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For over 100 years, cars were meant to be a piece of machinery specifically designed to be operated by humans. We have become so normalized with the idea of driving vehicles that it almost seems impossible to imagine a world where we didn’t. That theoretical world, however, may just become reality. In recent years, there has been an influx in the interest of level 5 autonomous vehicles (AVs) that can essentially drive themselves without human interaction or surveillance. Many car manufactures are already implementing some form of autopilot in many of their new models and are looking to break into the untapped market of autonomous vehicles. Many are optimistic of the benefits AVs can bring to the world, such as helping the disabled/elderly and reducing the environmental impact of driving. Some are so optimistic that they believe that we will live in a fully autonomous driving world in just a few years. With the increasing publicity of AVs, it is hard not to get caught up in the hype. However, the perceived benefits of autonomous vehicles may just be an illusion hiding the disadvantages of AVs. The risks of having a primitive human-free vehicle around people and the surprising negative ecological impact of AVs raises uncertainty over the future of autonomous vehicles. The precariousness of the autonomous future makes it more than reasonable to argue that in the future, **AVs will see limited growth across the nation, with most of the growth occurring in urban areas.**

The implementation of autonomous vehicles (AVs) in the United States will have numerous benefits and drawbacks. As far as the benefits go, a switch to AVs could drastically reduce pollution and carbon dioxide emissions, helping curb the drastic effects of climate change. Self-driving cars can allow the reduction of lane sizes, letting roads assume less space. Parking and curb spaces will not be as necessary as more people shift into transit options involving AVs. New jobs will be created in technological industries involving the development and improvement of these vehicles (Parsons; Ornes; Chatman & Marcel.) Despite these benefits however, AV implementation will also have plenty of drawbacks. A shift to AVs is predicted to increase an already concerning amount of urban sprawl. Thousands of jobs will be lost in industries that autonomous vehicles take over (Freemark et al.; Parsons; Chatman & Marcel; Ornes.) According to researcher Stephen Ornes in a report in CQ Press, “state highway planners say it will cost billions in public money to prepare the nation's 4 million miles of paved roads and 250,000 intersections for widespread use of autonomous cars.” An interesting aspect of this question of AV implementation is the stark urban/rural divide. As Freemark and his team find in “Are Cities Prepared for Autonomous Vehicles? Planning for Technological Change by U.S. Local Governments,” though “few local governments have begun planning for AVs . . . cities with larger populations and higher population growth are more likely to be prepared.” This may be due to multiple factors, such as an increased reliance upon transit to get to work (transits are some of the first places where AVs are starting to be implemented). Large urban areas are also more likely to be able to afford the cost that comes with adding AV infrastructure while small rural areas may not perceive the benefits of AVs to be great enough to outweigh their massive costs. Overall, as Freemark and his team summarize, “although local officials are optimistic about the technology and its potential to increase safety while reducing congestion, costs, and pollution, more than a third of respondents worried about AVs increasing vehicle miles traveled and sprawl while reducing transit ridership and local revenues.” This, along with the uncertainty of autonomous vehicles and their high initial costs will more than likely limit the implementation of AVs to small test sites for the foreseeable future.

However, the possibility of autonomous vehicles being implemented in large urban areas soon merits closer inspection. The emergence of autonomous vehicles would drastically change numerous aspects of big cities. For example, a switch to AVs could lead to a smaller physical impact on the environment as lane sizes become smaller. On the other hand, a switch to autonomous vehicles could lead to an increase in the number of cars on the road, worsening traffic and leading to more congestion. An increase in urban sprawl would lead to cities expanding at a greater rate than they are already (Parsons; Ornes; Chatman & Marcel.) Transportation would also change, as more people look to autonomous vehicles (in the forms of taxis and shuttles) to chauffeur them around and make deliveries (Parsons; Chatman & Marcel.) The rise of AVs would lead to many urban jobs related to car manufacturing to disappear while new careers arise in the technology sector as cities look to continuously increase AV efficiency and safety. This, however, may not be entirely negative, as Ornes argues that “autonomous cars are going to largely eliminate jobs [people] weren't interested in and create opportunities in work that people will find more rewarding.” Finally, a shift to AVs may require massive policy decisions on how AVs will operate in cities and who should be held accountable in the case of an emergency. Overall, the potential of autonomous vehicle implementation in urban areas raises the possibility of AVs changing the landscape and workforce of the cities.

