous and don't want to be stuck."

—Portland commercial

However, some recognized that "personal vehicle" may refer to a car owned by someone else. Younger participants, and particularly those in Portland where rideshare services are readily available, were vocal in their support of alternatives to car ownership.

"Hopefully, people will drive fewer miles in their personal vehicles. I think a lot of people will also be using [rideshare] services. Not necessarily [driving] in their personal vehicles, but in other people's vehicles." —Bend

"No one is going to have their own car…I mean, that's a possible future, especially with the ridesharing and the way that has really taken off." —Portland

"I would rather see more—and I've seen a decline—with Uber and Lyft. I would rather see more ZipCar and Car2Go." —Portland commercial

Increasing congestion, the growing cost of owning a personal vehicle, and an explosion of delivery services influenced participants' views of the future transportation system.

Some participants described increasing congestion as a deal breaker for Oregonians to continue traveling in personal vehicles, due to the difficulty and high cost of adding vehicle capacity. One participant brought up automated vehicles, unprompted, in this discussion.

"We cannot build enough lanes. We need to think outside of the box. Mass transit. Force people out of their cars and make them use bikes. Give them the opportunity to get where they need to go." —Bend

"I think people are going to have to stop using their cars as much. Only when they really have to, like when they have to go to Redmond. If you can get around town, get to your job, go do your shopping and entertainment by using something, like these electric buses that don't have a driver. They drive autonomously." —Bend

As the cost of living in Oregon continues to increase—driven by swiftly increasing housing costs—several participants were quick to note that owning a car may be financially out of reach for many in the coming years.

"I think a personal vehicle is going to be too great a cost for a lot [of people]." —Bend

"I think cars are going to go back in history and essentially become the playthings of the rich." —Portland commercial

Participants also noted that our lives are changing. More people work from home and do fewer errands, assisted by the advent of home delivery services. These factors could reduce the need for Oregonians to travel in the future.

"[A future] where we all work from home and shop from home and everything is done from home. I'm starting to think about that lately in my situation. Shopping, everything, is not the same anymore." —Portland

"I think a lot of people kind of sit in their houses and become keyboard warriors, and just love the fact that you can sit and hide a little bit." —Portland commercial

Participants hoped that, in the future, Oregon's transportation system would be less reliant on fossil fuels.

Energy issues came up repeatedly. Some participants immediately linked cleaner cars to automated vehicles—even before discussion about AVs was prompted.

> *"I think with running out of petroleum we will probably have to do something other than a personal vehicle. I mean, we already have the car sharing thing going on. I think people will probably, hopefully, not have their own car in the future." —Portland*

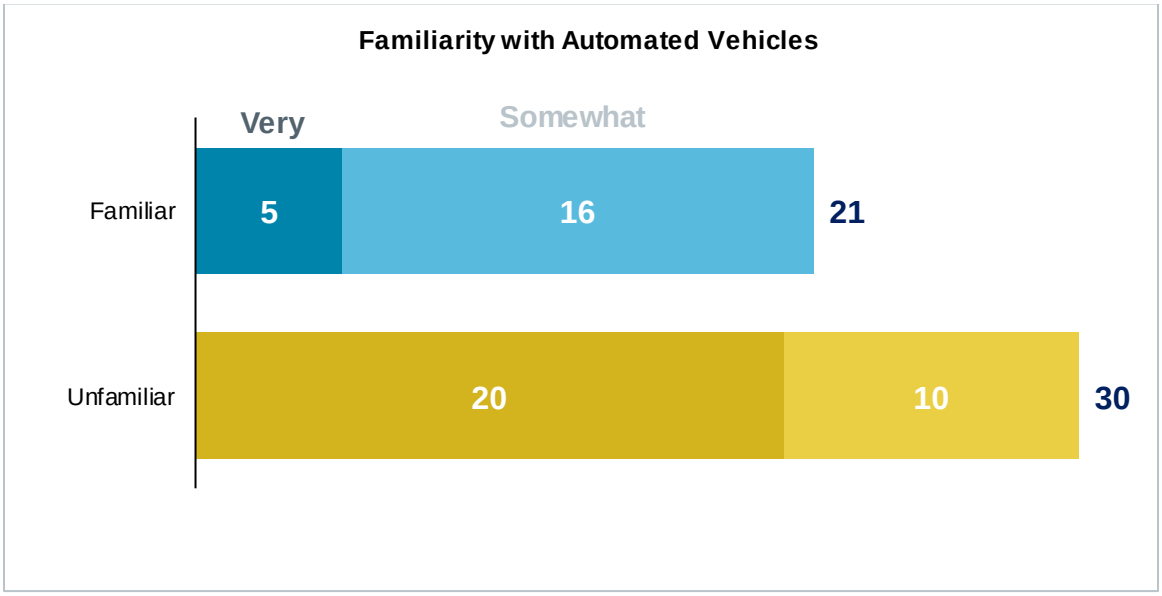
> *"I mentioned already about the self-driving cars, but more of them are going to come, and also we won't be using gas in [our] cars. There are going to be a lot of electric cars." —Portland*

3.3 AWARENESS AND INITIAL IMPRESSIONS OF AUTONOMOUS VEHICLES

Residents were more likely to describe themselves as unfamiliar with automated vehicles, and many initially expressed reservations about safety.

More than half of participants said they are unfamiliar with automated vehicles. Some knew enough about them to describe certain features, and Tesla was mentioned a few times as an example of automated vehicles—or at least, vehicles with certain automated features.

Words and phrases that came to mind when participants considered automated vehicles included "AI," "Elon Musk," and "The Jetsons." Most were clear that the word "autonomous" referred to a vehicle that is "self-driving" or "driverless."



DHM Research, October 2018: Chart 3

Some participants immediately described fears about automated vehicles. Typically, those who were less familiar with them were more apprehensive.

Initial impressions were both positive and negative, and familiarity with AVs typically played a significant role in whether participants were afraid of them or focused mostly on potential benefits.

Those who expressed concerns used charged language. One described these vehicles as "death traps and terrorism." Another made judgments about AV proponents.

> *"People would be idiotic to trust a self-driving machine. Artificial intelligence is not safe." —Lincoln City*

> *"For the love of God, please no self-driving cars!" —Bend*

A few participants were familiar with AVs only because of news stories about crashes. Accordingly, some of those who were familiar were also highly critical.

> *"Basically, a car that drives itself, that lets you get in and does everything. The idea of it sounds great. It has not been a good thing so far. If the cars are crashing, then they're not ready to be used yet." —Portland commercial*

Yet participants were split, and many expressed favorable initial impressions about AVs. Commonly, those with positive impressions associated AVs with improved safety.

> *"Driverless cars that allow safe passage from one location to another. Tesla." —Bend*

> *"Vehicles that are programmed for safety and are fuel-efficient." —Roseburg*

> *"Self-driving, safety a high priority. [Can change] lanes automatically. Safe." —Portland commercial*

Participants that described AVs with even greater specificity pointed to the ability of these cars to talk to one another.

> *"Cars that drive so efficiently that I can read a book ...so I am just a passenger. They link with one another to prevent accidents and accelerate in unison off of stops (red lights)." —Portland commercial*

> *"The more autonomous vehicles that you have on the road, [the more] they can communicate with each other. They can warn each other of what's possible. They can communicate with each other to get the best results that you can for driving from here to there." —Bend*

3.4 AUTOMATED VEHICLES: BENEFITS, APPLICATIONS, AND RISKS

POTENTIAL BENEFITS

Many participants assumed—or at least preferred—that automated vehicles will be electric and see them as a way of reducing fossil fuel emissions and protecting the environment.

Participants tended to assume that AVs would be electric; many participants saw this as a potential benefit. Electric, automated vehicles could also allow residents save money on fuel.

> *"A way to reduce carbon footprint." —Portland*

"It's totally different. I'm excited about that. I'm excited to be able to save gas [because it would be electric]. I think it's awesome." —Lincoln City

Some participants believed that AVs could improve traffic safety, reduce congestion, and eliminate intoxicated driving.

Participants were likely to cite safety concerns as top priorities for transportation in the state, so opportunities for AVs to improve safety were viewed positively—although some participants continued to express reservations.

"There is a real need for [improved safety]. I mean, the cops get calls like 50 times a day over traffic collisions. So, the whole idea is to make roads safer and get you from Point A to Point B without getting hit. It if works, that will make it safe to travel and that will also, I think, give us more time." —Portland

Specifically, some participants explained that AVs could improve safety by reducing human error, driver distraction, and improving traffic flow. Even a few participants who were generally opposed to the concept of AVs warmed to the idea of providing safe transportation options for people who are intoxicated.

"I like the idea of no more drinking and driving." —Portland commercial

"I could go downtown to bars and not worry about driving home." —Bend

Proponents of automated vehicles also saw their potential for managing traffic and reducing congestion. A few imagined a world where cars can communicate with one another and traffic congestion is largely obsolete.

"Whenever I think of these cars, it reminds me of these movies I've seen. The traffic is flowing beautifully because no one is driving themselves. Everyone is merging perfectly, and the cars are communicating. There's no traffic. It's just moving." —Portland commercial

"I didn't realize I had strong feelings about autonomous cars. I actually think one of the ways that might solve congestion is, I feel like I see so many people cutting each other off, or not merging ahead, or not really following what I feel like are commonsense traffic rules. I wonder if it will impact congestion that way. People drive better because the car would drive." —Portland commercial

However, many residents likely need more education and information about AVs to understand how they could improve safety and reduce traffic. Education about how cars connect, communicate, and improve based on past performance may be useful.

"I don't see how it would solve traffic congestion. You're just going to have a self-driving car, but still a car." —Portland commercial

Some participants envisioned a future where automated vehicles improve productivity and reduce stress.

In terms of individual benefits to users, reducing stress and improving productivity were top potential benefits for participants. Many participants—in both the resident and commercial groups—said they would be able to complete major portions of their job in the car if they were not actively driving, which could save valuable time.

"I totally think it would be awesome. I could be doing chart notes while my car is driving me to the next place…instead of two hours at the end of the day. It would be amazing." –Bend

"It would help my work. It would give me more time because I could multitask on the way, in between appointments." —Portland commercial

Reduced stress while driving was also a positive, as many participants described congestion as frustrating. AVs could also reduce stress for some users by eliminating the need to make so many trips in the first place.

"Blood pressure goes up in traffic when you're driving in it. If we didn't have to drive, it would probably be healthier for all." —Portland commercial

"It would free up mothers or fathers and kids [who] are driving all over the place. You're taking them to sports practice or whatever. You would be able to put your child in one of those cars, without having to do it or rush around." —Bend

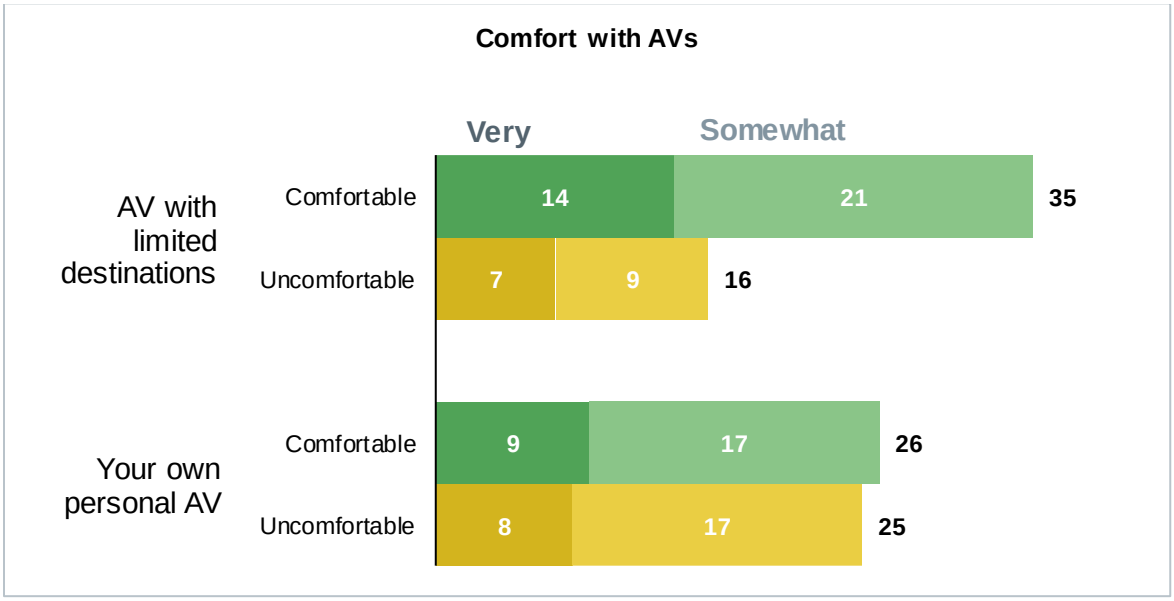
SPECIFIC APPLICATIONS

Participants saw opportunities for automated vehicles to improve public transportation and provide better options for seniors and people with disabilities.

Automated vehicles were commonly associated with public transportation, especially forms of transportation like trolleys, with which people are already familiar.

"I just think of mass transit with set routes. Airport shuttles and that kind of thing." —Bend

Participants were certainly more comfortable with AVs for shorter trips or trips with a fixed route. While participants were split as to whether they would be comfortable in a fully automated vehicle for most of their trips, more than two-thirds said they would be comfortable riding in a fully automated vehicle *between two limited destinations*.



DHM Research | October 2018 | Chart 4

"If it was somewhere around a college campus, I wouldn't really see it going over 25 miles an hour. I just don't see as many risk factors with that. I think it would be something I'm comfortable with." —Lincoln City

Throughout the discussions, some participants were very vocal in their support for improved public transportation options. These preferences were echoed in their perceptions of how AVs might be used in the future to better serve the needs of the public.

"I have family in Mexico. The bus stations there are like little airports, almost. You have your different bus lines that go different routes, and you have certain stops. So, I could see an autonomous bus get on there and make its certain stops and whatnot. I can see something like that." —Roseburg

"I thought more about rural areas where there isn't necessarily public transportation infrastructure. This could be a bridge to that, perhaps." —Portland commercial

In addition to more traditional forms of public transportation, participants described options for people with disabilities and for helping elderly residents age in place. One participant remained unsure about the safety of AVs but began to see how they could benefit her later in life.

