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# REVIEW OF THE
# MAG PROP 400
# TRANSPORTATION PLAN 2023

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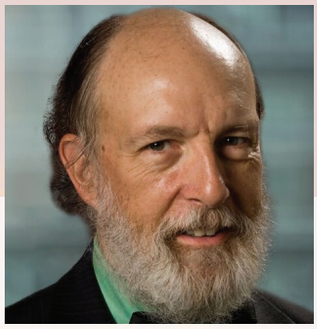
# CONTENTS

# EXECUTIVE SUMMARY



## By Randal O'Toole

The recent pandemic dramatically changed American transportation patterns, chiefly by greatly increasing the number of people working at home. In the Phoenix urban area, for example, telecommuting tripled between 2019 and 2021, which in turn reduced transit ridership by more than 40 percent. However, it increased Phoenix-area driving by nearly 20 percent.

Yet the Maricopa Association of Governments (MAG) latest regional transportation plan, which was published nearly two years after the COVID pandemic began, fails to acknowledge these changes or the pandemic itself. As a result, it was obsolete before it was published. The plan claims it will relieve congestion, reduce air pollution, and make transportation accessible to more people, but none of these claims make sense in view of post-pandemic changes in how people move around.

Even before the pandemic, MAG's transportation plans were failing, primarily because of MAG's decision to use a high-cost, low-capacity form of public transit that resulted in fewer transit riders, more traffic congestion, and more pollution emissions. This transit system was sold to voters by claiming it would reduce congestion and make transportation more accessible to low-income riders, but congestion got worse and low-income commuters turned away from transit. Other problems that MAG's plans failed to solve include growing traffic fatalities and increased transit crime.

MAG's plans failed because MAG didn't use a standard rational planning process that is taught in every urban planning school. This process includes the development of a wide range of alternatives, which MAG didn't do. The process continues by evaluating those alternatives to find the optimal combination of policies and practices, which MAG didn't do. Finally, the process includes a monitoring system that feeds back into future plans so that mistakes made in earlier plans could be corrected, which MAG didn't do.

The most obvious result of this failure to implement the most basic of planning procedures has been the waste of some $3 billion on construction of an obsolete, high-cost, low-capacity transit system that did Phoenix transit more harm than good and contributed to increased congestion and air pollution. Less visible is the fact that, if a small fraction of this money had been spent on more cost-effective programs that would have been identified in a rationally planned transportation program, it would have done far more to reduce congestion and pollution and increase transportation accessibility and traffic safety.

# INTRODUCTION

The COVID-19 pandemic completely and permanently changed the outlook for transportation in the United States. Three times as many people are working at home. Rush-hour travel has been reduced and public transit ridership has plummeted.

Phoenix transit ridership was hit particularly hard: as of December 2022, nationwide transit ridership had recovered to 66.0 percent of December 2019, but ridership in Phoenix was still only 52.5 percent of pre-pandemic levels. Meanwhile, despite the reduction in commuting, the number of miles driven in Phoenix and other Arizona urban areas was almost 20 percent more in November 2022 than the same month in 2019.

Phoenix's most recent regional transportation plan is completely oblivious to these changes. Although the plan was published by the Maricopa Association of Governments (MAG in December 2021, nearly two years after the pandemic began, it only mentions the word "pandemic" once and that is in reference to the number of people who used the Phoenix airport before the pandemic began. Otherwise, someone reading the plan wouldn't know that a pandemic even happened, much less that it greatly changed transportation patterns.

The main problem is that the writers of recent MAG transportation plans failed to use the standard rational planning process that is taught in every urban planning school. This process includes identifying a range of alternatives, evaluating the alternatives, implementing the alternative or combination of alternatives that best meets the goals of the plan, then monitoring plan implementation and incorporating the results of that monitoring into the next iteration of the plan. None of these critical steps were taken in either the 2017 or 2021 plans, so the region continues to waste money on an inefficient plan that includes many projects that produce almost no benefits.

In short, this isn't a plan; it's a scheme. In Britain, the two words have the same meaning, but in the United States scheme is more sinister. The American Heritage dictionary defines it as "a secret or devious plan; a plot."[1] The secret in this case is that MAG's regional transportation plan has a hidden agenda, a plot to transfer billions of dollars a year from taxpayers' pockets to contractors and other special interest groups for programs and projects that will produce little or no benefit to the taxpayers. This plot has been cloaked in rhetoric about environmental quality and social equity and covered up by the plan's failure to use a rational planning process that would have revealed that the selected plan doesn't achieve those or any other reasonable goals.

# RATIONAL PLANNING

Rational planning requires five steps shown in figure 1: identification of goals, development of alternatives, evaluation of those alternatives, selection and implementation of the alternative that best reaches the goals, and monitoring implementation with feedback to improve the next iteration of the plan.[2] This process dates back to at least 1969, when it was proposed in a book on urban and regional planning.[3]

Alternatives are critical because no one can know in advance the ideal solution to a complex problem such as how to best design transportation systems for region of 4 million people. Alternatives also provide transparency, revealing how the planners and other officials made their decisions. For example, if officials adopt a set of goals and then select an alternative that isn't the best way to reach those goals, it shows that those officials have some other hidden agenda.

Monitoring is also critical, especially when plans are to be revised every few years. Monitoring can check whether planners' predictions that specific policies or projects will have particular outcomes are correct; if the predictions turn out to be wrong, the information can be used to correct the next plan revision.

Congress requires metropolitan planning organizations such as the Maricopa Association of Governments to write regional transportation plans and to revise them about every five years. Yet none of MAG's recent regional transportation plans, including plans issued in 2003, 2014, 2017, or 2021, included a wide range of alternatives, an evaluation of those alternatives, or monitoring of the effects of the plans.

Prior to publishing the 2021 Phoenix regional transportation plan, MAG did evaluate four "scenarios" that might be considered alternatives. Two are described as "new capacity" and two as "system optimization."

