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# No city on the horizon: Autonomous cars, artificial intelligence, and the absence of urbanism

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In this perspective piece we use a case study of Phoenix (Arizona) to explore the ways in which the implementation of autonomous vehicle technology is tied to the political economy of the city. We highlight the potential urban benefits that can stem from the use of autonomous vehicles, while also bringing to the fore the necessity of governance in realizing these same benefits. By using Phoenix as a case study, we illustrate the dissonance that exists between policymakers within government and the future urban imaginaries that are used as reasons to justify Phoenix as a test ground. By viewing the position of stakeholders within industry and within government we address the individual and political gains that adoption of such technology can bring on an inter-state competitive level. These dynamics of market competition, combined with a lack of proactive engagement in urban planning show that the potential urban benefits that can be brought on by the autonomous vehicle are left solely to the imagination.

## KEYWORDS

artificial intelligence, autonomous vehicle, urban governance, Phoenix (Arizona), Waymo, cities, urbanism

## Introduction: Autonomous cars inside/outside the city

This paper seeks to put forward a narrative to provide insight to both academics and policymakers regarding the wider forces that are at play in the autonomous vehicle (AV) implementation taking place in Phoenix (Arizona). The city of Phoenix has been chosen as AVs are currently a fully operational service available to the public within areas of the city. The goal of this paper is to contribute to a dialogue regarding the importance of proactive cooperation between drivers of technology and urban policymakers. AVs driven by artificial intelligence (AI) keep gaining traction. Their growing popularity can be observed through three key dimensions. First, in existing urban spaces where AVs are being tested in real-life environments, thereby becoming part of the transport portfolio of cities and their road infrastructure (Dowling and McGuiirk, 2020; Acheampong et al., 2021). Second, in the scientific literature where, particularly in the fields of computer science and engineering, the AV is being hailed as a revolutionary urban technology capable of significantly improving the efficiency and sustainability of cities' transport system (Guériaux et al., 2020; Deveci et al., 2021). Third, in the realm

of policy where we see many countries, such as the Netherlands, US, UK, China and Singapore, implementing agendas to accelerate the diffusion of AVs (see, for instance, [Government of the Netherlands, 2021](#)).

Underpinning these three dimensions, there is one common narrative: AVs are good for cities. While this is a disputed topic, it remains the predominant narrative that is seen in relation to the implementation of AV technology. Many computer scientists, engineers, urbanists and planners argue that the city can benefit from the AV in several ways. In terms of traffic flows, for example, it has been estimated that a single shared AV can replace up to 11 conventional cars and four taxis, thus reducing the total amount of vehicles in transit ([Fagnant and Kockelman, 2018](#); [Guériau et al., 2020](#)). From a planning perspective, urban scholars point out that such reduction offers a unique chance to redesign cities in a less car-centric way, decreasing the space currently reserved for vehicles lanes, junctions and parking spaces, in favor of public spaces, urban gardens and cycling infrastructure ([Duarte and Ratti, 2018](#); [Cugurullo et al., 2021](#)). Similar optimistic perspectives echo in policy. The transfer of driving functions from humans to AI is often depicted by policymakers as an unparalleled opportunity to liberate cities from traffic jams. As the [Government of the United Kingdom \(2020, p. 2\)](#) succinctly puts it, one of the AVs potential benefits is “to call an end to urban congestion.” Moreover, AVs are portrayed by policymakers as lifesavers that, by removing human error from the driving equation, can save thousands of lives and improve urban mobility. Emblematic is the position of the [United States Department of Transportation \(2022, p. 2\)](#) which claims that “by eliminating poor human choices while driving, AV technology has enormous potential to save lives.”

What these urban visions and related discourses suggest is that the AV is *inside* the city. Not simply in material terms as a physical object traversing urban spaces, but also as a technology that is being consciously integrated by policymakers and planners into the built environment, in order to benefit cities. In this perspective article we seek to counter this narrative, by showing that in reality, AVs are often outside urban agendas ([McCarroll and Cugurullo, 2022](#)). We discuss the case of Phoenix (Arizona), a prominent testbed for autonomous urban transport experimentation, to demonstrate that, despite the substantial presence of AVs in the city, their diffusion is not connected to urbanistic initiatives related to urban transport systems, road infrastructure, land-use and road safety, but rather to national and international political economies that are largely disconnected from the metabolism of individual cities. As such, highlighting that without the proactive engagement of urban governance the above-mentioned potential benefits of AVs will remain potential and not manifest themselves into the tangible reality of the urban environment. We use the concept of a lack of urbanism to highlight this disengagement between technology and urban governance in the case of the AV. Leading

to a state of inertia within the urban environment where AVs are shown as a solution to urban problems, yet without the governance needed to facilitate these solutions their benefits remain unattainable.