"I have a friend who is paralyzed from the neck down. He'll never be able to drive a car…I'm not saying I trust AVs, but I can see the potential for their usefulness in those areas." —Lincoln City

"Especially the elderly and handicapped. They don't need a car. They just need someone to take them somewhere." —Bend

"I'm not excited about it, because I'm a control freak. [But,] the option to basically have something or somebody drive me around when I can no longer do that, that would be exciting. Getting to the doctor or across town to do shopping, whatever is required basically, when I'm unable to drive myself." —Lincoln City

However, one participant living with a disability felt differently. He noted that an automated vehicle can't provide the physical support he needs to get in and out of the car. Furthermore, he would lose out on the ability to socialize with the driver, which he felt was important to his quality of life.

"I would rather have somebody to talk to and drive than nobody to talk to." —Portland

RISKS AND FEARS

A perceived loss of control while driving is alarming to many participants, who hope that automated vehicles will have a manual override feature.

Commonly, participants described themselves as "control freaks," and many had difficulty imagining riding in a car without their hands on the steering wheel. Despite fears, some people noted that they could see themselves getting used to the technology over time.

"It makes me a little nervous, because I'm 57 and I'm used to having my hands on the wheel. But I'm open to new things. And we have got to start thinking about doing some stuff differently, or we're going to burn up our planet." —Roseburg

Participants who had experience with automated driver-assistance features were somewhat split; some were wary of these new features, and others viewed them positively.

"I have a friend who has a newer Toyota. We went on a road trip and it was…I don't know. It takes control away." —Bend

"I have been in a lot of Teslas. They're [automated] and it's a trip. They gauge how fast you're going [compared] to the car in front of you. They adapt to freeway driving, not city." —Portland

Participants who expressed fears about automated vehicles were primarily worried about malfunctions and hacking.

Some people viewed a lack of control while driving as problematic because they assumed that the vehicles will, at least on occasion, malfunction. Many participants shared a sense that these potential malfunctions could be very deadly or intentionally caused by hackers.

"I don't trust man-made machines. I've had GPS take me to the wrong spot. Why am I going to trust—for my kids [and] myself—a man-made [machine]? Computers crash. Cars break down. How do I know it's not just going to take a dive off a cliff?"
—Lincoln City

"The hacking of computer systems when they can come in, all of a sudden your brakes don't work or whatever." —Portland

Aside from hacking or "driving off a cliff," participants seemed unable to put into words why an automated vehicle malfunctioning would be different than current practices; after all, recalls for cars or car parts are a familiar concept. When pressed on this issue, they pointed to the locus of control they feel while actually driving a vehicle.

"I still feel like if something goes bad, I am still the one controlling the car."
—Portland commercial

Knowledge about automated systems, technology improvements, and "artificial intelligence" varied across participants.

One reason some participants were so concerned about automated vehicles is that they believed the systems would be unable to adapt to new situations in the way that human drivers do. For this reason, some believed that AVs could never be safer than humans.

"Humans can at least change. Software is software. It is whatever you download. You can't change it. It is what it is." —Portland commercial

Sometimes, other participants pushed back against these beliefs or took the opposite view.

Participant 1: *"Technology fails. People can adapt. Technology cannot."*

Participant 2: *"I think eventually technology does tend to improve. And I'm sorry, but humans are way fallible, and they're emotional. Machines don't get mad and run over their husbands." —Lincoln City*

Younger residents tended to be more aware of technology's ability to learn and adapt, although this was not strictly true. Those with more positive views of the adaptability of future technology noted that systems are indeed able to learn and improve. These proponents also pointed to features that may exceed human abilities, such as motion detection.

"Technology is improving. Computers improve. They have the ability to see if a deer is [moving], out where we might not be able to see with our eyes. The car might be able to sense something." —Bend

"I think you might be able to tap into the human instinct and have that built into the artificial intelligence." —Roseburg

Perceptions of income inequality and social isolation due to new technology may have colored opinions about automated vehicles.

Several comments in the discussions highlighted a perception that people today are more likely to isolate themselves from others as a result of technology. Some saw automated vehicles as a way for people to further isolate themselves. While this was a minor concern overall, it may provide insight into negative opinions about, or distrust of, AVs.

"I just think we rely too heavily on technology…An example is the internet. We thought, 'Oh, it's going to connect people more,' but now we have seen that it's actually disconnected us." —Portland

The cost of transportation came up repeatedly, and many participants were concerned that costs will continue to rise. Although automated vehicles may offer an opportunity for residents to pay for what they use when it comes to personal vehicles, some participants believed that AVs could also exacerbate existing inequality.

"If they are a status symbol, they are out of reach, even to take a ride in it. If it costs $10 just to go a few blocks or whatever, people can't afford that." —Bend

3.5 IMPACTS OF AUTOMATED VEHICLES ON JOBS

While automated vehicles may eliminate some jobs, participants thought major changes in the job market would be incremental.

Automated vehicles' potential impact on jobs came up both in the resident and commercial groups. While two participants—a taxi driver and a pizza delivery driver—felt confident their jobs would be eliminated in the coming years, participants on the whole did not express panic.

"I saw a video of a self-driving Dominos car. It made me feel like if they come out with them, I wouldn't have a job. Like I said, I've been doing this for 13 years, I like what I do." —Portland commercial

"I won't have a job. I am going to get a different job. And that is fine, you know? It is inefficient." —Portland commercial

One reason these concerns may have been tempered is that participants believed the human element of most jobs in the transportation industry is an important factor—and one that is not likely to be replaced as soon as automated vehicles are deployed.

"You still need a human element to it. Yes, you can have a driverless truck for packages. But how is it going to get to the door?" —Portland commercial

Although participants discussed other models for delivery that do not require a human element, like using a drone for small packages or requiring a recipient to take packages directly from a vehicle, these

approaches were seen as a step further than AV deployment, and therefore less worthy of immediate concern.

Another belief that ameliorated concerns about jobs was that new technology will create new jobs. Engineers would be necessary to build new systems, and someone would be responsible for maintaining the new vehicles.

> *"Whenever I hear about the jobs being taken over, I think to myself, okay. [Someone] gets fired because the machine takes over his job, then who works on the machine? There are new jobs that open up when technology comes out." —Portland commercial*

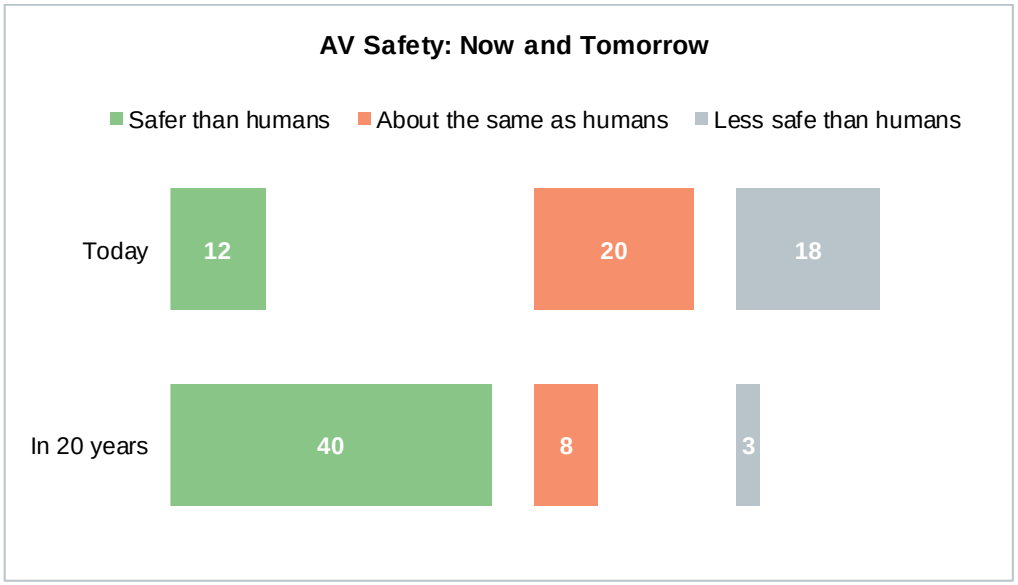
When it comes to the trucking industry, one participant working in logistics explained that driverless technology could ease employment concerns and save money.

> *"Generally, in the transportation industry, you just back your trailer in and somebody unloads it. You don't have to be there to unload it. There are hours of waiting, even if you have an appointment. [AVs could] save cost and there are so few employees — that's one problem that my industry is having, it's not being able to find drivers."*
> *—Portland commercial*

3.6 MEASURING AND TESTING THE SAFETY OF AUTOMATED VEHICLES

Some participants were wary of the safety of automated vehicles today, but most believed they will be safe in the future.

Although many participants expressed concern about the safety of automated vehicles today, nearly all believed that AVs would be safer than humans in the future. Of the 51 participants, 40 said they expected AVs to be safer than human drivers in 20 years.



DHM Research, October 2018: Chart 5

A small minority even said that fully automated vehicles today are safer than humans, despite some risks.

"I would think they are about the same as human drivers, because humans are so distracted and that causes a lot of accidents." —Bend

Participants made several assumptions about automated vehicles and safety:

1. Automated vehicles will become safer over time—even if they aren't ever safer than humans.
2. To be allowed on the roads, fully automated vehicles must be *at least* as safe as human drivers, but many residents will expect them to be significantly safer than human drivers.
3. Automated vehicles will need to be tested to ensure their safety—but testing should be highly regulated and require a variety of safety features.

Participants hold automated vehicles to higher safety standards than human drivers.

All participants—even skeptics—agreed that automated vehicles will become safer over time. However, there was not consensus agreement that these safety improvements would ever match or exceed the safety of human drivers. Importantly, even if AVs are "safer than humans," it may not be enough to convince some residents that they should be allowed on the road without a human operator in the driver's seat.

"I think when they get implemented, they will be safer. I don't think they can or should be implemented until they're at least as safe, safer than we all are." —Lincoln City

"At least as safe as humans. If they're less safe, there is an argument against it. If they're equally safe, there is no argument. And if they're more safe, there is no argument against it." —Roseburg

Several participants were vocal in their belief that AVs be 100% safe before deployment, even though a few of these participants recognized that is likely impossible. While a majority of participants were more measured in their expectations, there was widespread belief that AVs must represent a "substantial improvement" in safety, compared to human drivers.

Participant 1: *"I wouldn't take anything less than 100% on it."*

Participant 2: *"Nothing in life is 100%. You're never going to get 100%. A real-world, long-term test is the only way you're going to know, and the only way to know it to let them try." —Lincoln City*

"No safety issues at all. I know that's kind of unrealistic. Zero malfunctioning. I'm sure that's never going to be a thing. There's always going to be issues. I would feel comfortable and probably get in one if there were, I would go with [others] on the 2% [risk]." —Portland commercial

In one of the Portland commercial groups, the moderator asked participants to rank the safety of human drivers today on a scale of 0 to 10, with 10 meaning "perfectly safe all the time." On average, participants ranked human drivers as between a 6 and 7, with 7 being the most common response. However, when asked how safe AVs must be before the state allows it on public roads, participants said they must be between a 9 and 10.

This shows that residents were willing to accept some future where AVs are safer than human drivers, but not safe enough to allow them on the roads. However, these perceptions are almost certain to change over time. National research suggests that people are more accepting of AVs when they are more familiar

with them, even if they have only ridden in AV for a short drive.[2] As automated features in cars become more commonplace—and as fully automated technology continues to accelerate—Oregonians are likely to become more accepting of the technology and the benefits it provides. In fact, even some of the most critical focus group participants warmed slightly to the concept of AVs after hearing from other group members about possible benefits.

To compare the safety of automated vehicles to human drivers, residents will look to reaction time and rates of accidents and injuries.

Participants said they would be better able to assess the safety of AVs if they had statistics about accidents, injuries, and reaction time. Ideally, these statistics would present direct comparisons between AVs and average human drivers.

> *"We could do reports, like the national crash average of autonomous vehicles versus self-driven vehicles. Which one is higher, which ones have [higher] crash rates, which ones have [higher] death rates. Or you could run test courses to see how this car reacts compared to this car." —Roseburg*

> *"I would look at reaction time. As long as they can respond to scenarios faster than a human can. Even processing information. You know, like seeing a car coming and then being able to see the bigger picture of just more of what is going on than people can. And yes, statistically, when they drive more miles with fewer accidents than the average person." —Portland commercial*

The discussions didn't focus on the source of these statistics, although one participant noted that auto insurance companies are trustworthy on this matter.

> *"Insurance companies get involved, because they keep tabs on all of the accidents that are happening. Whatever they're doing to measure that. They charge us based on how likely we are to get into an accident." —Lincoln City*

Residents would likely feel safer if they knew that automated vehicles on the road required a driver in the front seat, at least initially, and a manual override option.

Some participants knew that automated vehicles are already on the roads, but most did not. It was clear from the discussions that participants would feel safer if a driver was required to sit in the driver's seat, in case a human needed to override the system and take control. Participants believed this would be a necessary safety feature because they were concerned that automated vehicles might "drive off a cliff." Many participants saw this careful approach as necessary to safety integrating autonomous driving technology.

> *"Keeping the driver behind the wheel until all of the kinks are worked out." —Portland commercial*

> *"I just think all the AV cars should have a human override feature. I would make a law right there that you could always opt out." —Lincoln City*

[2] https://www.sciencemag.org/news/2017/12/people-don-t-trust-driverless-cars-researchers-are-trying-change

Participants preferred physical restrictions on the locations where fully automated vehicles are tested.

Several times, participants brought up the idea of only allowing automated vehicles in specific lanes. Notably, participants did not openly support building new infrastructure to accommodate this idea. Although participants seemed to indicate that these lanes should not allow human drivers, the suggestions did not fully explain how this would improve safety for other drivers.

> *"Separate lanes. Don't allow AVs to be on the same part of the road as human drivers, and don't allow children to ride in them alone." —Lincoln City*

> *"I think we should have a designated lane or something for the autonomous [vehicles]. Have the downtown area and more congested areas be the ones that have the autonomous vehicles in use." —Bend*

One explanation for these suggestions is the simple shock of looking into a car and seeing, well, nothing. Another approach, as one participant suggested, would be to simply label automated vehicles with some type of mark or sticker.

> *"If there's an AV on the road, I want to be aware of it. I don't want to be driving up, and all of a sudden I look over, and there isn't anybody there." —Lincoln City*

Likely inspired by one of the written exercises, which asked participants to assess whether they would feel safer riding in AV on a short trip on a college campus or in similar conditions, some people suggested testing AVs in this manner.