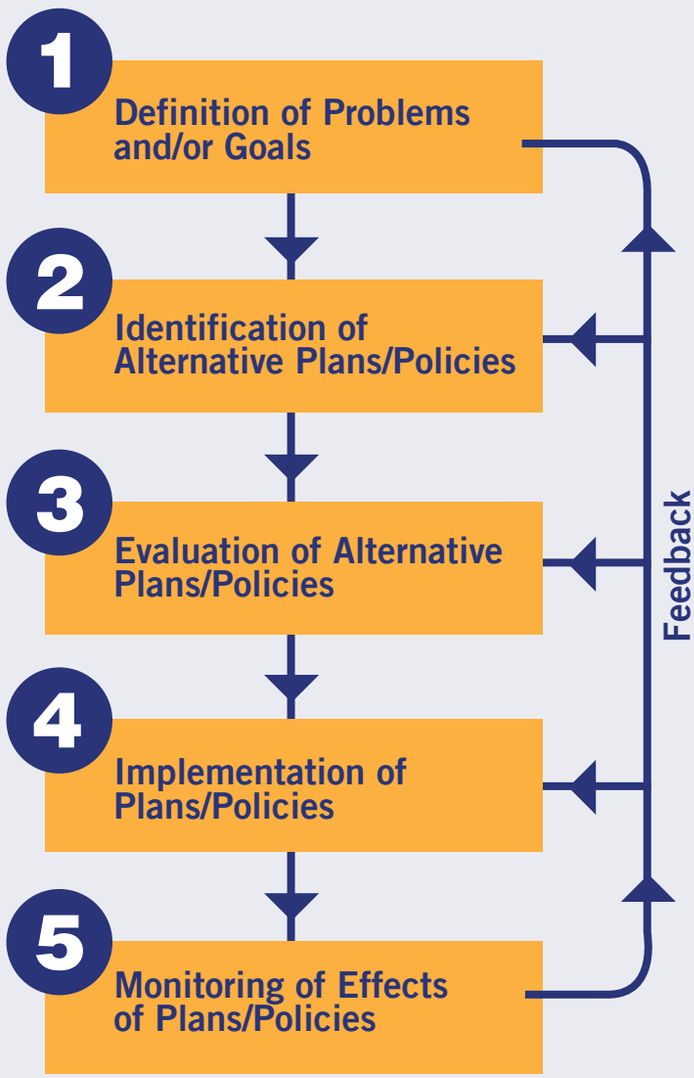



***Figure 1:*** *The rational planning method includes five important steps, three of which—steps 2, 3, and 5—were skipped by the Maricopa Association of Governments' regional transportation plans. Source: Nigel Taylor, Urban Planning Theory Since 1945, p. 68.*

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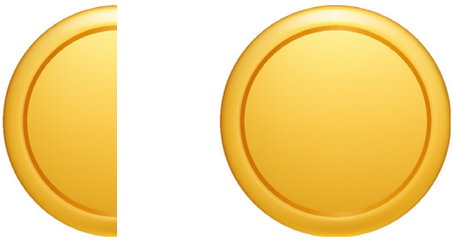
One of each assumes a continuation of the existing half-cent sales tax for transportation and the other imagines a doubling of that sales tax.



**Half-Cent Sales Tax** **Double-Cent Sales Tax**

In fact, the new capacity and optimization scenarios hardly differed from one another. In the half-cent sales tax scenarios, the new capacity scenario called for spending $14.7 billion on freeways and $3.6 billion on so-called high-capacity transit vs. $13.8 billion on freeways and $3.7 billion on high-capacity transit in the optimization scenario.

The optimization scenario actually would build more miles of high-capacity transit and more miles of roads than the new capacity scenario. Spending was increased in the one-cent sales tax scenarios, but the ratios between spending on freeways, other roads, rail transit, and buses remained about the same.[4]

**As designed, these scenarios failed to reveal the trade-offs between various kinds of spending such as buses vs. light rail, freeways vs. non-freeway arterials, bike lanes vs. bicycle boulevards, or other issues in the plan.**


The outcomes of the two half-cent scenarios are barely discernible: both see the same number of vehicle-miles traveled; one results in 67 hours of delay per commuter and the other 69 hours; and both give typical residents access to about the same number of jobs within a 30-minute trip.[5] Notably, the transit ridership of each scenario was not revealed; if it had been calculated, it probably would have revealed that all the spending MAG proposes to do on transit is having very little effect. Nor are there any data on the impacts of the scenarios on safety.

Even if a full range of alternatives had been considered, there is the additional problem that the computation of such outcomes is done in a black box that is inaccessible to the public. Transportation models are complicated, but fundamentally they are based on assumptions about how people's travel behavior responds to the options that are available. MAG did not release information about these


assumptions, which could have been compared with past projects to see if they were valid.

Other parts of the plan suggest that MAG believes that spending more on transit will reduce congestion, that turning general purpose lanes into dedicated bus lanes will increase transit ridership, and that dedicated bicycle lanes will increase cyclist safety. All of these assumptions are questionable. Did MAG build them into its transportation model? If so, then what data does MAG have to support these assumptions? If not, then why does MAG make these assumptions elsewhere? Answers to these kinds of questions are needed if the public is to respond intelligently to MAG's draft plans and alternatives.

Although the four scenarios are mentioned in the plan itself, the 2021 plan itself considers only two alternatives in detail, the proposed plan and "no build," which essentially means no new facilities.

This is known as a "straw man" alternative because it is not one that anyone would ever select in a fast-growing region such as Phoenix and is used only to make the selected plan look good.

For example, page 76 of the 2021 plan projects that the no-build alternative would result in enough congestion to force the average commuter to suffer through 76 hours of delays per year. The selected alternative was projected to reduce this to 69 hours. The plan calls for spending $75 billion over 30 years, which works out to $1,250 per commuter per year or nearly $200 per hour saved. Someone might be excused for thinking that the no-build alternative might actually be better, since few people value their time at $200 an hour, but since the plan never concisely compares the benefits and costs, much less considers other alternatives, most people won't be aware of this.

In any case, questions about congestion are rendered moot by the pandemic. According to INRIX, which monitors traffic conditions in a thousand cities around the world, Phoenix drivers suffered only 26 hours of traffic delay in 2021, compared with 35 in 2019, so the no-build alternative would have resulted in well under 69 hours in any case.[6]

The transportation models used to evaluate these scenarios and alternatives, and the travel survey data used to create those models, date back to well before the pandemic and are totally worthless in a post-pandemic world.[7] But even if the models were valid, they were pointless since they weren't used to evaluate a full range of alternatives in the plan and the plan doesn't even reveal such basic information as projections of transit ridership or transit's share of travel. ■

# TRANSPORTATION
## BEFORE & AFTER THE PANDEMIC

Based on the best available data, before the pandemic the average resident of the Phoenix urban area traveled about 12,000 to 13,000 miles a year by automobile, 60 to 100 miles a year by public transit, and 400 to 500 miles a year on foot, bicycle, and motorcycle.[8]

For the last 30 years, and probably much longer, transit has carried well under 1 percent of passenger-miles in the urban area and virtually no freight (figure 2). Automobiles carry around 95 percent of passenger-miles and trucks carry virtually all freight within the region.[9] Despite transit's insignificance, more than 40 percent of the money in the regional transportation plan is devoted to transit.