# Though autonomous vehicles may not disperse to rural areas soon, they may start having a slow presence after being well implemented in urban areas. As autonomous vehicle technology advances, rural areas may find it cheaper to add the infrastructure for AVs than before, allowing to make the switch. Also, if AVs become safer/more reliable over time, they may be the perfect way to get emergency help (such as the fire department or an EMT) to rural areas that may not currently have access to such services, helping vulnerable groups such as the elderly or those with chronic medical conditions. The most realistic path for autonomous vehicles to reach rural areas, however, may be to act as rideshares and Ubers to solve the current lack of public transportation. In “Autonomous Vehicles in Rural Communities: Is It Feasible?” researcher Diandra Prioleau and her team from the University of Florida argue that “automated buses have the potential to address the transportation issues in rural areas, but solutions must be thoroughly vetted for proper execution before deployment.” That being said, all rural areas are different, having personalized needs and situations. Due to this, autonomous vehicles may find it difficult to penetrate into some areas in the United States. However, given enough time and technological advancement (increasing reliability and bringing down the cost), autonomous vehicles may be able to disperse to more rural areas, given plenty of time.

# That being said, there are reasons why some believe that autonomous vehicle implementation will happen in the near future around the country, not just in urban areas. For example, some experts believe that autonomous vehicles will accompany the rise of electric and hybrid vehicles, reaching the market in just a few years. They point to the ability of AVs to transport people with disabilities or impairments (such as the elderly) as a major benefit that will boost the usage of AVs everywhere in the United States (Stoma et al.; Porter et al.) For example, researcher Libby Porter and her colleagues, in “The Autonomous Vehicle Revolution: Implications for Planning/The Future Driverless City,” find that “the AV revolution could be combined with a mass shift to carbon neutral vehicles, presenting new possibilities for carbon reductions . . . For people with disabilities and impairments to mobility, AV presents transformative possibilities, with a recent survey in Australia demonstrating that more than 85% of people felt AV would bring mobility impaired people significant benefits.” A major topic that may decide the rate of AV implementation is whether most people believe that autonomous vehicles are safer than human drivers. If AV technology can advance far enough where AVs can be labeled as definitely safer than human drivers, there will be a rapid surgency of AV implementation beyond the level of beta testing currently being seen. Though recent AV accidents (such as the recent ones in California and Arizona) have dented public confidence to some degree, some experts argue that there is no reason to doubt the ability of autonomous vehicles to become safer and more efficient at an astounding rate (Porter et al.; Parsons.) There is so much optimism for some that Porter and her colleagues have argued that “according to industry estimates, four in 10 vehicles will be autonomous by 2040 . . . the predicted global value of the autonomous vehicle industry has been projected at $US54billion [sic] in 2019, rising to $US556billion [sic] by 2026.” If these predictions hold true, the United States will see autonomous vehicles gaining precedence everywhere (not only in large urban areas), with AVs becoming mainstream in daily life for most (if not all) Americans.

# Autonomous vehicles are an exciting new frontier in technology and the automotive industry, having the potential to revolutionize how we live our lives, reducing (if not eliminating) the need for personal vehicles and bringing more connectivity between urban and rural areas. In an autonomous world, most people would use AVs for daily transportation, reducing their environmental impact and changing the physical landscape and workforce of where they live. However, AV implementation is likely to be limited for the foreseeable future. The cost of adding the infrastructure needed for autonomous vehicles can stop smaller cities and rural areas from embracing AVs. For cities that can afford to add AV infrastructure, some current problems that AVs have, such as a tendency to increase urban sprawl, and recent tragic accidents involving AVs may cause policy makers to be hesitant in approving their implementation. These factors point to autonomous vehicles being limited to small test sites for the near future until they are slowly incorporated in urban cities and finally spread to some (but likely not all) rural areas. Further research, however, is needed into current AV development and how that may change the rate of AV implementation. If the technology in autonomous vehicles can become advanced enough to where they can safely and effectively navigate complex situations and their costs lower to where they are more conceivable, cities may start implementing AVs sooner than expected. Overall, the autonomous vehicle industry will continue to change and evolve. The question is in the rate of this growth and whether it affects the possible implementation of autonomous vehicles in the United States. No matter, how long it takes, however, the future is bright for autonomous vehicles.

[1773 Words]

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