> *"In a small area around a college campus, yeah. But in a big city where there are people walking and dogs, no. Not without a human behind that wheel to brake or stop that car." —Roseburg*

Others thought that a specific area, rather than a certain route, would be beneficial. This would allow AVs to interact with other cars and pedestrians, and it could also provide additional transportation options to some communities.

> *"I suggest they have trial areas, like a metro area, to see if it's really viable. And also, if they look at the rules of the road, what needs to be changed there to implement this?" —Roseburg*

> *"Test it in the places that need it the most. Test it where TriMet fails, for instance." —Portland commercial*

3.7 REGULATING AUTOMATED VEHICLES

There was some split in opinion as to whether Oregon should be a leader in developing policies for automated vehicles. Participants lean in favor of a cautious approach.

When asked whether Oregon should take a lead role in AV policy compared to other states, residents were hesitant. Safety and cost were big concerns. Naturally, participants wanted to ensure that AVs were safe before deployment. Several participants also said the state couldn't afford to take a leadership role when there are other, bigger priorities.

> *"I want them to know that the risk of getting it wrong is greater than the risk of getting it right. What do you get for getting it right first? Nothing, really. We all have [AVs].*

[Alternatively, the risk is] 'Oh, you messed up and you killed a bunch of people, and you're bankrupt now.'" —Portland

"What funding does Oregon have to be a leader in [AVs]? Oregon already doesn't have enough funding…Our foster [care] system, it's the worst one in the nation. Our homeless problem…The last thing we need to do is be a leader in a multibillion, multitrillion dollar thing. Just allow other states to get the legwork in and then see how it goes, possibly follow that." —Lincoln City

Conversely, a few participants were strongly in favor of Oregon leading the way. Once again believing that automated vehicles would be electric, they pointed to the state's history as a leader in environmental policy.

"I think it's kind of expected of us. I like having that reputation. That is one of the great things about living here, is we are a leader in so much. Recycling and the Bottle Bill—we have been success in a lot of areas so far." —Portland

"I do think they should support the advent of it, especially if they turn into cars that aren't running on fossil fuels. It would be really important to Oregon to be on that cutting edge. The West Coast has always been interested in not polluting any more than they already have. I think Oregon would, all of us would, like to see less pollution." —Bend

This split in opinion may show that participants don't want Oregon to make significant investments in AV regulation merely to position itself as a leader—but they also don't want the state to allow businesses to dictate policy with a "deploy now, ask later" approach. Some Portland participants mentioned the electric scooters that seemed to appear overnight on the city's streets and thought the state should be ahead of the technology industry and prepare for AVs in advance.

"I think Oregon needs to have regulations of some kind. They're going to bring them here no matter what. They need to be up ahead of that." —Bend

Suggested principles for guiding such regulatory policies included efficiency, utilitarianism, and consideration of the needs of underserved communities. Residents would likely appreciate any policies that leverage benefits, like jobs, in allowing testing and deployment of AVs on Oregon's public roads.

"Efficiency. The best results for most of the population." —Portland

"Think about minorities who won't be able to afford something like this. Is it going to offer more jobs for the community?" —Lincoln City

The discussions did not ask participants to address the four major policy areas considered by the Task Force on Autonomous Vehicles, but each broad issue came up unprompted.

The task force considered four broad policy areas, but participants were not asked to provide direct feedback on these topics. Instead, comments about each topic were collected throughout the discussions, as participants brought up each issue on their own.

INSURANCE AND LIABILITY

Participants leaned strongly in favor of manufacturer liability, while recognizing that sometimes, individual owners must be held accountable for their personal property.

In some of the focus groups, liability issues came up early in the discussion. People wondered who would be responsible for a crash or accident caused by a car without a driver. While some participants merely posed questions, others felt strongly that manufacturers should be held liable for vehicles, particularly in cases of malfunction.

> *"If you summon an autonomous vehicle 20 years in the future…and it has a collision somehow with a car driven by a human, how does the human get the info? Does he have to sit there and trade insurance info? What do you do?" —Portland*

> *"Ford is the manufacturer. I think it goes back to them, because if they're going to be on the road, they have got to be safe. And yes, maybe Bob could have fixed it, or maybe he didn't repair something. But it still goes back to the original [manufacturer]. That is where it starts." —Roseburg*

Of course, malfunction is not the only liability issue. Participants recognized situations where owners of AVs should be held responsible for failing to provide upkeep and maintenance. Concerns about liability also specifically mentioned insurance.

> *"Who is carrying the insurance? Who is going to be responsible for it? They're going to have an entire rewrite of the driving regulations." —Portland*

> *"Say there is something you don't mean to do. It's not your fault for driving, but it's your fault because it's your car. It's your property." —Roseburg*

LICENSING AND REGISTRATION

Participants said that automated vehicle and software manufactures should carry licenses, and that vehicle registration should include software testing.

While most people think of driver's licenses as proof that someone can safely operate a vehicle, participants described "licensing" AVs in a way more akin to business licenses.

> *"Companies need to have proper licensing before they are released onto the roads. So, if they wanted to test them, there would need to be licensing, potentially different licensing structures for the technology used." —Portland commercial*

This participant went on to specify that a licensing structure similar to the one the City of Portland applied to rideshare companies would be a good solution. In that way, policymakers could review different aspects of the proposed technology and its impacts, and this information could guide the development of regulations.

Similarly, many people think of registering a vehicle as purchasing tags and, if applicable, passing an emissions test. For automated vehicles, participants thought registration may include testing software to ensure that it can safely drive on the roads.

> *"I would like to see a registration for autonomous vehicles. Make sure their software is up to date. They function properly." —Portland commercial*

LAW ENFORCEMENT AND CRASH REPORTING

Some participants anticipated the need for new safety laws specifically for automated vehicles, such as adjustments to speed limits, and clearer direction on how to use passing lanes.

A few participants were baffled as to how automated vehicles would interact with police or in case of an accident. Who would provide insurance information?

> *"Imagine one malfunctions; it speeds. You're a traffic cop. How do you write a ticket to an autonomous vehicle?" —Portland*

This question may have prompted one participant to recommend requiring dash cameras in automated vehicles.

> *"They have something like the camera mount in your car when you're driving. If an accident happens, the camera catches it. It should be mandated for every one of these cars." —Portland*

Thinking more broadly, some participants thought new laws and regulations may be necessary to keep automated vehicles and human drivers safe and playing by compatible rules.

> *"If they crashed, would it be on them? Would it be on the car? There are things like that. There are other things, like speed limits. Can you go faster in the left lane? What is going to be like in the right lane?" —Roseburg*

Ultimately, discussions about crashes and reporting tended to focus on questions, not suggestions or proposed solutions.

CYBERSECURITY AND LONG-TERM POLICY

Protecting consumers through regulations on data mining may alleviate concerns about privacy.

Hacking and cybersecurity came up at least once in every focus group. Some participants argued that the risk of hacking was too great to allow automated vehicles on the road. Although only a few recommendations were put forward, residents will look to their government to enact regulations that protect consumers and drivers.

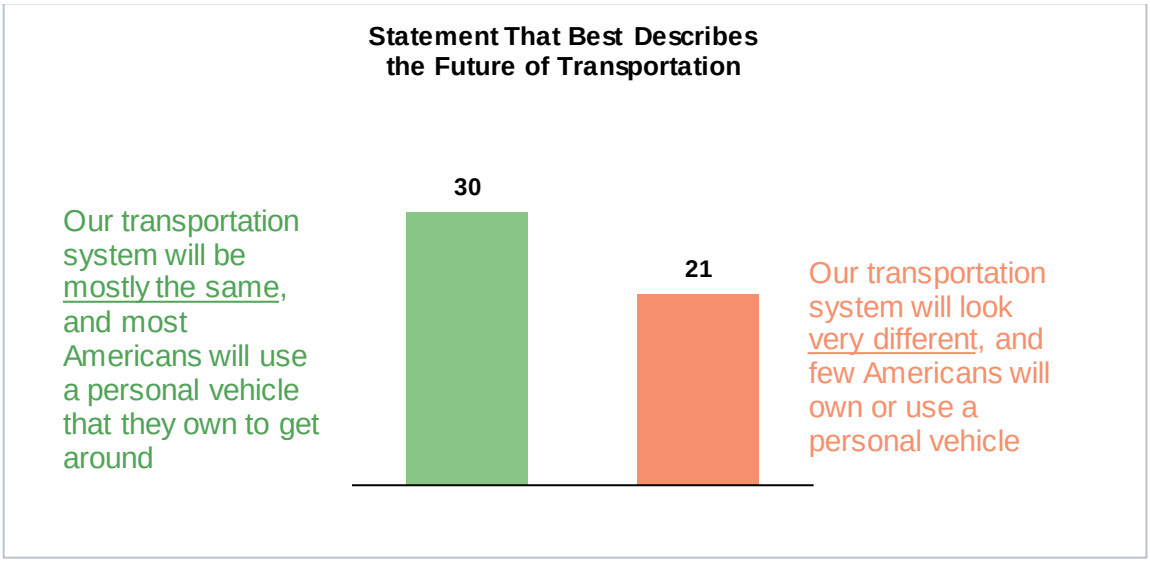
> *"There has to be some regulations against data mining. These things are going to know where you are any time of the day. They're going to know your travel patterns, when you are and aren't home." —Roseburg*

> *"I was concerned about improving laws regarding these new types of transportation. Consumer protection laws and laws in general. Are you keeping an eye on this? Are you changing and updating the laws to go along with it?" —Portland commercial*

3.8 TRANSPORTATION PLANNING AND PUBLIC INVESTMENTS

Participants said policymakers should plan to improve the state's inadequate infrastructure and build capacity for cars and public transportation.

Participants are more likely to believe that the transportation system of the future will look mostly the same, although there is a split in opinion.



DHM Research | October 2018 | Chart 6

Accordingly, many hoped policymakers would plan investments based primarily on current needs. Citing inadequate infrastructure, participants seemed to agree that repairing and maintaining the state's current roads, bridges, and highways are top priorities.

> *"If I were a city planner, I would first repair what isn't working now. Because there is a lot that isn't working now, and there's a lot that we don't have the funding for."*
>
> *—Lincoln City*

Adding capacity was important in two respects. Some participants expressed a desire to add capacity through more lanes and parking spaces. Just as many participants hoped the state would improve public transportation options.

> *"Fix the roads. Invest the money in public transportation, parking." —Portland*

> *"I would spend my public funding on going green with more energy-efficient transportation, with an eye toward public transportation, ride sharing, really encouraging cycling and walking, and making it safe." —Lincoln City*

In planning for the future, participants expressed frustration with past planning decisions. For example, narrow freeways in Portland that abut houses and other buildings were seen as proof of a lack of foresight. In describing these frustrations, participants did not acknowledge how planning for additional capacity 50 years ago would have required significantly larger public investments (and higher taxes).

However, participants did recognize that planning for an unknown future is difficult. Most tended to believe that roads would still be necessary when cars are mostly automated.

"Current infrastructure is inadequate. The needs may be different in 20 years, but due to increasing population growth more and better infrastructure will still be required—regardless of AV technology." —Lincoln City

Land use and transportation planning approaches that provide amenities and jobs near people's homes were attractive to residents, who saw smaller communities as a way to reduce traffic.

A few participants explained that a smart way to address capacity is to simply reduce the need to travel or reduce the distance residents must travel. Land use policies designed to encourage small communities were mentioned a few times.

"I was thinking about creating communities, more where everything is accessible in an area. [People] can just go grocery shopping or whatever all in their community. I don't know what you would call it. A marketplace area? Building housing with everything around it." —Portland commercial

"I would like to see them planning ahead concerning land use issues, both residential and commercial. If we're going to have these autonomous vehicles, we need to have corridors…Like a new development that would [be] super easy. There is Walmart. There is Sherm's. There is whatever. I can get my autonomous car, get off, and all I have to do is go out, like to a bus stop, and come back out." —Roseburg

3.9 FINAL ADVICE

Showing residents how automated vehicles operate may be more effective than describing their potential benefits. The benefits may not be credible to people who are unfamiliar with the technology.

At the end of the focus groups, participants asked state leaders to provide more information and education about automated vehicles. They specifically asked to learn more about how AVs could benefit residents.

"Inform and educate consumers how this will benefit them and the community." —Lincoln City

This may work for some residents, but based on participants' own reactions during the discussions, simple messages about the benefits that AVs could provide in Oregon may be dismissed as not credible. Additionally, positive messages may be overshadowed by a deep distrust of the new technology, particularly among older residents.

On the other hand, participants were clear that many of their fears derived from the unknown. They often struggled to picture or describe how AVs would operate, and only a few participants mentioned familiarity with automated features like lane-keeping assist and adaptive cruise control.

Therefore, examples of how automated vehicles work, particularly through images and video, may be much more helpful. Participants were reasonably open to short test-drives in automated vehicles, which could have a major impact on perceptions of AVs.

"I'd like to see a prototype, actually see it functioning in traffic, on the highway, on city streets. That would be kind of cool. I think that would probably convince me that, 'Okay, this vehicle knows what I'm doing. I don't have to be behind the wheel.'"

—Lincoln City

Participants were most likely to express positive opinions about automated vehicles when they considered how AVs could reduce carbon emissions and improve transportation options for certain residents.

Although many participants remained cautious or fearful of automated vehicles at the end of the focus groups, each discussion helped to shape opinions in the room. Many, if not all, participants at least warmed to the idea of automated vehicles when presented with potential benefits—even if they still preferred that AVs stay off the roads.

Two possible benefits stand out. One, participants readily accepted that automated vehicles could help reduce carbon emissions. This is likely due to the fact that participants assumed—unprompted—that AVs would be electric. Two, participants recognized the need for better transportation options for specific populations or circumstances, including people with disabilities, the elderly, people who are intoxicated, and those with inadequate access to public transportation.

"I would want to have it be a non-fossil-fuel-based program. I would want to have it be safer than human-driven vehicles. I would want to have it benefit the people that are basically poor working class. I would want its primary benefits to be for the people that need it the most." —Portland commercial

These potential benefits are easily described and don't require complex explanations. Even residents who are unfamiliar with AVs can quickly understand how they could cut down on drunk driving or provide freedom and mobility to people living with disabilities. These are key factors that may improve public acceptance of AVs in the future.