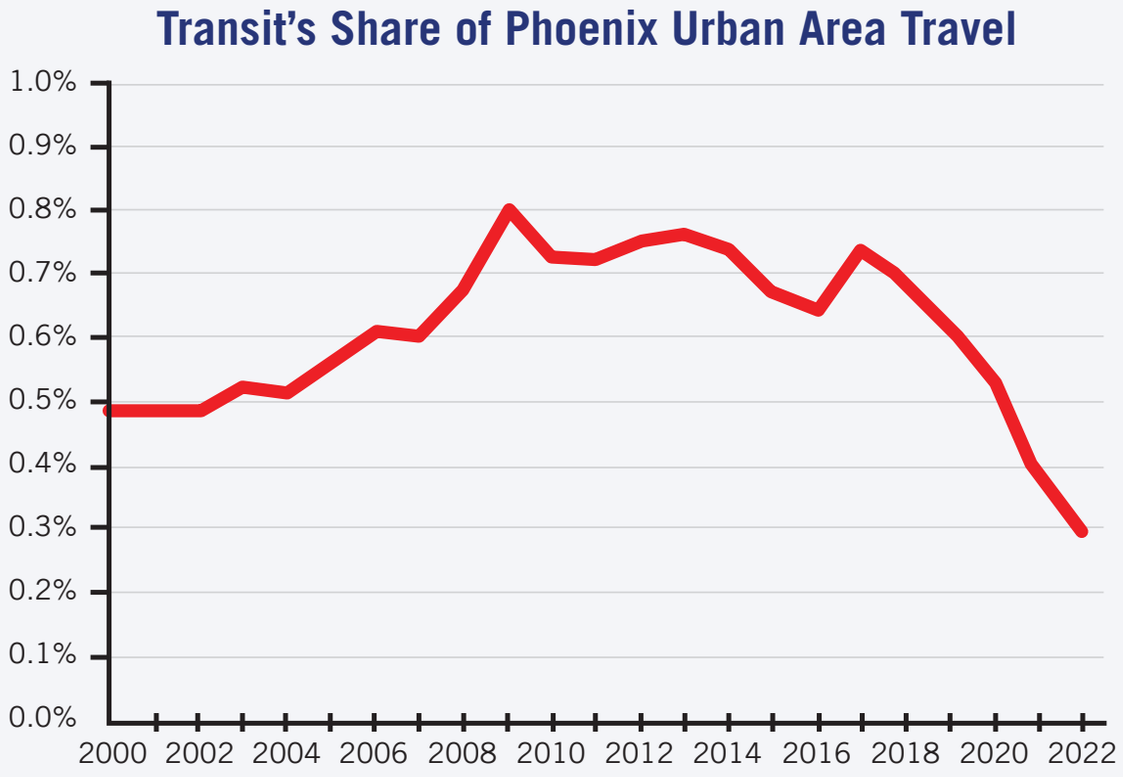



***Figure 2:*** *For the past thirty years, transit's share of travel has ranged between 0.5 and 0.8 percent and in 2022 dropped to a record low of 0.3 percent. This counts only motorized travel; adding bicycle riding and walking would reduce transit's share even more.* ***Source: Highway Statistics and National Transit Database.***

The justification for turning away from highways in favor of other modes is the claim that multimodal improvements will boost transit ridership and reduce auto driving. But this has not worked.

Figure 3 shows that transit passenger-miles grew rapidly between 2002 and 2009, increasing its share of travel from under 0.5 percent to 0.8 percent (measured as a share of transit plus motor vehicle passenger-miles). Before 2009, spending a lot of money on bus transit barely nudged the needle marking transit's share of travel. After 2009, spending even more money on light rail flattened transit's growth while driving increased. By 2019, transit's share had fallen to 0.6 percent.

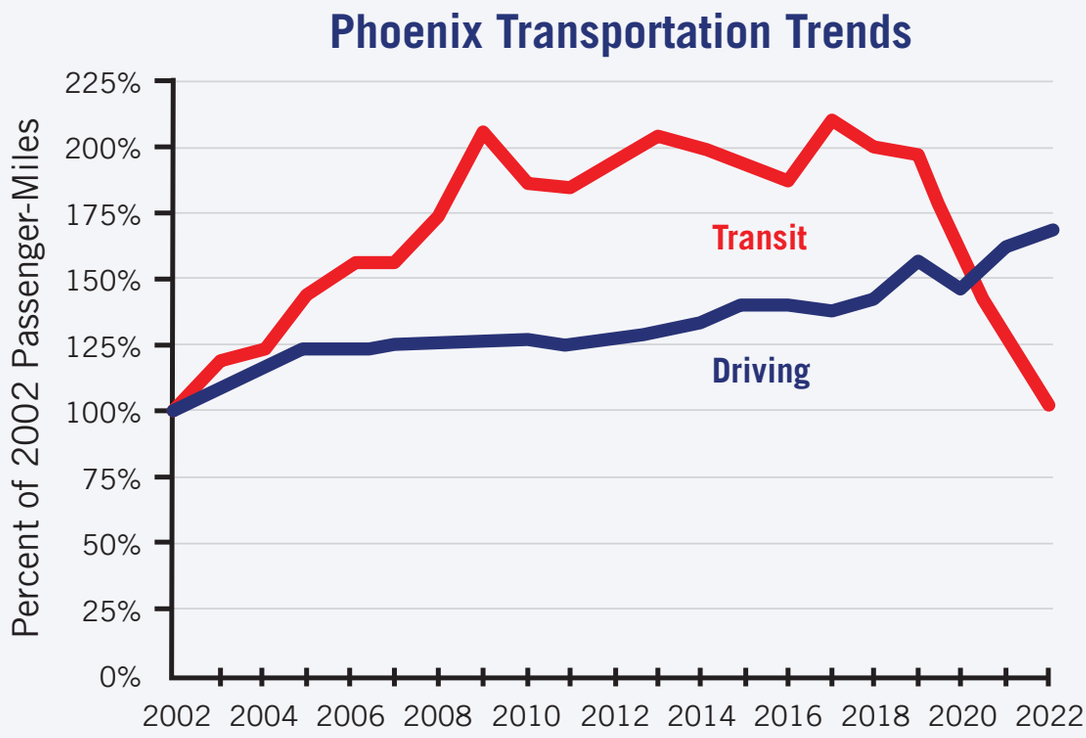



***Figure 3:*** *Phoenix transit passenger-miles grew rapidly through 2009 but flattened out after that. Note also that by 2021 driving had recovered to its pre-pandemic levels while transit continued to lose riders. Both transit and driving are shown as the change from 2002; since auto passenger-miles were 100 to 200 times transit passenger-miles, if both were shown in passenger-miles, transit would be a flat line at the bottom of the chart. This chart shows transit passenger miles carried in fiscal years, which for Phoenix transit agencies end on June 30, while driving is for calendar years.*

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What happened to transit can be seen by comparing ridership by transit mode. As shown in figure 4, both bus and vanpool passenger-miles grew through 2009. In that year, Valley Metro opened the region's first light-rail line. Within two years, agencies reduced funding for bus operations by 11 percent, which led to a 15 percent drop in bus service (measured in vehicle-revenue hours) and a 26 percent drop in bus passenger-miles. Vanpool funding and ridership also declined.

At first glance, a reduction in bus service might seem appropriate when a new light-rail line is opened. After all, the rail line is replacing one or more existing bus lines. In fact, a rail line cannot exist by itself as any transit line directly serves only a narrow corridor. To promote ridership, transit agencies need to provide frequent feeder buses from stations along the rail line to neighborhoods that are too far from stations to walk. The result is that bus service should increase, not decrease, when a rail line opens. However, too often agencies are forced to reduce bus service due to the high cost of the rail line.

In Phoenix's case, the metro area's population grew by nearly 25 percent between 2009 and 2019, yet transit ridership was stagnant or falling, resulting in a significant decline in trips per capita.