## Inside Phoenix

The city of Phoenix has emerged as a key location in the training and early stage implementation of AVs. With Waymo now offering the Waymo One ride-hailing service to the public. The Waymo One service is an on demand ride hail where the customer uses their smartphone to call a vehicle to their current location. The vehicle will bring them to their chosen destination. The service itself is fully autonomous, meaning that there is no safety driver present. The service is currently available within the subregions of Tempe, Mesa, and Chandler. While this service is currently operational in Phoenix, Waymo is already beginning the scaling process into other US cities such as San Francisco and Los Angeles ([Singh and Saini, 2021](#)). When first exploring reasons as to why an AV company may choose a city, Phoenix seems to be a logical choice. The topography of the area is flat, allowing for a rigid grid system of roads to have been put in place. The climate of the region is also very dry, having on average 300 days of sunshine per year. Such dry conditions are beneficial for early stage AV training, as rain can often create difficulties for the sensor suites used to perceive the road and surrounding environment ([Zang et al., 2019](#)). These factors combine to make Phoenix suitable for early stage AV use as there are fewer obstacles in the form of adverse weather conditions, difficult road patterns and edge case scenarios such as cyclists. Upon initial inspection this would seem an appropriate place for AV testing. However, the choice to use Phoenix as a test ground did not develop so clearly.

Former governor of Arizona Doug Ducey signed an executive order in 2015 which vastly decreased regulation on the testing and implementation of AV pilot programs in the state of Arizona. The primary goal of the executive order was to “undertake any necessary steps to support the testing and operation of self-driving vehicles on public roads within Arizona” ([State of Arizona, 2015](#)). Accompanying this executive order was the formation of a committee within the Arizona Department of Transportation whose goal was to advise how best to advance the testing and operation of AVs on public roads. This step solidified Arizona as the US state with the most favorable conditions, both physical environment wise and policy wise for the testing and introduction of AVs. With such steps taken to facilitate Waymo, Arizona is creating a welcoming regulatory environment for global multinational technology corporations to actively engage in reshaping urban space. As stated in the 2015 executive order by former Governor Ducey (cited

in [Dandazzo, 2017](#)), “the state believes that the development of self-driving vehicle technology will promote economic growth, bring new jobs, provide research opportunities for the state’s academic institutions and their students and faculty, and allow the state to host the emergence of new technologies.”

Phoenix is an example of a city that thrived in the post war period. As [Shermer \(2015, p. 59\)](#) notes, “by the mid-1940s, they had already tentatively moved past voluntarism to take advantage of but also stymie the liberal regulatory state. In the process, they had completed much of the ideological groundwork for a homegrown neo-liberalism that embraced government power to free industrialists from regulation and taxation.” A practice that is still visible in former governor Ducey’s decision making. Due to increased internal migration, the population of Phoenix has been steadily expanding since the 1990s. Combined with cheap cost of land compared to neighboring states, Phoenix has grown as a rapid urban sprawl ([Heim, 2001](#); [Torrens, 2006](#); [Guhathakurta and Stimson, 2007](#)). With these urban issues clearly identifiable in the academic literature, it is easy to assume that committees formed to aid in the dissemination of AVs would indeed be linked to urban design and planning bodies. Such links would aid in realizing the potential benefits of mobility technology in the urban environment, in a way akin to what the scientific literature discussed in the previous section suggests: reducing traffic congestion, preventing car accidents, decreasing car ownership and redesigning urban spaces in a less car-centric manner. While such initiatives may seem like an obvious step for policymakers, the role of the committee is clear and narrow in its focus which is not urbanistic in nature. It seeks to eliminate all potential barriers in the way of this emerging technology. In contrast with neighboring states there are no legal requirements on AV companies to report their findings such as disconnection data. There are also no legal requirements on AV companies to have their vehicles registered in the state of Arizona ([MacDonald-Evoy, 2017](#)). The lack of rigid legal framework is at odds with other states in the US that are allowing AVs to operate.

In the revised executive order signed by former Governor Ducey in 2018, the reasons for facilitating AV implementation become more clear. Within the text of the executive order it is stated that Arizona’s soft regulatory approach has led to increased investment and economic development throughout the state. The document also references that this economic growth has been identified by national publications and has categorized Arizona’s growth as a *tech-boom*: “The business friendly and low regulatory environment has led to increased investment and economic development throughout the state, the economic growth has been recognized by numerous national publications, including the New York Times that identified Arizona’s growth as a tech-boom” ([State of Arizona, 2018, p. 1](#)).

The rationale provided in this executive order combined with some of former Governor Ducey’s statements highlight that the presence of Waymo as well as other tech corporations is an economic goal designed to boost Arizona’s competitiveness with other US states in drawing the investment of multinational technology corporations. In 2016, Ducey is quoted in saying: “This is about economic development, but it’s also about changing the way we live and work. . . . California may not want you, but we do” ([Office of the Governor – Doug Ducey, 2016](#)).