Appendix 4

Appendix A
Participant Demographics
City and Zip Code

Group 1	Group 2
[No city] 97266	[No city] 97367
Gresham 97080	Depoe Bay 97341
Milwaukie 97223	Depoe Bay 97341
Portland 97203	Lincoln City 97367
Portland 97209	Lincoln City 97367
Portland 97214	Otis 97368
Portland 97215	Otis 97368
Portland 97218	Otis 97368
Portland 97218	
Group 3	**Group 4**
[No city] 97756	Coos Bay 97470
Bend 97701	Myrtle Creek 97457
Bend 97702	Roseburg 97470
Bend 97702	Roseburg 97470
Bend 97702	Roseburg 97470
Bend 97703	Roseburg 97471
Redmond 97756	Roseburg 97471
Redmond 97756	Roseburg 97471
Group 5	**Group 6**
Aloha 97078	Beaverton 97006
Milwaukie 97222	Beaverton 97006
Oregon City 97045	Lake Oswego 97035
Portland 97206	Lake Oswego 97035
Portland 97209	Portland 97211
Portland 97217	Portland 97219
Portland 97225	Portland 97230
Portland 97232	Portland 97266
Tigard 97223	Tigard 97224

Occupation

Group 1	Group 2
Artist	Benefit and eligibility worker
Car lot attendant	Construction
Caregiver	Construction Project Manager–retired
Computer drafter	Florist–retired
Disabled—restaurants	Maintenance, Wildlands firefighter
Homemaker	Office manager
Logistics manager, supply change management	Property manager, Hypnotherapist
Re-entry mentor	Self-employed
Unemployed	
Group 3	**Group 4**
Administrative assistant	Chef
Apothecary, marketing manager	Financial services–retired

Civil engineering tech	Foster parent and homemaker
Hospital technician, musician–retired	Office manager
Human services specialist	Property manager
Peer support specialist—mental health	Service tech
Self-employed	Sound tech, chef
Sustaining engineer	Transportation
Group 5	**Group 6**
Auditor	Claims manager for lost and damaged freight
Broker	Courier
Customer service	Delivery driver
Driver, part time	Driver
Package driver for UPS	Event coordinator
Personal delivery driver	Lyft driver
Self-employed delivery driver	Lyft driver, night auditor for Grand Hotel
Taxi driver	Process server
Uber driver	Uber driver

Commute to Work or School

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Drive	5	5	7	7	7	9
Walk	--	1	--	--	1	--
Bike	--	--	--	1	--	--
Someone drives me	1	1	1	--	--	--
Taxi/Uber/Lyft	--	--	--	--	1	--
Public transit	2	--	--	--	--	--
Other: work from home	1	--	--	--	--	--
No response	--	1	--	--	--	--

Education Level

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Less than high school graduate	--	--	--	--	--	--
High school diploma	2	--	1	--	2	3
Some college; technical school, community college; 2-year degree	4	7	3	6	3	3
College degree; 4-year degree	1	1	4	2	3	3
Graduate degree	2	--	--	--	1	--
No response	--	--	--	--	---	--

Number of people in household

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
1	5	2	1	1	2	1
2	2	2	3	3	2	3
3	1	--	1	3	3	3
4	--	2	3	--	--	1
5 or more	1	2	--	1	2	1
No response	--	--	--	--	--	--

Household Income

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Less than $25,000	5	2	--	2	--	3
$25,000–$49,999	2	3	4	3	3	3
$50,000–$74,999	2	1	3	--	4	1
$75,000–$99,999	--	1	1	1	--	2
$100,000–$150,000	--	--	--	2	1	--
More than $150,000	--	1	--	--	1	--
No Response	--	--	--	--	--	--

Age

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
18–24	1	1	1	1	--	--
25–34	2	1	2	1	2	3
35–44	2	2	2	1	3	1
45–54	1	1	1	2	2	2
55–64	2	1	1	2	1	3
65–74	1	--	1	1	--	--
75+	--	--	--	--	1	--
No Response	--	2	--	--	--	--

Gender

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Male	5	3	3	4	5	4
Female	4	5	5	4	4	5
Non-Binary or Gender Non-Conforming	--	--	--	--	--	--
Other:	--	--	--	--	--	--
No Response	--	--	--	--	--	--

Racial or Ethnic Identity*

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
White	6	6	6	5	6	8
American Indian, Alaska Native or First Nations	1	--	--	--	--	1
Asian	1	--	--	1	1	--
Hispanic or Latino	1	2	3	3	1	--
Middle Eastern or North African	--	--	1	--	--	--
Black or African American	2	1	--	--	--	1
African	--	--	1	--	--	--
Native Hawaiian or Pacific Islander	--	--	--	--	--	--
Another race or ethnicity	--	--	1	--	1	--

*Multiple responses accepted

Appendix B
Written Exercise 1

Thinking about roads and transportation issues in Oregon, what are the biggest concerns you have right now? Star (★) the most important one

Group 1

- *Bus being late; potholes; no services on certain roads
- *Clogged freeways; need for more efficient public transportation; disrepair of roads—potholes
- *Congestion; traffic; bike access; road quality
- *Highways; traffic; congestion; roads; parking
- *Noisy TriMet riders and lack of accountability; potholes; signage—road signs on all four intersections, address numbers visible
- *Pavement or potholes—maintenance
- *Safety; traffic; infrastructure/quality; GPS
- *Traffic; road congestion; public transportation; safety
- *Traffic. What will traffic be like in years to come; public transportation; highway safety

Group 2

- *Alternative to public transport, no Uber; lots of potholes, lack of through streets not on 101, alternate routes; lack of tax; need more busses and more times.
- *In Lincoln City the traffic and congestion on Hwy 101 is a huge problem. There is NO way around it; lack of public transport; lack of commuter services in our area.
- *Lack of bus stops and transit hours, especially in the rural area.
- *Not enough sidewalks; must extend bus service; bicycles seem unsafe because there is so much traffic; tourist traffic on the coast; no ridesharing option.
- *Regular bus routes; bus stops protected from weather; Hwy 101 going South off Fowlweather; bicycle traffic; pedestrian traffic
- *Traffic–Too much for existing roads; Hwy [illegible]; planning for future needs, long term.
- *Transportation for impaired drivers; pedestrian safety; availability of affordable public transit; Uber/Lyft unavailable everywhere.
- *Undeveloped, poorly maintained roads; could maybe use more public transit; more accessibility to public transit.

Group 3

- [No star] We cannot build enough lanes, we need to think out of the box. Mass transit.
- *97—two lane, no center divider; upkeep of roads during the winter; roundabout etiquette; no freeway; no lights on 97.
- *Accidents; waiting in traffic too long; road rage; pollution; too many cars on the road.
- *Lack of public transit; congestion; limited bike laws; road repair, preference to wealthier neighborhoods.
- *Road maintenance/construction; overall traffic
- *Roads damaged; growing everywhere; road construction
- *The roads are sometimes unsafe because of surface damage and poor engineering regarding other roads, etc. The roads don't seem to accommodate the traffic ever. Roads don't seem to be friendly to bicycles. Roads don't take into account migration of animals.
- *Too small for growing population; projects take too long to complete

Group 4

- *Lack of community bus/transportation; May county roads not adequately maintained; Most tax money goes to Portland metro areas and the rest of the state gets left out.
- *Lack of maintenance; length of time road repairs take
- *Not enough three lane highways; not enough passing lanes on Hills
- *Road and highway maintenance; bridge safety
- *Road work; repair some of the streets in the city and other cities really need repair. Potholes need to be filled badly.
- *Safety on the roads; weather; high fatalities; drunk driving; air pollution from poorly maintained cars
- *The uncourteous drivers; road construction; unsafe semi-truck drivers
- *Where the transits are located and the times they come; ways to deal with some passengers that may be unpleasant; how often the transits are updated

Group 5

- *Bad/inadequate freeway system; traffic; poorly-designed intersections; TriMet—waste of money!
- *Congestion; lack of safe (divider) bike lanes; intersections with NO stop signs; lack of north/south bike lanes/greenways
- *Diversity and multiple choices in transportation options; congestion on freeways during peak periods—congestion hides productivity; street maintenance
- *No attention to parking when new condos are built; not enough lines to drive; push public transportation
- *No new roads being built; focus on per-mile billing for taxis, insurance; rising costs for transportation
- *Portland has many small roads with a lot of cars parked on both sides. Also, a lot of traffic.
- *Safety; congestion; liability (insurance/accidents) construction
- *Too many cars; construction; gridlock; potholes
- *Traffic; need bigger freeways; rude drivers

Group 6

- *Bad roads, not enough light, reflectors; traffic; 217 Beaverton; I-84 and I-5
- *Bicycles and cars on the same road; traffic; road conditions; pedestrians; conditions of bridges
- *Increased congestion, particularly on freeways; poor road quality in SE Portland; construction on most major freeways; poor driving from new gig economy drivers; bridge construction
- *Possible tolls; Bad road conditions (potholes); traffic; no way to upscale (add more roads)
- *Public transportation (horror story); emissions; traffic times; cyclists; pedestrians (growing numbers + bad drivers)
- *Too much traffic; bad roads; people not paying attention
- *Traffic congestion; road conditions; detours due to building construction
- *Traffic on freeways; health of our bridges and infrastructure; inter-city transportation; potholes
- *Traffic; bad roads (potholes); bikes and scooters; too much construction

For the starred issue, add a few sentences about why it is your most important issue and what you would like done about it

Group 1

- [Bus being late] I only take the bus so I'm late when the bus is late; more operators and buses

- [Clogged freeways] Traffic cannot flow easily, causing congestion and frustration. Build more and more efficient freeways.
- [Congestion] Affects drive time; increases risk of accidents; expand roadways
- [Highways] Highways are important. They are too congested. We need more lanes or highways.
- [Noisy TriMet riders and lack of accountability] It makes for an uncomfortable ride. It is the driver's job to hold riders accountable, not for riders to engage each other
- [Pavement or potholes] Becomes costly for vehicle repairs. Want city to do a better job of ensuring all roads are fixed.
- [Safety] Are traffic signs effective enough to all to understand? Paint needs repainting, signs need explaining
- [Traffic] I am a Portland native and they traffic issue here has become a serious concern. More people being added, what […]
- [Traffic] It's taking longer and longer to get anywhere. More cars every year on roads. More people using roads.

Group 2

- [Alternative to public transport] When your car breaks down you need a back up plan. If bus doesn't work I wish I could call an Uber or Lyft. We need those types of services in Lincoln County area.
- [In Lincoln City the traffic and congestion on Hwy 101 is a huge problem] The congestion on 101 during summer creates accident/safety issues and impatience among tourists and residents. A bypass need to be created.
- [Lack of bus stops and transit hours] Provide more transit buses, like running every 30 minutes vs only 5 times a day. It makes it difficult for people that are trying to find a job to go from point A to point B.
- [Not enough sidewalks] My daughter and I walk most of the time. So many sidewalks just disappear and we are left to walk on grass. So more sidewalks are needed.
- [Regular bus routes] Fix 101 South at the bottom of Fowlweather. Don't put asphalt on sand.
- [Traffic–too much for existing roads] Heavy traffic; slow moving; hinders commerce and frustrates daily driving.
- [Transportation for impaired drivers] People under the influence of intoxicants normally don't have an affordable means of transportation aside from their own vehicle. Institute a constantly available source of transport.
- [Undeveloped, poorly maintained roads] This is an important issue and a big one in a lot of communities in Oregon. Large cities always have roadwork being done. Smaller towns have dirt roads a lot of the time.

Group 3

- [97—two lane] Many accidents on the 97, many are head-on crashes. Divider could buffer cars from going into the wrong side of the road.
- [Accidents] Due to so much traffic in Bend there are too many drivers running red lights, driving where they shouldn't be. I don't want to be hurt or hit.
- [Lack of public transit] For those with limited income, public transit is the only way to get around. If non-existent or limited, it makes it that much harder to be self-sufficient.
- [No star] If I could not use my car and get around easily, I would. Like in Europe: buses, trains…
- [Road maintenance/construction] When there is construction or roads closed, it makes everywhere else a lot more congested. Needed but possibly do more road work at night.

- [Roads damaged] Roads need to be fixed in order to avoid damage or accidents, seems like the work, can't be caught up.
- [The roads are sometimes unsafe because of surface damage and poor engineering regarding other roads, etc.] I would like ODOT to be more thoughtful about using our money to make roads safer.
- [Too small for growing population] Plan ahead to sustain a population way bigger than what projections are.

Group 4

- [Lack of community bus/transportation] Many retirees, students need public transportation.
- [Lack of maintenance] Proper road maintenance ensures a continual flow of traffic.
- [Not enough three lane highways] I would like to see three lane roads between Eugene and Salem.
- [Road and highway maintenance] Where I grew up in California, roads are neglected and are poor for driving. It can be hazardous.
- [Road work] [No response]
- [Safety on the roads] I would like to see improved traffic demarcations.
- [The uncourteous drivers] It seems like things have worse as far as people being unsafe [illegible]
- [Where the transits are located…] [No response]

Group 5

- [Bad/inadequate freeway system] They need better infrastructure. Drops/overpass
- [Congestion] Leads to longer commute times. Extra idling causes more pollution.
- [Diversity and multiple choices in transportation options] People should have many choices to get around.
- [No attention to parking when new condos are built] With the addition of more multi-resident housing they […]
- [No new roads being built] A city cannot double in population with the same sized arterial network. This is like inviting 100 people to a great party in a studio apartment.
- [Portland has many small roads with a lot of cars parked on both sides] I can get very packed. I think the roads need to be improved or more modern. I noticed it is happening slowly.
- [Safety] Safety is most important to me because my life and livelihood depend on driving. Less congestion would improve safety; mobile phone enforcement.
- [Too many cars] Traffic is getting worse and worse every day. We need more lanes opened up for traffic. It's important because I have a long commute.
- [Traffic] Portland area needs to either add more freeways, or more lanes on the current ones.

Group 6

- [Bad roads] I drive in the evening quite a bit (people home from work) and in the winter it's awful to see while driving.
- [Bicycles and cars on the same road] This issue concerns me since I drive around all day. I see many bicycles that don't have the proper lighting on their bicycles. They also don't always abide by the rules.
- [Increased congestion] Congestion has gotten worse over the past few years. Perhaps freeway expansion or the introduction of more HOV lanes?
- [Possible tolls] I don't think that charging people more to use the roads is fair. Tolls will hurt lower and middle class (working class) people the most. Politicians will steal the toll money.