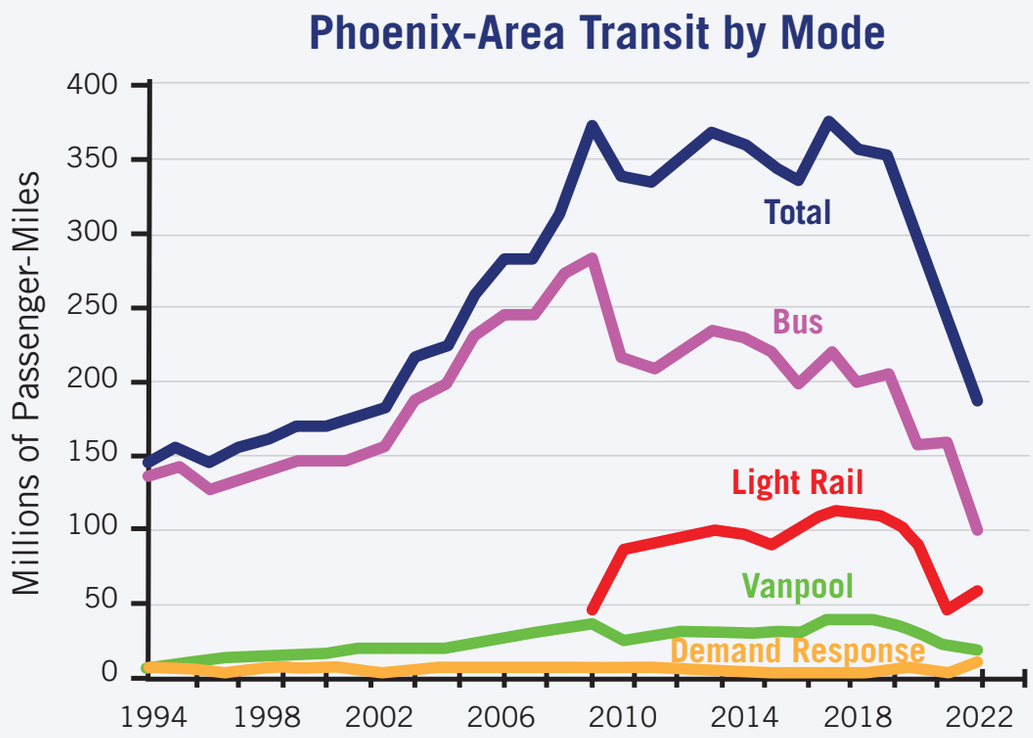


***Figure 4:*** *Phoenix bus and vanpool passenger-miles grew rapidly through 2009 but crashed after that as the region's transit agencies diverted operating funds from those two modes to the light-rail line. Light rail includes streetcar passenger-miles, though they are insignificant.*

The effects of the pandemic on transit were even worse. As shown in figure 5, transit ridership collapsed to 55 percent of 2019 levels and appears to have plateaued at that level.

Despite 2021 and 2022 being years of recovery for most activities, Phoenix transit ridership in 2021 was lower than in 2020 and ridership in 2022 was lower than in 2021. Ridership may never again come close to 2019 numbers, except possibly through population growth.10 In contrast, urban driving in Arizona had completely recovered to pre-COVID levels by mid-2021.11

The main driver for the post-pandemic changes is telecommuting, which nearly tripled from 158,000 people in the Phoenix area in 2019 to nearly 467,000 in 2021. Increased telecommuting had the greatest impact on transit. Between 2019 and 2021, the number of people commuting by automobiles declined by 18 percent and the number walking declined by 12 percent, but the number taking transit to work fell by 50 percent.[12]

Driving has grown above pre-COVID levels because, as several research studies have found, people who work at home actually drive more than people who commute to work.[13] Most of that new driving is not during rush hours, so they are able to drive more miles in a fixed amount of time than the time they would have spent commuting. ■

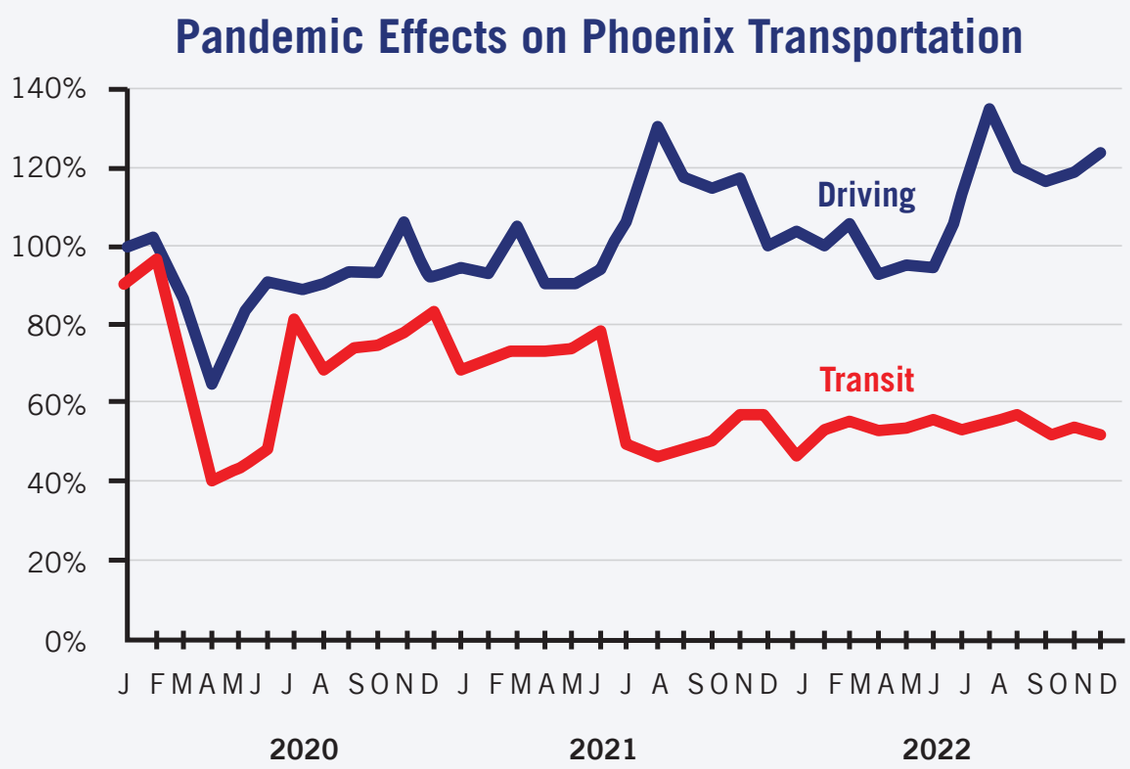


***Figure 5:*** *Monthly transit ridership and miles of driving as a percent of the same months in 2019 reveal that driving had pretty much completely recovered from the pandemic by mid-2021, while at the same time transit collapsed to below 60 percent of 2019 numbers and look like they may never exceed that. Transit is based on monthly ridership numbers published by the Federal Transit Administration. Driving is based on urban arterial miles driven in Arizona, but it is likely that these mirror total miles driven in Phoenix.*

# LIGHT RAIL:
## AN EXAMPLE OF IRRATIONAL PLANNING


**Phoenix's light-rail system is a prime example of the region's irrational planning system at work.**

**Light rail was sold to the public as a way of attracting people out of their cars to relieve congestion.**

**Instead, as figure 4 showed, light rail had a devastating effect on Phoenix transit. Before light rail, Phoenix transit ridership was rapidly growing. After light rail, it was stagnant or declining.**