In 2017, a year after Waymo had set its roots in Arizona, former Governor Ducey awarded a no-bid contract worth in excess of \$24 million to Waymo’s parent company Google to provide the Arizona state governing department with new email and communication accounts. This symbiotic relationship between Waymo and Doug Ducey has been beneficial on both sides. The significance of the connection between an incumbent disruptive technology such as AVs and platformization is highlighted by [Alvarez León and Aoyama \(2022\)](#) as key in increasing a company’s market capture. With Google successfully gaining control over the communication platforms used by the governing body of the state of Arizona, such a coupling between platform, contemporary technology and stakeholders can be seen. Waymo has been provided with lax legal regulations to allow for easier operation in the area. In response to this Waymo has contributed \$100,000 to Ducey’s recent COVID-19 relief fund as well as providing opportunities for positive publicity ([Harris, 2020](#)). When seen in conjunction with the narrative put forward in AV publicity as well as government statements, a sense of the mutual gain comes to the fore.

What is happening on the ground right now in Phoenix is indeed proactive in the sense that AVs are being given free reign to test and operate as they please. This is beneficial for their long term deployment on larger scales. However, the visible regulatory and policy work is clearly focused on the short term. The committees formed by former Governor Ducey exist solely as tools to dismantle barriers in the way of economic progress. Cities need to be conceptualized in all their complexity and diversity, rather than reduced to a form of strategic essentialism ([Aoyama and Alvarez León, 2021](#)). A short term approach to the governance of contemporary technology fails to engage with the potential urban and social implications of AVs. Without insight into the way in which urban space shifts and evolves there can be no engagement with deciding the direction of the city. Such short-term approaches are not aligned with the realization of wider urban and societal benefits (greater road safety, reduced traffic congestion and a less car-centric urban design, for instance) that can come with the use of AVs. In using these potential benefits as justification for allowing AVs to operate but failing to proactively engage with urban change, the non-economic benefits of the AV may be left solely as future urban imaginaries.

## Conclusion: Urban AI in the absence of urbanism

There is an evident dissonance between the advertised urban benefits of AVs and the lack of action being taken by governance to aid in achieving these goals in cities. The case of Phoenix shows that while AVs may be operational, without proactive governance there will be little positive change to the urban environment. This shift will require engaging researchers and policymakers to address political, social, and infrastructure design realms to create a more efficient, equitable, sustainable, and healthy transportation system for the next era of transport innovation (Gaio and Cugurullo, 2022). On the one hand, the scientific literature portrays the AV as a potent driver of urban change which has the potential to reshape both mobility and the built environment, thereby favoring the production of public spaces and the reduction of traffic congestion levels and road collisions. On the other hand, however, despite the fact that similar benefits often feature in public policy discourses, our critical perspective on the case of Phoenix shows that AV technology is being employed as a medium to boost the economy of the state and fulfill the political interests of single politicians. When we look at the trajectory that the development and deployment of AVs is following, we see no city on the horizon.

In Phoenix, the AV-related initiatives led by the governor and his committees are grounded in the intention to diversify and grow the economy of Arizona and make the state more competitive, so to be economically successful particularly against other states such as California. This rationale mirrors the broader political economy of the US. The [United States Department of Transportation \(2022, p. 1\)](#) maintains that the AV 'holds tremendous promise to strengthen the U.S. economy' and it is committed 'to ensure the United States leads the world in AV technology', especially in light of the growing international competition against China in the field of AI (Lee, 2018). But where is the city in all of this? Where is *urbanism*?

The AV is an urban artificial intelligence. It is a type of AI that operates primarily in cities, thus influencing key urban services and spaces (Cugurullo, 2020). Yet, urban AIs, such as AVs, are often being implemented and integrated into the city without an urbanistic sensitivity. In other words, we have urban AIs that are entering our cities and changing them, but such urban transformations triggered by AI are not being addressed by policymakers by means of the science and philosophy of urbanism. We argue that this lacuna is very problematic. Unless policymakers employ the practical and conceptual tools of urban planning, urban design and urban governance to inform and discipline the diffusion of AI in cities, then the urban benefits of

AI will exist solely as imaginaries. The current trend whereby AI serves the goals of national and international political economies as an apolitical instrument of economic progress, has to stop (Rodríguez-Alcázar et al., 2020; Cugurullo, 2021). AI, in the shape of autonomous cars and other urban artificial intelligences ranging from service robots to city brains, is a place-based technology firmly located in the city, and it is through the study and understanding of cities that the deployment of AI should take place.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Author contributions

CM authored the draft of the manuscript. FC supervised the publication process, edited the paper, and contributed elements to the final manuscript. All authors contributed to the article and approved the submitted version.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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