- [Public transportation] I feel like our public transportation isn't doing much to help the congestion of drivers and roads. People feel less and less protected on it and I have seen crime climb in the area it leads to.
- [Too much traffic] More roads; more public transportation
- [Traffic congestion] Fewer cars on the road. Perhaps the working public could have different work hours. Toll roads, but I do not want them and do not think they will work. Roundabouts?
- [Traffic on freeways] I feel our population has grown but our main freeways have not. Expansion of the freeways and more alternative transit would be my fix.
- [Traffic] The traffic is out of control in all areas. Making more accessible roads would help things.

Appendix C
Written Exercise 2

Now, think about transportation in Oregon 20 years in the future.

Which of the following do you think is more likely?

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
People will drive more miles in their personal vehicles	3	3	4	3	2	2	**17**
People will drive about the same amount of miles in their personal vehicles	1	3	2	4	2	2	**14**
People will drive fewer miles in their personal vehicles	5	2	2	1	5	5	**20**

Which of the following do you think is more likely?

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
People will spend more time in their personal vehicles	5	3	4	4	5	3	**24**
People will spend about the same amount of time in their personal vehicles	--	4	2	3	2	1	**12**
People will spend less time in their personal vehicles	4	1	2	1	2	5	**15**

Which statements best matches your view of what transportation will look like in 20 years?

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
Our transportation system will be mostly the same, and most Americans will use a personal vehicle that they own to get around	3	5	7	6	4	5	**30**
Our transportation system will look very different, and few Americans will own or use a personal vehicle	6	3	1	2	5	4	**21**

Appendix D
Written Exercise 3

What are some steps Oregon should be taking now to prepare for that future?

Group 1

- Come up with a feasible plan to ensure safe roads and accessibility
- Expanding road systems for cars and bikes
- Improve our roads (widen freeways); improve public transit; studies relating to above
- Make cars more affordable; higher minimum wage; lower cost of living
- Planning and roadways so fewer cars on the road. Need to put in more lanes on highways or more highways.
- Provide better transportation service and lower rates
- Road expansion; keep adding to public transportation; make public transportation more affordable
- Upgrade freeways—build more efficient freeways. Upgrade surface roads (fix potholes)
- Widening roads; expanding alternate modes: bike lanes, more bus routes, buses

Group 2

- Better back-way roads. Public transit available at night/on weekends. Find ways to avoid congestion.
- Employ more bus drivers. Add flexible transit times.
- Encourage more cycling and walking by adding more sidewalks, more bike lanes and more incentive to walk or bike.
- Forcing regulations concerning COI emissions. Improving roads. Making roads safer.
- Improve public transportation opportunities. Reroute traffic from the most congested areas.
- Need to devote more money to mass transit. Need to research alternative fuel types and encourage people to use mass transit with incentives.
- Planning for different types of transportation. Addressing traffic issues where personal vehicles are still or will continue to be basic transportation.
- Start over; Realize what you're getting into

Group 3

- Electric roads/autonomous vehicles
- Expand roads, major highways to sustain growth that is and will happen.
- Maintenance on roads; adding more lanes to busy areas
- More highways/parkways, better transportation options in rural areas.
- More long trip vehicles available like metro train available for cross-city travel. Bigger roads, more lanes for amount of people moving here.
- More public transportation to cut down on traffic. More forward-thinking city and street planning. Overestimate population.
- Oregon should force public transportation on selfish people who will not use or support public transportation. Oregon must prepare for more people on the roads and provide an alternative to having to drive.
- Road work being done and/or added. Needs to be well planned out to make the most of it.

Group 4

- Budgeting for roads, public transportation, surveys.
- Build more three lane highways

- Earthquake proofing; better, cheaper public transportation
- Making sure that funding is allocated and used for roads and highways.
- Planning slow of traffic, influx etc. Making sure bridges etc. are safe.
- Promoting development along main driving corridors.
- Road work increase
- They could add a mobile service or real time tracking so you can check times. This eliminates late or early transportation.

Group 5

- Build new roads and expand existing ones; reduce the costs of personal transportation rather than mass transit total emphasis
- Road expansion; additional freeway and highway lanes; reduce permitting of new residential housing. This brings more cars to a neighborhood. I.e. Sellwood.
- Ensure corporate liability regulations; continue to improve/expand public transportation options.
- Take an accurate poll/census of as many people as possible to assess how they travel/commute
- Some kind of fast rail service; more freeways
- Add more public transportation avenues to alleviate traffic; add more travel lanes for traffic
- Plan infrastructure; stop wasting money on additional light rail, it doesn't work.
- Prepare for increased population. More people will be moving to Portland, in my opinion
- Public transportation 24/7—no gaps in service. More bike lanes and greenways—a push toward less driving; mileage requirement—fuel efficiency requirements

Group 6

- Adding skyrails to free up roads; expanding freeway lanes
- Better city planning; better public transportation; incentivize public transportation
- Concentrate on roads; to see to drive; preparing for more vehicles; work on traffic
- Embrace autonomous vehicles; improve public transportation
- I believe since more people are working from home or remotely, traffic numbers will go down some but better, safer public transportation is needed.
- Looking at the road conditions and seeing how they can improve.
- More roads; fix streets; I'm not really sure
- Subsidizing transportation fares to encourage transit; widening bike and bus lanes; investing in the best transportation infrastructure; tax cuts for public transportation riders? Taxes on auto sales? More charging stations for electric vehicles.
- Widen freeways; expand rail transit options

What role should government play in leading these steps?

Group 1

- Finance upgrades of freeways and surface roads through prudent fiscal policy
- Fund expansion; work with private sector
- Funding expansion, working with private sector
- Government should provide more funds to assist people for affordable transit fare
- Incentives for using alternate modes (non-personal car)
- Not sure this is a governmental issue as much as it is a […]
- Regulating whether or not all businesses are following rules and becoming more affordable

- The government should be at the forefront fixing the infrastructure
- Transportation equals money since government is all about money

Group 2

- Government should allocate more funds for transportation improvements and safety
- Grow up
- I think government should use rewards and incentives to get people to switch. We love our cars too much. Make it in a person's [illegible] to switch.
- Implement incentives to reduce existing oil fueled vehicles.
- More contracts for road crews. Pass legislation to reduce CO2.
- None. The public should lead and help instate better transportation, with the help of local officials.
- The first lady can always advocate for cycling and walking to promote healthy lifestyles. Make witty slogans or campaigns. Get active in schools!
- Think of the minority that are discouraged due to the lack of transportation.

Group 3

- Build more roadways and focus on the communities that are growing the fastest.
- Educate people, help cities provide transportation.
- Funding for mass transit. Support community industry and housing so people don't have to drive so far to work.
- Government should plan for growth and develop solutions.
- Look at strongest needs and offer incentives.
- Mainly responsible to getting the ball rolling and fix these issues.
- Set the structure for e-road. Build the infrastructure, develop strategies
- Should be funded by state and some city funds.

Group 4

- Allocate funding for repair
- City, state, and county roads maintained. Vote for money people should have a say.
- I expect the government to lead the way in building/maintaining the roadways.
- I'm not sure what the government's role in this should be.
- Non-profit private sector participation.
- Planning ahead concerning land use issues, both commercial and residential
- The government could give a way to authorize an action of some sort to help avoid conflict.
- Using our tax dollars wisely to provide for roads and highways along with public transit.

Group 5

- Build infrastructure to make transportation more efficient.
- Fund projects for construction to add more travel lanes
- Fund road and highway expansion
- Get out of the way of the private sector; deregulate transportation industry; stop having drivers subsidize mass transit; reduce regulation
- Keep improving the roads and preparing for more people.
- Mass transit planning/funding; facilitate third party options (rideshares, etc.)
- Minimum fuel efficiency requirements; incentives for biking/walking/busing/MAX; gas tax increases

- Public safety; protect climate; maintain/expand infrastructure.
- Toll? Additional revenue from Washington state drivers; plan how to eliminate cars—telecommute, offer business incentives.

Group 6

- Almost all of it, with state and local government
- Each city should be responsible for changes.
- Government can model their commitment to public transportation by making it more accessible to all.
- Government funding. Mandating or "forcing" states to improve the flow and safety of drivers.
- I think it should be up to the individual states to decide what is best for their states.
- Not a lot, county and state
- Public transport police force of some kind. People need to feel safe and protected on TriMet, Max lines and other forms.
- Regulate development; incentivize public transportation; subsidize public transportation
- Some help, but not all

Appendix E
Written Exercise 4

When you think about autonomous vehicles, what comes to mind?

Group 1
- AI; lack of human control
- Elon Musk
- Expensive; obsolete unless all are autonomous; unsafe
- Jetsons! Crashes; safety; product not been studied enough—could improve safety
- Not sure. They can always malfunction or get hacked
- Scary. We rely too much on technology without knowing the consequence. Window breaking devices are being given away freely now because our car windows are no longer manual and present a safety hazard.
- Sport cars (Tesla); cars that you just need to get in and it will start on its own
- Vehicles that can be programmed to go to a specific destination with humans able to override in emergency
- Why bother?

Group 2
- Driverless cars; having your car set to autopilot but also parking assist and lane change notice.
- Driverless; smoother flow of traffic; safer
- Google
- More efficient
- Never heard of that word. I don't know.
- People would be idiotic to trust a self-driving machine. Artificial intelligence is not safe.
- Self-driving, self-navigating cars
- The future; The Jetsons, cars that can fly; Cars that don't necessarily run on gas.

Group 3
- Driverless car/bus/train
- Driverless cars and cars that sense things to prevent accidents. Cars that can give computer information to satellites to help you.
- Driverless cars with sensors that tallow safe passage from one location to another. Tesla.
- I don't know…Self-driving cars?
- Mass transit with set routes. For the love of god, please no self-driving cars!
- Vehicles that are programmed for safety, and are fuel efficient?
- Vehicles that drive themselves
- Yes we can move more people with less vehicles and you can park more cars in less space.

Group 4
- A new technology that currently needs improvement but is totally viable.
- Absolutely not a good idea. I hope this does not become a way of transport.
- Don't like; really don't think safe overall; all roads couldn't be used by them, at least in rural areas
- Hydrogen powered self-aware robotic vehicles
- I feel like it is something we could definitely see in the future, but I also believe that a lot of Americans are independent and want to still drive themselves.

- Self-driving vehicles, I don't feel would have the same reaction time as a human.
- Too reliant on technology; not totally sold on the idea
- When I think of an autonomous vehicle I think of the AI, what's the car/vehicle's design, how does the AI work?

Group 5

- Cars that drive and navigate themselves. No driver participation.
- Cars that drive themselves so efficiently I can read a book or as the "driver" they drive themselves so well I am just a passenger. They link with one another to prevent accidents and accelerate in unison off of stops (red lights)
- Driverless cars. The Jestons. Bullet train.
- HAL 9000; death traps; terrorism; hacking
- It would take a lot of control by the car and the roads would have to be changed.
- Johnny Cab from *Total Recall*; software crashes/glitches/hacking; autopilot in planes
- Self-driving vehicles. Something that doesn't need a human to operate
- Self-driving/safety high priority; lane changes automatically. Safe.
- Self-steering; carpool lanes; app-delivered vehicles

Group 6

- A lot of motorized vehicles is the only thing that comes to mind. I am not familiar with the phrase.
- Dangerous! Bad idea! Not enough technology yet.
- I like the idea, but I'm worried about who will be investing in them. I think they could make the roads much safer, but I would hate to have an entire infrastructure build just for private companies, for instance.
- Just as much traffic. They would help the trucking industry because of the employee shortage. Disabled and the elderly would benefit if they are not able to drive.
- Not sure what it means
- Self-driving transit on demand; being able to order a private driverless cab; not have to drive your own car
- The Jetsons; safety; the future; less congestion; planned routes; algorithms; AI; Artificial Intelligence
- Vehicles to borrow? No brand?
- What comes to mind is that it is a self-driving car.

How familiar are you with autonomous vehicles?

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
Very familiar	1	1	--	1	--	2	**5**
Somewhat familiar	3	1	2	4	4	2	**16**
Not too familiar	3	5	4	3	3	2	**20**
Not at all familiar	2	1	2	--	2	3	**10**

Appendix F
Written Exercise 5

Imagine you have access to a fully autonomous vehicle, with no driver needed at all.

Would you want to own your own vehicle or rent one as needed?

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
Own	6	4	3	1	5	6	**25**
Rent as needed	3	4	5	7	4	3	**26**

Why?

Groups 1–2 and 4–6 were not asked this question

Group 3

- [Own] As long as it could be 100%. Still skeptic with other drivers.
- [Own] I don't like to feel stranded. I am pretty impulsive when I come and go.
- [Own] I prefer to own my own things outright and not make continuous payments.
- [Rent] I don't get out much and don't need a car full time
- [Rent] I don't need. It would be like mass transit.
- [Rent] I like to have control over my driving
- [Rent] I wouldn't want one at all. Let someone else deal with cost of maintenance and insurance.
- [Rent] It would probably cost a lot to keep it up with new technology.

How comfortable would you be riding in your own fully autonomous vehicle for most of the trips you take?

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
Very comfortable	1	3	1	1	1	2	**9**
Somewhat comfortable	2	--	5	2	3	5	**17**
Not too comfortable	6	3	1	3	3	1	**17**
Not at all comfortable	--	2	1	2	2	1	**8**

Why?

Group 1

- [Very] No response
- [Somewhat] I feel somewhat comfortable because I still will like to be able to operate the car in case something goes wrong.
- [Somewhat] Would need to be aware of traffic and situations in case override is needed.
- [Not too] Because I would have apprehensions of is it really capable of getting me where I need to go safely.
- [Not too] Glitches, hackers, falling asleep
- [Not too] I am not convinced these vehicles are safe. I don't fully trust.
- [Not too] Need a reason to trust.
- [Not too] No control over the vehicle, or very little control
- [Not too] They can always malfunction.

Groups 2–6 were not asked this question

How comfortable would you be riding in a fully autonomous vehicle with people you don't know for most of the trips you take?

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
Very comfortable	1	2	1	--	1	1	**6**
Somewhat comfortable	2	1	1	2	1	3	**10**
Not too comfortable	3	3	6	4	3	3	**22**
Not at all comfortable	3	2	--	2	4	2	**13**

How comfortable would you be riding in a fully autonomous vehicle between two limited destinations (for example, between MAX stop and work, around college campus)?