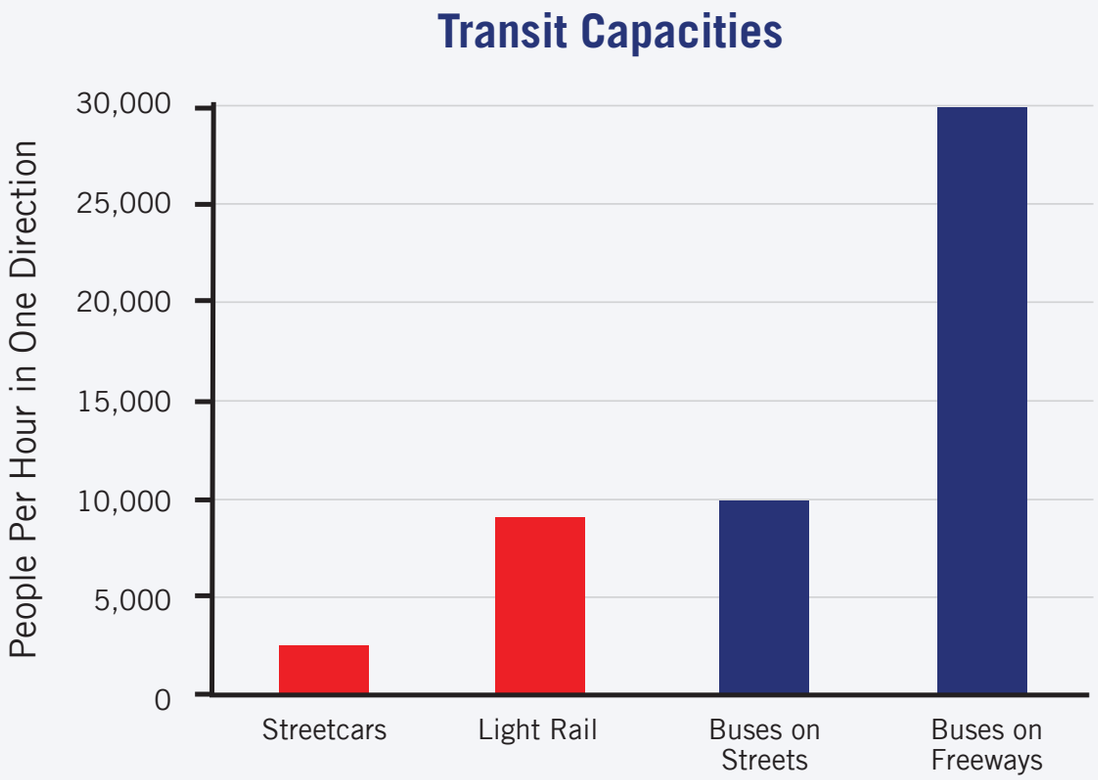


***Figure 6:*** *Light rail is low-capacity transit and streetcars are super-low-capacity transit. Portland's busway, which is on ordinary city streets, can move 9,960 people per hour. Istanbul's busway, which is built in the median strip of a freeway, can move 30,000 people per hour. Both cost far less yet can move more people than streetcars or light rail.*

The problem with light rail is that it is a high-cost form of low-capacity transit. Phoenix's regional transportation plans frequently call light rail "high-capacity transit," but this is at best a marketing term and at worst a lie. The truth is that the word "light" in light rail refers not to weight but to capacity: the American Public Transportation Association's transit glossary defines light rail as "an electric railway with a 'light volume' transit capacity."[14]

A single light-rail vehicle can hold about 150 people, and three of them coupled together can carry 450, which is a lot more than a bus. But, for safety reasons, a single light-rail line can only move about 20 trains per hour, limiting the rail line's capacity to about 9,000 people per hour.

In contrast, bus lanes can safely move hundreds of buses per hour. Using about the same amount of land as a light-rail line, Istanbul has a busway that is capable of moving up to 30,000 people per hour, and routinely carries well over 20,000 people an hour.[15] Bus-rapid transit lines in Bogota, Columbia, have even higher capacities, being capable of moving 41,000 people per hour, though they use more land than a light-rail line.[16] Phoenix is unlikely to have any route that needs this kind of capacity, but buses can serve almost any level of demand, from 40 to 40,000 people per hour, at about the same cost per rider, whereas rail lines require huge up-front costs that can only be justified by the ridership in extremely high-density cities such as Hong Kong or Tokyo.

Even more laughable is that MAG counts streetcars as high-capacity transit. Tempe's streetcars can carry 120 passengers and operate three to four times per hour.[17] At maximum capacity, which would require the purchase of several more streetcars, they could run 20 times an hour, which

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works out to 2,400 people an hour. In contrast, Portland has designated one bus lane and a parking strip for buses on downtown streets that can move more than160 buses per hour.[18] With each bus capable of carrying 60 passengers, that's almost 10,000 people per hour. If light rail is low-capacity transit, streetcars are super-low-capacity transit.

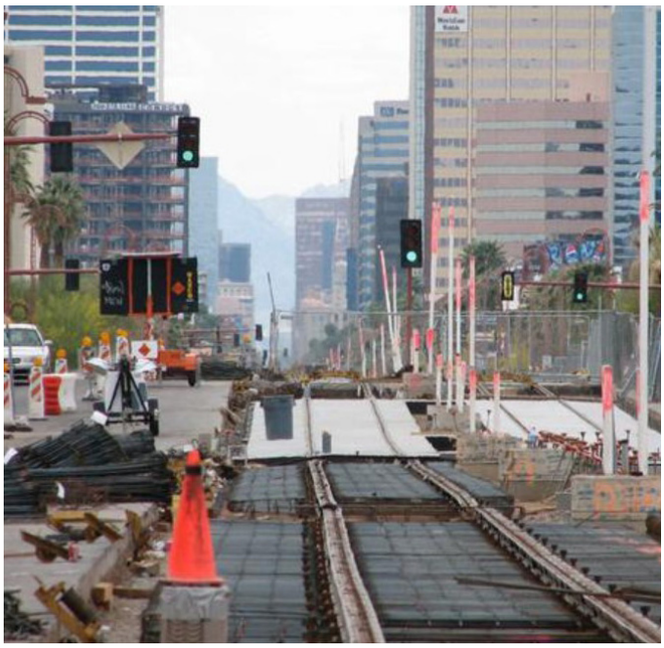
**To serve the Tempe streetcar line, Valley Metro bought six streetcars costing $5.5 million apiece. For the same amount of money, Valley Metro could have purchased 66 buses that could have provided twice the frequency of service over more than five times more route miles, saving taxpayers the cost of constructing the streetcar infrastructure.**


Light rail and streetcars were rendered obsolete in 1927 when a bus manufacturer called Twin Coach made the first bus that cost less to buy and less to operate, per seat-mile, than streetcars or other rail lines.[19] Within ten years after that bus was introduced, more than 500 U.S. cities converted their streetcar lines to buses and no more streetcar lines were built in the United States for more than 40 years.[20] Starting in the 1980s, cities that began building light-rail lines did so almost exclusively not because they were efficient but so they could be eligible for federal funds that were not available to transit agencies that only operated buses.

The Federal Highway Act of 1973 permitted cities to cancel interstate freeways and use the federal share of the funds on transit capital improvements instead.[21] The mayor of Portland, Oregon wanted to cancel a freeway, but there was no way that Portland's bus agency could spend the freeway dollars on bus capital improvements. The mayor conceived the idea of building a high-cost, low-capacity line, not because it was efficient but because it was expensive enough to absorb all of those federal dollars. Several other cities, including Buffalo, Sacramento, and San Jose, followed Portland's example.

In 1991, Congress repealed this law and instead created a transit capital grants fund that could only be spent on "fixed-guideway" transit, meaning either rails or dedicated busways.[22] Although the law required that such spending be "cost effective," in actual practice the Federal Transit Administration funded almost any project, no matter how expensive or how few riders it was expected to carry. The catch was that state or local governments had to provide matching funds for construction and pay for most of the operating costs, which Congress thought would keep project costs from getting out of hand.