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
Very comfortable	2	2	3	2	2	3	**14**
Somewhat comfortable	6	2	4	4	2	3	**21**
Not too comfortable	1	2	1	1	2	2	**9**
Not at all comfortable	--	2	--	1	3	1	**7**

Appendix G
Written Exercise 6

What are some of your positive feelings about AVs—what are you excited about? Star (★) what you are most excited about.

Group 1

- [No star] Kinda cool tech; could do those things that are currently distractions while in motion
- [No star] Less traffic on the roads; less emissions for the planet; more precise on traffic
- [No star] Safety will improve?; no more drunk drives; less accessible
- [No star] You probably wouldn't need a driver license; less DUI
- *Efficient; time saving; planet friendly; possible lower cost
- *Getting more done; lower traveling cost; meeting people; traveling to new places; vending machines
- *More precision; less stress; potential for increased security
- *Reduced driving stress; adds safety of automatic adjustment; able to focus on family riding with you
- *Safer roads; fewer accidents

Group 2

- [No star] Air transportation; less air pollution
- [No star] Nothing. I do not trust them and will refuse to use one in the future.
- [No star] The option to have someone or something drive me when I am unable to; save on fuel and carbon emissions
- *Environmentally friendly; quicker; safer
- *Help when you can't drive sober; help you stay in your line; help you park; let you know safety issues
- *I am excited about being part of progress and change; Also, I am sure this is efficient transportation.
- *The potential for easy access; not being forced to interact with a human driver; reliability; handicapped
- *Time; save gas; innovation; change; new; traffic

Group 3

- [No star] Ability for people who can't usually drive be able to have that freedom to go wherever. Cost to go down.
- [No star] Hope for the future. Help with global warming. Less accidents.
- [No star] If they work, it's a great mode of transportation to get around
- [No star] No stressful driving; possible lower cost in the long run.
- *Eliminate human error; be able to do other things while driving.
- *Potential for reduced number of vehicles on the road; potential for improve gas mileage
- *Safety. No-stress driving. Being able to go far away and take a nap if I want.
- *The lack of human error; the potential to help people who can't drive.

Group 4

- [No star] Safety features; sensing distance; not excited in general
- [No star] The potential to have fewer automobiles on the road. The opportunity to change America's relationship with the automobile.
- *Convenience, not having to focus on driving, wear and tear on personal vehicles
- *Less traffic on the roads
- *No gas; autopilot; safety

- *Safe driving conditions; more accessible public transportation
- *Safety; hopefully more economical
- *Self driving vehicles in bad weather or nighttime.

Group 5
- [No star] Nothing
- [No star] Use commute time more productively
- *All the cars would stay in the proper lane
- *Better drivers; efficiency; safety
- *Efficiency; safety; cost-effectiveness; less pollution
- *Free up time; not having to pay attention; cheaper insurance
- *Freeing up my time/focus/energy; increased safety; more efficient commute—decrease commute time
- *New tech advances unrelated to vehicles. Robot and drone applications
- *Save energy for more things; less stress of driving; don't have to focus as much. Less stress

Group 6
- [No star] I'm not. I don't like the idea.
- [No star] Less stress; get things done; no parking—I'm in and out; you can work and ride to where to you need to go to work or play
- [No star] No distracted drivers; traffic flow could run more smoothly; less car accidents
- [No star] To help people that are not able to drive due to age and disability. Better drivers, the AV would be regulated to drive the speed limit and obey laws of the road.
- *Automation; smart technology; futuristic; efficient
- *Less stress being the driver; cars interacting with each other for safety; following the rules of the road
- *No more people drinking and driving; relaxing while in traffic; on demand transportation; easy navigation in strange areas
- *Possible congestion relief; can multitask while being driven; potentially less fatalities on the road
- *Safety; relaxing on a road trip; potential for public transportation that isn't reliant on people; parking; could make ride sharing so much easier and safe.

How could autonomous vehicles improve your community?

Group 1
- Allow people to travel more freely
- Bettering emissions; bringing people together; making traveling easier
- Easier to get around
- Less likely to have accidents
- Less traffic; less accidents; not sure?
- More free time. Car does GPS for you so you don't have to look up directions
- Reduce accidents; more efficient commutes; less stressful drivers
- Reduce DUI (death); hopefully electric
- Safer roads; decreased carbon footprint

Group 2

- Could provide a good alternative for handicapped people; could improve public transit.
- Emissions
- Improvement for tourist travel; improvement for elderly or disabled; improvement for school children
- Less accidents; traffic; pollution
- Provide transportation for those who are unable to drive or choose not to drive.
- Ride sharing eases need for public transportation; improved safety; relieve traffic
- Take drunk drivers off the road; reduce tourist traffic; improve transportation for those without cars
- They can be the sober drivers; Help have more alternative transport available like a car share or more buses that don't need drivers.

Group 3

- Eliminate drunk driving; allow people to get around.
- Gas pollution; less traffic/road rage; DUII
- If they're available financially poor, sick disabled people who can't drive can get to where they need to go. If they are affordable.
- Intersection with fellow passengers; can text without risking the lives of pedestrians and other drivers.
- More people fitting into a vehicle; less cars on the road
- More people would have access to public transportation and be able to be productive. Hopefully would be cost-effective for anyone.
- Social environment. Getting more people together in a space where they can make friends.
- With self driving buses, help more people get around places in town. Bigger amount of people are able to get places, rather than a self driving cars that hold two people.

Group 4

- [Nothing written]
- Allowing more shut-ins and agoraphobes transportation
- Couldn't in this small town, except if buses were perhaps
- I'm not sure. Maybe just being forced to be around people or interact with people more.
- Less road hazards and dangers; better economy
- Less trips equals less pollution and congestion.
- More interaction with people in general, in regards to AV in public transit
- No more need for traffic lights

Group 5

- Cheaper insurance for all; less fatalities // cheaper insurance for vehicles
- Could be less smog from electric car // It would cut the cost of vehicle transportation
- Handicapped individual can "drive" // possible reduced labor and liability costs
- Help those who can't drive get around // Improve my industry? Unsure.
- Increased safety; lowered commute time; less idling—cleaner air // Less accidents; more efficient delivery times; potential wage increase from drop of insurance costs for drivers
- Possibly safer driving. Less accidents if done right.
- See above [Efficiency; safety; cost-effectiveness; less pollution] // If I were the owner of a fleet of AVs I could have passive income
- Systems; efficient; less accidents // more time; I'm more safe; able to multi-task
- They will not improve the community. They will just add to street and sidewalk clutter. Competition, Car2go, Flexcar, scooters, etc.

Group 6

- Congestion relief; less roadside issues; less accidents
- Easier access to transportation; safety, less accidents
- Helping people that cannot drive and not able to use public transportation
- I would be excited to not see texting people causing accidents and also solve some of the congestion by improving driving. I'm really excited to see how it could make public transportation cheaper.
- Just more cars on the road
- Less bad drivers; less stress on people
- Less traffic problems
- Reduce traffic; free up time. You can do other things without having to focus on the road.
- They could improve the community by cutting down on congestion.

Appendix H
Written Exercise 7

What are some of your negative feelings about AVs—what are you worried about? Star (★) what you are most worried about.

Group 1

- [No star] Lack of human contact
- [No star] Malfunctions; may forget to program
- *Malfunctions—need a failsafe
- *Safety; cost; availability; dependability
- *Tech; pedestrian access
- *Technical malfunction; more congestion if highways not improved
- *Them malfunctioning or being unable to control
- *Unsafe—faulty product; cost
- *Won't stop; hacking

Group 2

- *Affordability; maybe some people will be shut out or non-trusting due to lack of education on the subject
- *Batteries; landfills; environmental effects; road tax
- *Computer gets disconnected and routes you somewhere else; $$
- *Costs; lack of control; possible safety issues
- *Crashes; short out and break down; take a long way like when the GPS sends you the long way and makes you late.
- *Implementing before technology is finished; Not having human backup/interface
- *Machines glitch often; hackers could hack into the system; if it picked up my child would it bring her to me?
- *Potential to malfunction; wrecks; price tag decreasing availability

Group 3

- [No star] None
- [No star] That you rely on it. In the future you don't learn to drive.
- [No star] The cost of upkeep; having one available to me; will we still be able to be spontaneous?
- [No star] They could go haywire for some reason
- *Can't stop human errors of reckless driving; technology errors.
- *Further automation taking away jobs; clogged roads due to technical glitches or slower pace. It would be a technology outside the financial means of most/many people.
- *Not being in control/relying on senses to not error up or see things that human could detect. Weather issues. Snow.
- *Not having a way to escape if you see it coming; the accidents that can happen may be greater if something goes wrong; that it would not be available to all classes.

Group 4

- [No star] Bad satellite contact ergo bad directional capabilities
- [No star] Design; safety; AI; can it have an autopilot

- [No star] I am just worried about the safety factor.
- [No star] Lack of independence; the fact that there could be a major glitch that could cause catastrophic loss of life
- *How would it be funded: How would road maintenance be funded adequately if gas consumption decreased?
- *I am scared of getting in a wreck
- *Loss of individuality, go where, when; in large cities it might work
- *Relying too much on technology; How pedestrians would interact with AVs

Group 5

- [No star] Costs; system problems (not having all the kinks worked out)
- [No star] People could be less attentive and that could spread to all things
- [No star] These cars cannot respond strategically to be as flexible to circumstance as a human for unstable driving in hazardous road conditions. Hackable. How do they fill fuel?
- *Hacking; accidents
- *Hacking; liability; trolley problem
- *Hacking; not in control; expensive to maintain
- *Loss of jobs; safety; lower class and people with disabilities left behind
- *Not failsafe; too expensive for average people
- *Unable to react appropriately to all situations; more expensive to own

Group 6

- [No star] Elitism, only some people can have them and we all have to own them to get by. Death of driving skills? Algorithms which seem neutral being programmed by people with biases.
- [No star] Human error. Would not help traffic congestion. Expense would outweigh ownership of a regular vehicle.
- *AI issues; pedestrians and cyclists
- *Being in a car with someone I don't know. Not being in control
- *Malfunction; high costs for repair
- *Malfunctions; not being able to drive anymore
- *No one in charge; wouldn't want to ride with other people
- *Other non-AV cars on the road; safety, how well do they work?
- *Trusting auto manufacturers; trusting software companies, getting hacked; safety; liability; cost

What harm could autonomous vehicles cause for your community? Groups 5 & 6 only: How could AVs harm your industry profession.

Group 1

- Accidents, malfunctions
- Bigger crashes; people who can't drive; carelessness
- Hackers—lack of human control
- Injuries?; more parking spaces being used; taking away from public transportation fund
- Make people lazy; more drunk drivers; more unsafe situations.
- Malfunctions could compromise safety
- Maybe more property crime

- More congestion if highways/freeways not improved
- No help when needed; medical problems, no one to assist

Group 2

- AV related deaths due to system glitches or failures. Taxi and bus drivers would lose their jobs. People will become dependent on AVs.
- I don't know
- None
- Participation
- People may feel too isolated or insulated riding alone
- Possible traffic congestion; wrecks
- Waste; environmental [illegible]; watershed damage; migratory fish populations
- Worried they will crash and cause accidents

Group 3

- Failed, caused an accident.
- Further separation of classes.
- Hacking a system into the vehicles
- I do not think there would be harm to the community.
- I'm not really sure?
- None
- People wouldn't be able to afford them.
- The ability to own or to use the vehicle. Could become a status symbol of some kind.

Group 4

- ? streets, destinations not same as in metro
- Frustration from people who are driving.
- Lack of independence
- Misdirected vehicles causing accidents
- People getting hit by them; kids; bicyclists; the AV hitting other cars or taking you where you don't want to go
- The technology has the potential to be hacked or destroyed
- They could create chaos amongst other drivers by crashing or breaking down
- Traffic jams if there is a problem

Group 5

- [No response]
- Could cause more traffic // would not need transfer drivers
- Hacking; fatalities/computer glitches // Not pay employees as much; less personal service; no GPS in rural areas
- If a crash happens. No control over the vehicle. Less jobs. It would have to change with the times, along with thousands of other drivers.
- Makes debatable choices in regards to "trolley problem" // Less driving positions; potential for loss of wages or jobs altogether.
- More disconnected people; increased income disparity // Very few—no more independent taxi drivers

- Potential accidents/injuries to pedestrian/bike traffic // Harm my industry? Fewer job opportunities.
- Potential for problems; costs // Really none; if I don't have to drive, more time to focus on other tasks.
- Unemployment for drivers; congestion // Reduced sales due to less business contact

Group 6

- Can't offhand think of a way they could cause harm.
- Death if malfunction; loss of privacy, GPS trackers
- I can't think of anything.
- I don't know much about them, so I don't know.
- I don't see them as causing more harm than regular cars. Maybe they will put drivers our of a job which would be awful.
- Make us less aware; allow us to give in to distractions
- More accidents due to malfunction
- Safety; dependability; getting hacked, terrorism
- Unforeseen power failure of the AV itself

Appendix I
Written Exercise 8

Would autonomous vehicles influence how you get around?

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
Yes—a lot	4	1	4	2	--	5	**16**
Yes—some	2	4	2	3	2	2	**15**
No—not much	3	1	--	3	3	1	**11**
No—not at all	--	2	2	--	4	1	**9**

Why or why not?

Group 1

- [Yes—a lot] Allow me to reach destination; allow me to utilize this time I now devote to driving
- [Yes—a lot] Either make it more expensive or inexpensive; make traveling riskier for safety
- [Yes—a lot] No, need to wait. I can relax. Won't miss turns.
- [Yes—a lot] Would enjoy not focusing on errands such as to the store. Would be able to de-stress while driving
- [Yes—some] Some time. Less travel due to better road conditions (fewer accidents equals congestion)
- [Yes—some] Starting to change my mind a bit. If it improves safety then I'm all for it! Double, if it lessens traffic issues!
- [No—not much] Because not too sure of them. Like to have control and no help if needed.
- [No—not much] Still need to commute.
- [No—not much] There's still the issue of the commute.

Group 2

- [Yes—a lot] We would suddenly have a tempting, exciting new transportation option that would hopefully help us out!
- [Yes—some] Could possibly be an easier way to and from work
- [Yes—some] If they helped with mass transit it would benefit my family. But if they short out and run over my kid that would be a terrible impact.
- [Yes—some] Most of my needs are to out of the way places or rural areas. Probably not practical.
- [Yes—some] Savings on gas
- [No—not much] I prefer to have the freedom and control of my own vehicle.
- [No—not at all] I will have nothing to do with them. I would rather drive myself or walk.
- [No—not at all] Too new, don't trust the technology

Group 3

- [Yes—a lot] Because I would use it/them
- [Yes—a lot] I could go places I would like to go but can't because there is no public transit. I could use as needed.
- [Yes—a lot] I would totally use it if available, especially for long distances, or to crowded areas.
- [Yes—a lot] If they ran efficiently I think many people would benefit from one. People can get to and from work, the store, etc.
- [Yes—some] If I had to go somewhere unexpectedly I'm not sure I would want to wait around for a ride.

- [Yes—some] Yes some—if I own my own vehicle than I would be okay with them influencing how I get around.
- [No—not at all] I would not feel comfortable or as safe using one. I think I'm a safer driving by using skills and feelings that computers don't have access to.
- [No—not at all] Rather I'm driving or with a self-driving car, I'm still getting to wherever I need to be. Would not influence me at all.

Group 4

- [Yes—a lot] Because it seems you would be limited to where you could go
- [Yes—a lot] I think it would give the idea of perspective. Things could become seen as wait times.
- [Yes—some] As long as a human driver was behind the wheel.
- [Yes—some] I would use them as public transportation
- [Yes—some] Simply it would change the vehicular dynamic on public roads
- [No—not much] For the most part, I like to drive and trust my driving instincts
- [No—not much] I can only hope the structure of the utilization of this new technology is well planned and managed.
- [No—not much] Prefer to choose own destination like my personal car

Group 5

- [Yes—some] Because there are still cars on the road—this doesn't really address the infrastructure
- [Yes—some] I do not own a personal vehicle. I use Car2go, TriMet, scooters, and walk. So, if I were taking a taxi or Car2go, it would replace that.
- [No—not much] I don't plan to use them until they have a long track record of safety and success
- [No—not much] I'd still need to drive or be driven to places. I'd much rather have an autonomous chaffer to drive me for errands and engagements.
- [No—not much] Not yet at least. They are still very new and I don't trust them yet.
- [No—not at all] [Nothing written]
- [No—not at all] I wouldn't ride in them
- [No—not at all] I'd still do as much commuting. Maybe even more. I'd feel safe in an AV
- [No—not at all] It would change two drivers and that's all.

Group 6

- [Yes–a lot] Because I live close to the city. If I lived elsewhere, or further from the city the need would be less.
- [Yes–a lot] I would be worried driving my own vehicle knowing these are on the road. Malfunctioning!
- [Yes–a lot] I would choose AV over other transportation options if its cost of use is less than owning a car.
- [Yes–a lot] I would use them for all my transportation needs.
- [Yes–a lot] They would be huge in my line of work, mapping and no need to find parking.
- [Yes–some] If it were paired with a shift in public transportation. I would be inclined to use it more as a personal vehicle for road trips, for instance. I don't know if I could afford to own one.
- [Yes–some] They would probably be going the exact speed limit. It could mess up the flow of traffic. Just wondering how AVs and not AVs would flow together.
- [No–not much] Not going to help me at all.
- [No–not at all] I am not interested in giving up driving cars.

Appendix J
Written Exercise 9

All things considered, do you think autonomous vehicles today are:

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
Safer than human drivers	3	--	2	2	2	3	**12**
About the same as human drivers	4	6	4	2	1	3	**20**
Less safe than human drivers	1	2	2	4	6	3	**18**
No response	1	--	--	--	--	--	**1**

Think about 20 years in the future. Do you think autonomous vehicles will be:

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
Safer than human drivers	8	5	7	5	7	8	**40**
About the same as human drivers	1	3	1	2	--	1	**8**
Less safe than human drivers	--	--	--	1	2	--	**3**

How comfortable are you with having fully autonomous vehicles on the road today?

Response Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total
Very comfortable	--	--	1	1	1	1	**4**
Somewhat comfortable	6	3	5	3	3	4	**24**
Not too comfortable	3	4	1	2	1	2	**13**
Not at all comfortable	--	1	1	2	4	2	**10**

How safe do autonomous vehicles need to be before the state allows them on the road?

Group 1

- 100%
- 99% error/accident free. Proof of successful trips
- All vehicles autonomous. Merging experts.
- Close to bulletproof.
- Equal to or greater than 90% success rate.
- Give it a year or two. Conduct a lot of tests.
- Proven record of no accidents.
- They need to have plenty of tests done before they […]
- Very safe

Group 2

- 100% lawsuit proof
- I think there needs to be a lot more research and development before that. They should at least have some kind of override so a person can take over if needed.

- It must be 100% safe to avoid a lawsuit.
- Same as or better than human driver in any particular circumstance
- They have to be fool proof, unable to be hacked. When there is 100% no way they will cause an accident, I may possibly take that chance. AV's need to have signs so people know there is no driver. Let it win a NASCAR race.
- They would need to be 100% fully functional and proven safe for riders AND other vehicles.
- They would need to be accident proof
- Way safer than humans. 99% success rate in tests.

Group 3

- 100%
- 100% safe
- 100%+/- given there are so many drivers on their cell phone and other forms of distracted driving.
- Certain mileage or driving hours in all conditions without an accident
- I imagine that they have to be very safe before putting people at risk if they were to fail
- Just enough data that proves them effective
- Tested many times
- They need to be safer than human drivers, with a very low percentage of accidents

Group 4

- 90% reliable
- A long viable track record showing no accidents, misjudgments, etc.
- As safe as a human being at the very least.
- Completely foolproof; accident free
- I feel if they can predict a crash with random features/factors they could be allowed everywhere
- I think they should be permitted with a human driver present at all times.
- They need to be glitch free, have sensors good enough to match human instinct.
- Totally reliable for any miscalculation; 100% on all testing (like the way cars are tested for crash, etc.)

Group 5

- Be able to avoid accidents even when others make mistakes.
- I do feel there is a point to measure that data. Because there are so many variables to factor. Even Max light rail (and airplanes and trains) runs it requires a handler/driver
- Need a track record of safety/accident free. Need to see how they work in congestion with other auto vehicles.
- Network security is my primary safety concern, and that seems very difficult to regulate or prove.
- Pass various safety tests.
- Potential for error/accidents <1% than that of humans
- Safer than they are now. Improvements need to be made first.
- Very safe. Can prove they are able to handle a wide variety of potential accident-causing situations.
- Zero accident record for five years. Hack-proof networks.

Group 6

- Again, I feel that I don't know enough about how the cars make decisions to know if they will be totally safe. Mostly it's just a new concept. I would be excited to see them today! Humans are not super safe drivers.

- Extremely safe. Years of testing. 10+
- Extremely. No accidents.
- Have a proven record of less accidents than driver cars.
- I don't know
- It would need to have a less than 2% error margin/accident margin for people to accept it.
- No safety issues at all! Zero malfunctioning.
- Safer than human drivers, beat the current statistics
- They need to be very safe and well tested.

Appendix K
Written Exercise 10

Imagine you are a city planner. You are looking at funding, parking, roads, and public transit now—and these decisions will have a big influence on what infrastructure is available 20 years in the future. What should you be thinking about? How should you spend public funds?

Group 1

- Fix the roads; invest the money in public transportation; parking
- I don't know, but I'll give you a good example of prior issues: freeway width and lanes. At the time they were built, instead of providing room on sides of freeway (not thinking about growth). They limited future growth too.
- Improving road conditions. More mass transit and other alternative transportation options.
- Incoming population; available money; invest in public transportation; invest in safety; obviously improve road conditions
- Population growth. City v. suburbs
- Safety; availability; dependability
- The amount of people who use what and what's trending. Over a time span, what has increased, decreased? Example: own personal vehicle 50%, bus 25%, carpool 20%, bike 5%
- They have to address the roads and public funds. Roads so there's enough space for growth of civilization.
- Thinking about increased efficiency of freeways, expanded public transit and parking. Spend? The best results for the most.

Group 2

- Current infrastructure is inadequate. The needs may be different in 20 years but due to increasing population growth more and better infrastructure will still be required regardless of AV technology. Infrastructure includes servicing all forms of transportation.
- First, repair what isn't working now, infrastructure, roads, safety, traffic issues. Budget for improvements now and advancement for the future. Research study to determine feasibility.
- Funding, people are hesitant in change and will not participate in it. Parking–recharge stations and solar panels. Roads, less traffic. Public transit, more convenient and user friendly. Encouragement and education.
- I would be conscious of ecology. I would spend public funds on going green with energy efficient transport with an eye toward public transport, ride sharing, cycling, walking (and making such safe). I would try and repave roads and build more sidewalks and incorporate more bike paths and trails.
- Invest in mass public transit. Assuming it's more efficient in future. More funding and resources towards rural roads.
- Magnetic mass transportation. Electric car charge ports, ERT stations, designated bike routes.
- Need to focus on funding more level 5 vehicles to have more public transit options. Also create ride share options with both level 5 and 6 AV vehicles. Then do funding for roads and parking for AV. Need good roads for the AV cars. Make it more walking and biking friendly.
- Transportation options for those unable to drive or unable to afford transportation. Ways to improve large traffic areas, either by more roads or lessened vehicles on the road. Better sidewalks and driver incentive for less car usage.

Group 3

- Being on the forefront of pushing the envelope to evolve with car manufactures to implement this technology into my city to benefit both the city and the manufacturer to see the brighter future of being able to use these things down the road to make money for the city.
- City planner has the responsibility to make sure there is adequate parking. That is a huge problem as money gets tighter and more people are living together. They should plan for mass transit.
- How to change the current system to a system that will allow 1 eve 5 to operate. Build for that future.
- Making the roads safer
- Vehicle-free zones, especially in metro areas; parking; access for all; affordable or free mass transit
- What's best is going to fit the community. On making roads AV friendly, what is going to work?
- You are having to take everything into consideration. Keep the future in play though. Growth in the communities.
- You'd need to be thinking about being able to change the roads easily for upcoming growth and relying more on public transportation. More buses, multi-people vehicles, less single parking structures. Spend funds on these.

Group 4

- Eradicate homelessness, reinstate CCC camps and reinstate chain gangs to maintain roadways.
- How to pay for infrastructure? I would spend more on AV public transit (buses).
- I think free parking, fix potholes and side streets.
- I think the planning should include as someone said earlier, keeping urban areas urban and rural areas rural.
- I would look at designing infrastructure to accommodate AV but not ignore human driven cars. I think funding for AV, which a portion of which would also be allocated to infrastructure, would come from user fees, AV rentals.
- Planning the cities and rural area's development to complement the use of the AVs, ie: commercial corridors, residential, etc. Preserving rural areas and important biodiversity spots.
- We would have to create lots and special designated zones to deal with these cars rather it be electricity, solar power, or whatever fuel source.
- Where to put main roads/streets/grid layout; where to play public parking to get AV

Group 5

- Adding roads and bridges. Toll roads are not the answer. Use budgeted funding appropriately. Government employees earn too much in benefits and spiffs. Parking garages will be less important than additional roads and maintenance when thinking of airport parking. Bike lanes are a waste of space and a hazard to manually driven and AV cars. With the widening of bike lanes takes away from space to drive and park. As a whole society, we aren't going back to horse and buggy. Bikes are not going to replace vehicles.
- I would make more lanes. I would build a city above the current city, like the second floor in a building.
- Identify reasons people drive and commute; possibly offer subsides to companies for telecommuting employees.
- In order to influence public opinion, you have to appeal to people's desires: comfort, cost, etc. I would increase incentives for charging stations, maybe invest in them as a city.
- Increase roads by either building above freeways or below ground. Or doing the same for mass transit. Having more mass transit with less stops.
- Increasing lanes, more bridges. Make mass transit easier for others to access. Expand mass transit.

- Road construction via private partnerships; land use designed around public transportation; decreasing government's role in transportation
- Still need the road. Whether it's an AV society or not, roads get vehicles there. We don't know when AVs will come to be, so until then we need to put focus on the now. Roads, overpasses.
- Wi-Fi network to connect autonomous vehicles. Invest in public transit—try to get less people driving; incentivize construction that provides off-street parking (for homes—not public garages); build up, not out.

Group 6

- Accessibility, how available will this technology be to everyone? How can this be adapted for public use? How can we prepare workers for a shift in the employment future? I would invest in a city-owned fleet, or perhaps in technology that could pair riders. Now I would look to private companies to invest in that. For instance, if our city adopted AVs now, we could get a discount in exchange for the data.
- Different styles of road, like elevated highways for AVs in use as mass transit. We already have rail like Max. Parking: there will be less land, so they can only go up which automated garages have been around since the 50's. Not sure because of lack of land.
- Fixing roads (better lighting, fix potholes); fixing merging lanes and overpasses, widening, allowing more room; safe public transportation; be transparent about costs and time to fix it all.
- I would be more careful about where housing units were located. I would make more marketplace plans. Creating housing with a whole community around it so everything would be accessible in that area. People would in that way not have to travel far to have access to the places they needed to go.
- Invest in a better future. Who's going to pay for this? How to fund it? People must demand that the government finds ways to fund science for the benefit of public infrastructure. Make everybody pay into a science grant. Make it nonprofit.
- More Max lines (skylines); fix roads, expand, potholes; more security on public transportation; less expensive parking
- Parking, especially for non-owned AVs. Roads need to be kept up. Upkeep for the AVs.
- Start with fixing roads. More public transportation like monorail, better lighting and safety.
- Upkeep of the current roads; new painted lines for AVs to follow; increasing public transit, expanded rail lines; plan experiment and have places, test areas available. Encourage small areas to test AVs, i.e. Nike campus driverless transportation or Pearl District only self-driving cars.

Appendix L
Written Exercise 11

The future may not be predictable. What are the three most important things you want leaders to consider as they make decisions about how to plan for the future?