It didn't. The nation's first modern light-rail line, one of the few built without federal dollars, was built by San Diego at a cost of about $20 million per mile in today's dollars. Passage of the 1991 law set off a race in which cities sought to spend more and



more in order to be eligible for more federal dollars. New light-rail projects were increasingly expensive until today the average cost of light-rail lines being federally funded or under consideration for federal funding today is more than $275 million per mile, and none are expected to cost less than $138 million a mile.[23] As a result, the goal of many transit agencies, including Valley Metro, has shifted from moving people around urban areas to moving dollars from taxpayers' pockets to engineering, design, and construction firms. To convince politicians and taxpayers to support this goal, transit agencies make outlandish claims about light rail. In addition to misleadingly calling it high-capacity transit, they promise it will reduce congestion and stimulate economic development.

Phoenix has proven that light rail is a spectacularly inefficient use of funds when compared with freeways. At a cost of $1.47 billion, the region recently completed the 22-mile, eight-lane Loop 202 South Mountain Freeway, an average of a little more than $8.3 million per lane-mile. For another $191 million, the state contracted with the builders to maintain the road for 30 years.[24] Two of the eight lanes are high-occupancy vehicle lanes, which means Valley Metro could run 150 buses an hour on each of those lanes that could carry more people than any light-rail line, and still leave enough room for more than 1,000 cars an hour on those lanes but 2,000 cars an hour on each of the other six lanes. On average, Phoenix-area freeways carried 9.6 million passenger-miles per lane-mile in 2019.[25]

For comparison, Valley Metro's first light-rail line was 19.7 miles long and cost $1.4 billion, about the same as the South Mountain Freeway.[26] In its first full year of operation, it carried just under 88 million passenger-miles, or an average of 4.45 million passenger miles per mile of rail line. Since light-rail miles cost nearly nine times as much as freeway lane-miles yet carry less than half as many passenger-miles, light rail is an extremely wasteful way of moving people. Worse, compared with more recent light-rail projects, that first line was cheap. The 5.5-mile South Central light-rail extension is costing nearly $1.35 billion, or $245 million per mile.[27]

Since Phoenix's high-cost, low-capacity system coincided with the stagnation of transit ridership, it did nothing to relieve congestion and may have made it worse. Thanks to improvements in the region's bus systems, the number of workers who took transit to work increased from about 28,000, or 2.1 percent, in 2000 to about 49,000, or 3.2 percent, in 2008, the year before the light-rail line opened.[28] By 2019, ten years after the first light-rail line opened, this had fallen back to less than 42,000 or 2.2 percent of workers.

If the region had continued to improve its bus system rather than build high-cost, low-capacity rail, the number of transit commuters might have grown by another 20,000 instead of shrinking by 7,000. With the light rail, the share of people driving alone to work grew from 74.8 percent in 2008 to 81.8 percent in 2019 and the number of vehicles used to commute to work grew from 1.2 million 2008 to 1.6 million in 2019.[29] If transit commuting had grown by 20,000 rather than shrink by 7,000, about 1 percent of those auto commuters would have been transit riders

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instead—not a large percentage but enough to make a small difference in congestion.

To support its claim that high-cost, low-capacity rail promotes economic development, Valley Metro counted any new projects built near the light-rail line (and some that weren't) as projects that were built because of the light rail. These included gas stations, a car dealership, a parking garage that specifically could not be used by light-rail riders, various government and university buildings that would have been built anyway, hundreds of parking garages and parking lots, and scores of housing projects that received subsidies of their own.[30] In fact, light rail may have had a minor influence on where some new projects were built, but it had virtually zero influence on the number of new projects built.

Instead of asking whether light rail was a cost-effective mode of transit, the regional transportation plan asks how many people live within a quarter mile of a high-cost, low-capacity rail line.[31] But that question is irrelevant if transit is so slow and inconvenient compared with driving that hardly anyone uses it. If equal access to every possible kind of urban transportation is a reasonable goal, then the region should spend heavily on cannons and nets so that people who want to travel by being shot from cannons can do so. While this may seem ridiculous, it is no more ridiculous than spending hundreds of millions on obsolete streetcars and billions on obsolete low-capacity rail systems.

Planners of the Phoenix light-rail system did not do a credible benefit-cost analysis of those lines, for if they had the rail lines never would have been built. But to the extent that they fantasized that the benefits would exceed the costs, such fantasies have been obliterated by the apparently permanent 45 percent decline in the region's transit ridership. Light-rail projects that were questionable in the first place are completely insane if ridership is only 55 percent of what it was before the pandemic.

Most of the problems associated with light rail could have been prevented if MAG's regional transportation plan had followed a rational planning process. Development and evaluation of a wide range of alternatives would have revealed that buses could move more people at a lower cost than light rail. Even if one light-rail line had been built, a monitoring system would have revealed that it didn't attract any more riders than a comparable bus-rapid transit line running on city streets and that its high costs were forcing reductions in bus service that cost more riders than were gained by the rail line.

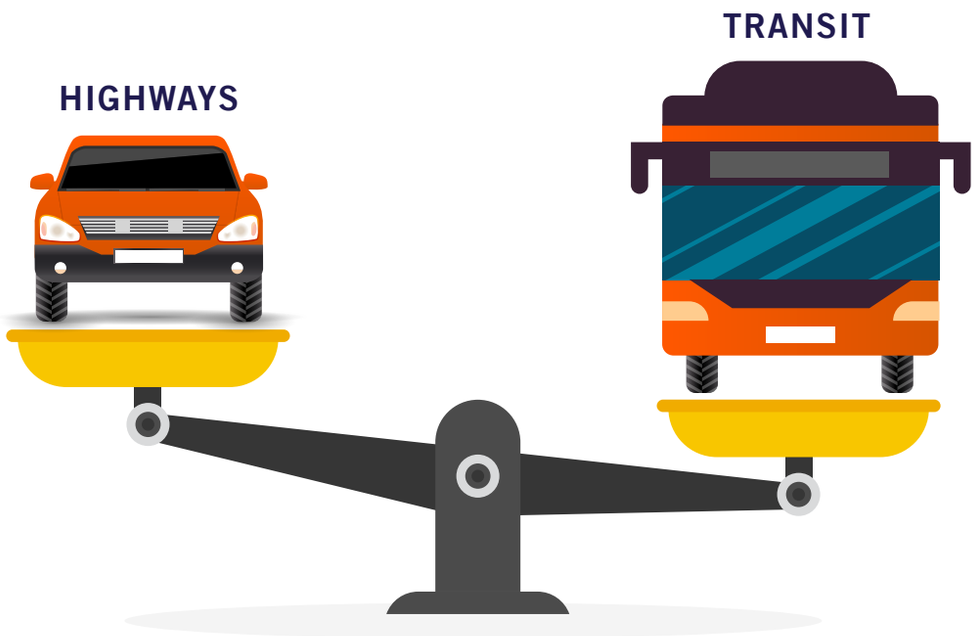
In addition to light rail, MAG's regional transportation plan proposes bus-rapid transit lines, including routes with traffic lanes dedicated exclusively to buses and routes using shared traffic lanes. Bus-rapid transit has a speed advantage over local bus lines because rapid buses typically stop only about once per mile instead of five or six times a mile. Dedicating lanes to buses adds little to this speed advantage, but it does increase congestion as the lanes are no longer available to other vehicles.

The president of Los Angeles Metro has specifically stated that he wants dedicated bus lanes primarily in the hope that the increased congestion will force more people to ride buses.[32] While dedicated bus lanes can move lots of people in dense cities such as Istanbul and New York, there are no routes in Phoenix where a dedicated lane would move more people than a shared lane. MAG should avoid making the same mistake with buses that it made with rail by erroneously selecting the high-cost alternative when the low-cost one will do just as well.

Light rail and streetcars are only two of the most egregious examples of poor regional transportation planning. MAG's regional transportation plans contain many other questionable decisions, including proposals for reducing the capacity of major streets to provide bike lanes and busways, a failure to rapidly coordinate all traffic signals in the region, and a slowdown of the region's freeway construction program. All of these questionable decisions could have been avoided if MAG had used a rational planning process. ■

# OTHER PROBLEMS WITH THE PLAN:

## IMBALANCED TRANSPORTATION FUNDING




Many transit advocates call for "balanced transportation funding," by which they mean as much money should be spent on transit as on highways. A true balance would spend proportional to use: if transit carries half the passenger travel in a region, but none of the freight, dedicating 25 to 30 percent of capital spending to transit would be appropriate, depending on the relative value of passenger and freight transport. In Phoenix, of course, transit carries less than 1 percent of travel and no amount of spending is likely to increase that.

Over a 30-year period (2022-2051), the $75 billion dollar plan calls for spending $15.45 billion on freeway/highway maintenance and operation (funded through ADOT with an allocation of state HURF and FHWA formula funding), $18.45 billion on freeway/ highway improvements, $30.2 billion on transit, and $10.5 billion on "regional priorities," which includes arterial improvements ($6.0 billion), active transportation ($1.6 billion), air quality ($0.6 billion), emerging technologies ($0.5 billion), intelligent transportation systems ($0.8 billion), safety ($0.4 billion), and transportation demand management ($0.7 billion).[33]

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One reason why transit is more costly is that transit agencies must pay for vehicle operations, whereas most highway vehicle operating costs are paid by highway users, not the highway agencies. Phoenix-area transit agencies spend less than $400 million per year on transit operations, so about 40 percent of the $30.2 billion spent on transit is for operating costs. That still leaves roughly $18 billion, or 24 percent of the total, spent on a transportation system that carries well under 1 percent of passenger travel and no freight. This is imbalanced.

Perhaps 2 percent of Phoenix-area passenger travel is cycling or walking. The plan devotes $1.6 billion to "active transportation," which means cycling and walking. Another $0.7 billion is for "transportation demand management," which MAG defines as efforts "to reduce the drive-alone rate through [increasing] travel choices [including] walking, biking, carpool, vanpool," and other forms of transit.[34] If all of this were devoted to cycling and walking, when added to the $1.6 billion the total is about 3.0 percent of total plan funding, which is not particularly imbalanced.

The transportation improvement plan (TIP) is a short-term plan that implements the regional transportation plan. MAG's TIP for 2022-2025 calls for spending 65.7 percent of funds on freeways, streets, and bridges, 27.7 percent on transit, 2.2 percent on cycles and pedestrians, with the remaining 2.9 percent divided between air quality, safety, and intelligent transportation systems.[35]

Less than 17 percent of the funds for transit is for operations or operating assistance, which means 83 percent is for capital improvements, capital replacement, or major maintenance activities. This is more than 23 percent of the entire TIP plan, which is clearly imbalanced for a system that provided only 0.3 percent of passenger travel and no freight in 2021.

Many of the air quality projects consist of paving roads to reduce dust, which is worthwhile. However, nearly $2 million is spent on a "regional rideshare and telework program" and another $3.7 million is for a "travel reduction program." This is mostly futile: there is little evidence that such programs reduce vehicle-miles traveled and people who telecommute actually drive more than people who don't.

The $149 million spent on cycle and pedestrian paths isn't imbalanced, but $24 million of this is to be spent on 21 miles of bicycle lanes, mostly on minor arterials and collectors. Often this means reducing the capacity of those streets for auto traffic. Only one project is for a bicycle boulevard that costs less than half as much, per mile, as the bike lanes. Such bicycle boulevards should have been preferred as they cost less than lanes, offer greater safety for cylists, and don't reduce roadway capacities for other vehicles.

# CONGESTION

Although the increase in the number of people working at home greatly reduced traffic congestion, especially in the morning hours, congestion is still a problem. Congestion is a deadweight-loss to society, as no one benefits from it at all except perhaps those who enjoy watching other people be miserable.

For this reason, it should be the top priority, after safety, of the regional transportation plan. Congestion is important enough in Phoenix that it is mentioned on 17 of the 2021 regional transportation plan's 88 pages.

**"Traffic congestion was by far the greatest frustration [the public has] with regional transportation," reports the document on page 44. Yet nowhere in the planning process did planners try to identify the policies and programs that could do the most to relieve congestion. Instead, the plan simply takes a scattershot approach: build a lot of new roads and light rail and streetcars and bus rapid transit and maybe congestion will decline.**

The octupling of freeway lane-miles between 1985 and 2019 did a tremendous job of reducing traffic congestion in the Phoenix metropolitan area. According to both INRIX and the Texas Transportation Institute, Phoenix had the least congestion of any urban area with more than 3 million people in 2019. The Texas Transportation Institute ranked Phoenix as having the 22nd most congestion of any U.S. urban area even though it is the 12th largest urban area in the country.[36]

Yet, despite all the new freeways, the Texas Transportation Institute estimates that the number of hours of delay experienced by Phoenix drivers grew from 38 in 1985 to 61 in 2019. Congestion cost the Phoenix area more than $3.7 billion—nearly $1,200 per auto commuter—in 2019, more than 11 times as much as in 1985.[37] Congestion was reduced by the pandemic, but unless something is done it is bound to eventually return.

Highway opponents argue that more highways simply "induce" more traffic, yet if this were true, then Nevada's highway 50, the "loneliest road in America," would be as congested as the busiest freeway in Los Angeles. What really happens is that new roads in growing urban areas create more economic opportunities for residents: access to better jobs, more outlets for things they produce or services they provide, better housing, lower-cost consumer goods, better health care, and so forth. The increased use of the roadway network is a symptom of its success, not failure.

At the same time, there are ways of reducing congestion that are far less expensive than building new freeways. For example, coordinating traffic signals is one of the most cost-effective ways of reducing congestion. Although MAG and local governments have traffic signal coordination programs, many traffic signals in the Phoenix area remain uncoordinated with one another or are coordinated using older technologies. For the cost of a couple of miles of new freeway, the region could probably coordinate every signal in the region using the latest technologies.