Group 1

- Ability to handle population growth; accessibility, not only to destinations, but availability to the transportation itself. Ecology.
- Congestion; efficiency in community; autonomous vehicles inevitable
- Equality; safety; availability
- Make sure there is all access to/on safe roads—sustainability. Infrastructure.
- Roads, fixing; highways, expanding; public transportation, more
- Safety; environmental impact; impact on taxes
- Safety; timing; planning
- Think globally, not just seldom or what they think people will like. They should ask the community what they think.
- What individuals want complied with; what would be beneficial to the group as a whole; cost

Group 2

- Consider future generations and the legacy we are leaving them. Consider the elderly, disabled and disenfranchised. Consider mothers and their children and their needs, care, etc.
- How to manage growth better than they are doing now. How to divert through traffic. How to fund improvements for infrastructure and advancements including AVs.
- Keep the community in mind, not the financial benefit leaders may reap. The people that are affected by decisions should have a majority say. Safety is more important than anything.
- Limit growth, reduce need and impacts of infrastructure. Funding, no unfunded projects or plans. Educate public to perceived needs.
- Minority (single man with 2 kids). Jobs (better apartments). Roads (safer).
- Planning for future generations (Medicare, IRA, etc). Increased legislation aimed at reducing CO2 emissions. Invest in education.
- The next generation, seniors. The environment. Population growth, housing, jobs.
- To make it easier for people to get to work and school. That all people want to feel safe on the road and at home. That leaders should always consider the good of the people. All people, not just rich people or donors but all people deserve happiness and a way to get home at night.

Group 3

- Cost, safety, congestion
- Growth, safety, ability
- How to move the public away from private cars? Has to make a system for auto vehicles.
- How will this affect (negative or positive) those citizens with the least means? Will it (or is it likely to) improve lives/society? What could go wrong?
- Safety, affordable to everyone, alternative transportation
- Think of the cost and making sure it is available to poor people. Think of the safety—hacking. Thing of availability to outlying areas and rural.
- Using less oil, less pollution, to control emissions and make the earth healthy for our children and their children. Safe roads.

- Will they be available to everyone? Will kids be safe? Will they be available 24/7/365

Group 4

- How to pay for AV infrastructure; how safe AVs will be; how to gain public trust for AVs
- Land use; planning to use less vehicle trips; preserving wilderness, habitats; inclusive of underprivileged populations
- Safety; economy; people
- Safety; funding; planning on how they will be used
- Safety; the fact that we cannot keep being dependent on fossil fuels
- Stop use of petrochemical fuels; institute a cleanup of Ocean
- There will always be a human element that needs to be considered. People will always be driving, even if AV exist. Funding for AV should not come from a tax but rather use fees.
- Where funding would come from; how AV would impact employment (fewer jobs?)

Group 5

- Climate; economy; safety
- Identify what is important to the public as individuals and transportation; diversity/variety in transportation options.
- Increasing population; industrial uses of land in transportation; less bike-related investment.
- More freeways/lanes of travel; better infrastructure on freeways (loops); tax/tolls on bridges from Oregon to Washington
- Population growth; safe roads; expanding urban growth boundary
- Population increase; loss of jobs
- Public transit; cleaner air; less sprawl—less commuters
- Stop looking for ways to add and raise taxes; use space more efficiently; cap population in neighborhoods
- The area will grow increasing transportation needs; building up instead of out

Group 6

- Emissions as a whole, cars are a very small percentage of pollution in the world; more community agriculture, less animal agriculture; Climate, Climate, Climate.
- Environmental concerns, carbon footprint of transportation options; traffic, movement of people; safety, especially earthquake readiness
- Fuel; safety; roads
- Improving and maintaining infrastructure; bridges, highways, rail traffic; because goods are moved around in these modes; social responsibility to keep safe and sane; air pollution
- More sky travel; improving roads and highways; safety
- Plan for climate change and plan to transition away from fossil fuel holistically. Plan communities where everyone has access to safe housing and housing is close to things people need. Public commons are vital, our infrastructure decisions should be made by elected officials democratically.
- Safety issues and crime in our city; traffic congestion; affordable housing
- Sustainability; not profit driven; green tech; low environmental impact; greater good of the future; move away from fossil fuel; safety
- The growth of the city and fixing it; the lighting

Appendix L
Written Exercise 12

Imagine you are one of the policymakers at the state level. You are considering what policies to put in place now to prepare for having more fully autonomous vehicles on the road. What rules or laws will we need to create to make sure autonomous vehicles are making our roads safer for everyone? Star (★) the most important one.

Group 1

- [No star] Background checks—making sure people who have a responsible past are given the option to have a responsible future. Education—you can't fault people if you haven't give the tools they need to be successful.
- [No star] Corporations need to be held more accountable
- [No star] People should have basic knowledge in driving, have a permit at least. It's recommended to have a second person in the car with you in case something goes wrong. Teens should have an adult of 21 with them at all times.
- *Bring infrastructure up to standards needed to accommodate autonomous vehicles; require technical excellence of auto cars. Autonomous vehicles need to be compatible with human driver vehicles. Take human failings into account.
- *Cameras, installed; trackers, installed; watch panel
- *Law-enforced vehicles; hybrid vehicles, half autonomous, half manual. Regulated. Do not, risk of getting it wrong is greater than getting it right. How will autonomous vehicles work in non-autonomous states? Once the percentage is greater than human error, it might be a better option.
- *Limit on number of accidents; limit on emission levels
- *Prior to putting any rules or laws in place, complete studies should be done to look at possibility of future needs. Only then will we make a better idea of what is needed. To assume something now is going to be what the future brings is crazy.
- *US to be the leading force in AV; how many are operating; laws for how fast they can drive; rules on how many will be allowed to operate

Group 2

- [No star] Require AVs to be safer than human drivers. Policies to reduce fuel consumption and require people to become more dependent on public transportation. Allocate more funds to rural and small communities.
- [No star] Upgrade; backup plan; guarantee safety
- *Children cannot ride alone in AV's. Kill switch so humans can take over. Have separate lanes for AVs. If it is hacked, sends an alert.
- *Liability issues. Access to infrastructure, priority. Vehicles should meet environmental needs.
- *Offer drivers new courses, and offer new drivers education. Maybe a separate lane. Strict regulations regarding safety.
- *Safety test them.
- *That AV cars all have a human override feature. That all AV cars will have to be fully insured and tested. Government tested and rated. Lots of research, real world testing.
- *We must make sure autonomous vehicles are, in fact efficient, safe, and helpful for the environment and the community.

Group 3

- [No star] No private cars. The transportation system is public owned, like our roads so the vehicles would also be publicly owned.
- [No star] Safety check for all driving situations. AV networking hacking security.
- [No star] Standard tests from each self-driving car to make sure they are safe. They are better than human drivers.
- [No star]The vehicles are tested and approved
- *AVs need to be proven space; AV need to be accessible to everyone; AV need to be affordable to everyone; AV need to be free of stress, no weridos
- *Be sure AVs have been thoroughly tested; AV available to everyone; rental options available; person ownership options
- *Heavy regulation of AV performance and ongoing monitored. Safety record. Efficiency. Maybe start with banning all but AVs in certain areas. Mandate affordability.
- *Safety implemented in each driverless vehicle (towards others, and cars). Driver vehicles may need a designated lane.

Group 4

- [No star] [No response]
- [No star] An agreement from AV manufacturers to fix problems that are found out after AVs are on the road.
- [No star] Laws against data mining, tracking where you are traveling
- [No star] Laws regarding oversight; rigorous testing of safety of AVs; severe penalties for fraud (think VW and Audi)
- [No star] The three laws of robotics cover it all!
- *Can AV be on same road with human drivers? Speed laws, driving rules of road.
- *I would design and compare it to a regular car. We would have to create laws against people looking to hack into cars. And/or find new laws for others for drinking, smoking aka under the influence.
- *Safety and a driver behind the wheel until the vehicles become more used on the roads

Group 5

- [No star] Always have someone watching them; always have humans involved; watch footage from cameras and improve
- [No star] Dedicated AV lanes (like carpool lanes); licensing for operating on AV
- [No star] Itemized chain of accountability; additional roads with road maintenance; AVs must reduce pollution and landfill waste than cars do today. It is unfair to allow AVs to be on the road without all drivers knowing.
- [No star] They pass safety tests; there is a protocol in place when accidents happen; make manufacturers responsible for AV issues; owner should still know rules of the road/have driver license.
- *Absolute liability for malfunctions, fail-safe technologies; high penalties for hacking, tampering; no government-mandated technologies
- *Create some kind of lane stumps to keep vehicles in proper lane
- *Find out how to address “moral” decisions i.e. trolley problem
- *Network security; liability/accountability; profit/efficiency sharing (tax the rich) U.B.I.; transparency
- *Responsibility—if there is no driver at the wheel, how is fault determined; software updates/upgrades and accessibility; how an AV integrates with a “normal” vehicle.

Group 6

- [No star] Lanes designed for AVs so that the transition to an AV future is smooth. Private corporations must apply for licenses (transparently) in order to test AVs.
- [No star] Make sure the cars have been well tested and they are safe; plan ahead where these cars will be parked
- [No star] Separate lanes on the highway; consumer protection laws that would need updating
- [No star] Speed limits
- *Low rate of malfunction; mandatory course on learning about the vehicle
- *Policies keeping the AV monitored by a driver until it's proven; public awareness, announce when testing; laws to keep companies responsible for accidents
- *Safe roads; clear roads; safe space; human drivers need to be present until the accident margin is very low; current laws need to be implemented in the AI software
- *Safer than human driven vehicles; wind, green (non-fossil fuel), solar powered; for the benefit of the most economically challenged
- *Safety; having one lane; AI in the car

What are the positives of autonomous vehicles?

Groups 1, 2 and 4–6 were not asked this question

Group 3

- Being able to be driven and get to places that may be very congested that I may stay away from because of the congestion.
- Could reduce number of vehicles on the road
- Environmental benefit
- Less vehicles on roads moving more people around
- Make people who can't drive, have access to getting around town.
- One giant issue, driving would no longer be a personal problem.
- Removes human error
- Safer driving

What are the negatives of autonomous vehicles?

Groups 1, 2 and 4–6 were not asked this question

Group 3

- Class bias toward owning/using AVs
- Cost
- Expense of AV
- Government controlling whether or not someone is allowed to drive or if people were priced out of being able to buy an AV and those not have private vehicles. Taking away the rights of humans, giving too much control to government.
- None
- Not available to all
- Safety. Accident percentage, meeting or exceeding what's available now
- Will it work for everyone?

Appendix L
Written Exercise 13

What final messages do you have?

Group 1

- Ask more people, maybe like the census-type deal; data; maybe a vote
- Be more accountable and insist on new laws to regulate the AVs
- I trust you
- Keep public safety/awareness in mind
- Plan for expansion; be sure that your laws are sufficient; plan ahead!
- Please be absolutely sure to consider ALL things and person before making this decision
- Rewrite motor vehicle regulations to accommodate autonomous vehicles. Plan long term infrastructure improvements.
- Safety being #1. Allow private sector to develop products and government to oversee safety.
- Safety; regulation; all vehicle brands should be mandated; votes

Group 2

- Educate public to pending changes.
- Educate, legislate
- Enforce/inform/educate consumers how this will benefit them and their community.
- I would advise more research be done on AVs. More funding must be granted to education for the community to encourage ridership and participation. Would I need a driver's license for an autonomous vehicle? Would AVs create jobs or make some jobs redundant?
- If public transit were more readily available more often the idea behind it would be accepted. Safety for children and pedestrians needs to be a top concern.
- Pass laws to require special safety regulations.
- Put more funding into all options that help people have transit options and keep people mobile.
- Tell us how it will work and benefit all.

Group 3

Group 3 was not asked this question.

Group 4

- Change is always going to happen as technology grows and gets better. Test these cars before you put them in public.
- Embrace the technology. Ask the billionaires of the state to help finance it. Preemptively create safety laws, nets, penalties because the technology (AV) will be set back exponentially if accidents happen. Financial accountability, insurance explicated. Extensively. Roseburg area is a great test area.
- How to find funding options; suggest trial areas (Metro) to see if AV truly viable; what "rules of the road" changes might be
- I think fully autonomous vehicles are a good switch. I think we should plan how their energy could be used, make the environment better, roads and or cars. With laws I think there should be an dupdate and a common idea that's not terrible.
- I think that it's for sure going to happen at some point. I think that obviously some impotent prints to consider would be how to fund the A.I.s and safety needs to be number one.
- In planning for a future with autonomous vehicles, recognize that they will not completely replace self-driven vehicles. People who choose to live in rural areas will likely drive their own vehicles. People

who drive their own vehicles should not have to contribute to the funding of autonomous vehicles and its infrastructure. With the technology that comes with AV, privacy should be maintained.
- Make changes in the highway. Budget, bottom line: safer, more effective, eco friendly
- Slow and steady. Keep working on AVs, but take it step by step. Pick a trial city in Oregon to test AV technology. Use AV technology in public transportation first.

Group 5
- Allow full wide experimentation of various technologies; let private companies spend the money, not taxpayers; slow rollout; don't sell AV as panacea or traffic solution with instant results.
- Don't assume what people want. Take a thorough census of people and how they travel and commute, what is important to them, so the decisions made reflect the will of the people.
- Don't expect people to love them too soon. It's a huge change. It will take a long time for people to get used to it and it would change the world. Make sure they are safe.
- Focus on the immediate problems—which are roads, capacity—again the AV concept isn't going to change the quantity of vehicles. People drive and we are a growing state. It's going to become more congested. We need larger and more freeways.
- Get them on a shared network, working in unison with each other, aware of where each one is and non-AVs are in relation to them; get reaction speed above that of humans; get error below that of humans; hubs/garages to store them; rideshare them (AirBnB sort of model); DON'T trust in the public to make informed decisions—rely on experts, people can be so simple; prevent sprawl; prevent more personal cars on the road; decrease idling; increased fuel efficiency.
- Keep in mind: Safety—older people are skeptical, how to convince them; Equity—corporations are greedy, how do we tax them; Climate
- Plan for the public's best interest in safety and space. No AV manufacturers spiff and contract perks without a 100% failsafe. AVs are NOT safe! Change carpool lanes to AV lanes for safety.
- Please think about the upcoming population growth. Safety should be a main concern. Expand freeways and build bridges to accommodate extra vehicles. Make sure operators of AV have a license to operate AV and know the rules of the road.
- Those coming, they need to begin planning the roads for them, and maybe some kind of overhead electronics to assure safety.

Group 6
- Accommodating all the new people on our roads
- Be transparent about spending money, and time to build.
- Earn your pension and healthcare!
- I don't know, sorry
- I would like to see that all the roads are well maintained and well-lit and prepared.
- Improve laws
- Please expand the highways and make them safer, especially merging lanes.
- Prioritize the least visible, most marginalized when you decide on our public transportation.
- Think of safety, cost of upkeep of vehicles and roads