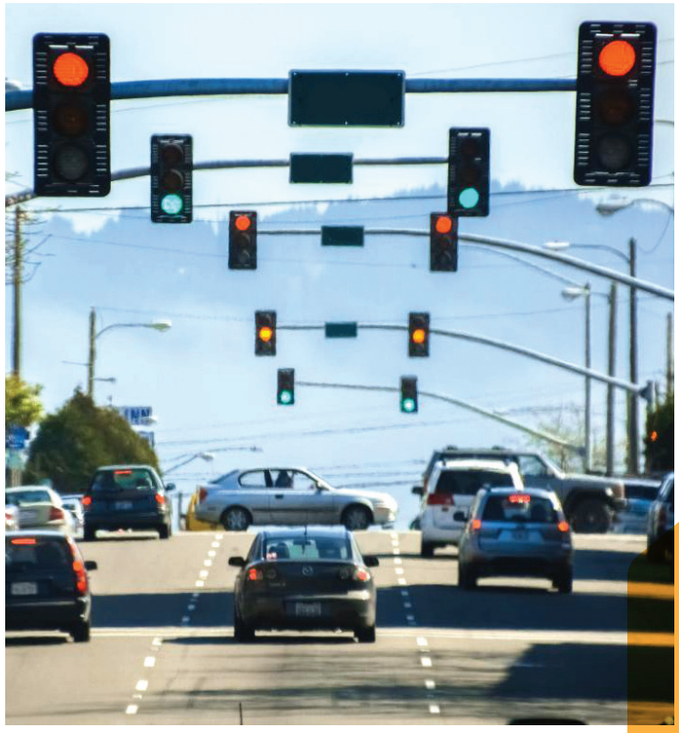

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Figure 7 suggests that even greater savings could be obtained for less money due to a peculiar quirk of highways. The figure shows that a typical freeway lane can move about 2,000 vehicles per hour at 50 miles per hour, but at slower speeds the throughput can drop to less than 1,000 vehicles per hour. When people try to force more vehicles on a freeway that it can handle, speeds and throughput slows. Even if the number of vehicles trying to use a lane drops below 2,000 per hour, the road will remain congested until it drops below whatever is the throughput at the speed the traffic is moving. This explains why people sometimes encounter traffic jams on otherwise free-flowing highways with no apparent cause of those jams.

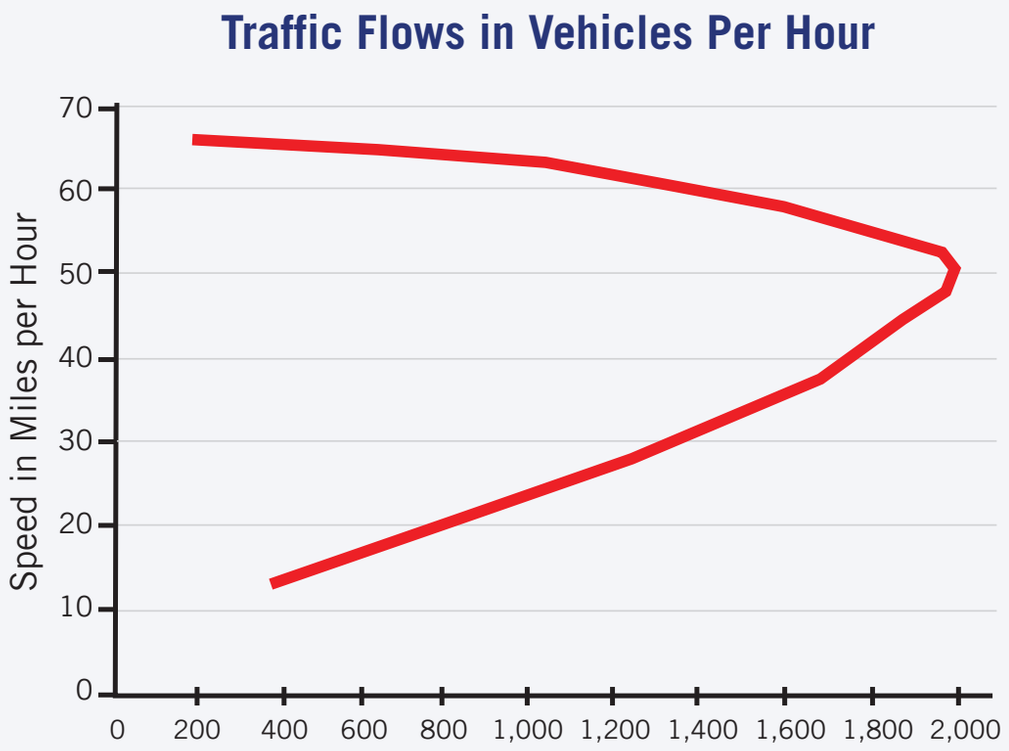


***Figure 7:*** *A typical freeway lane can move 2,000 vehicles per hour at speeds of 50 miles per hour. When people try to crowd more than 2,000 vehicles an hour onto the lanes, however, traffic slows, and when traffic slows the throughput can easily decline to less than 1,000 vehicles per hour. Taking steps to make sure that no more than 2,000 vehicles per hour ever try to use the freeway lanes can effectively double rush-hour throughput. Source: Based on a chart shown in 2015 Corridor Capacity Report (Olympia: Washington State Department of Transportation, 2015), p. 5.*

The solution to this problem is simple in concept but difficult in implementation: make sure traffic never exceeds 2,000 vehicles per lane per hour, or whatever is the maximum capacity of the road. Freeway ramp meters are one way to do this, but even they can become swamped with traffic and to some degree just move congestion to another part of the highway network.

Signal coordination and ramp metering are the kinds of ideas that should have been considered in alternatives in the regional transportation plan—but were not. The availability of funds from the half-cent sales tax allowed planners to simply ignore alternatives that were more cost-effective than building new freeways or light-rail lines.

# SAFETY

Another issue that should be at least as important as congestion is safety. Arizona roadway safety has greatly improved, with fatality rates dropping from 52.8 per billion vehicle-miles in 1980 to just 12.6 in 2010. However, since 2010 safety has declined, with fatality rates rising to 16.0 per billion vehicle-miles in 2020. The 2021 regional transportation plan devotes an entire page to safety, but the only on-the-ground activity it mentions is training school crossing safety guards. Instead, it focuses on things like creating a transportation safety committee, writing a safety plan, and a "See Me AZ" advertising campaign to raise driver awareness of pedestrians and bicycle riders.[38]

The safety plan, which MAG adopted in 2018, offers no more concrete programs aimed at improving safety. Instead, most of it focuses on vague ideas such as "promoting a culture of safety" and adopting a "vision statement" saying that "everyone stays safe traveling place to place."[39] The plan does refer to another document, "Task 5 and 6," which supposedly lists "over 70 safety strategies."[40] But neither the regional transportation plan, the safety plan, or the tasks 5 and 6 document reveals which of these strategies will be funded by the regional transportation plan and the process for determining such funding is completely opaque.

Nationwide traffic safety has greatly improved since the early 1970s, when more than 55,000 people per year were killed in traffic accidents. By the early 2010s, this had declined to under 33,000 people per year. Because miles of driving had greatly increased, fatality rates had declined even more from 48.5 fatalities per billion vehicle-miles in 1970 to 11.0 in 2010. In a disturbing change of direction, however, fatalities have grown since 2010, reaching more than 36,000 in 2019, nearly 39,000 in 2020, and nearly 43,000 in 2021.

Arizona has always had fatality rates much higher than the national average. In the mid-1980s, it had the dubious distinction of having the highest fatality rates of any state in the country. While it is not the highest today, it was fourth highest in 2018 and tenth highest in 2019.[41]

Similarly, urban Maricopa County has about 40 percent higher fatality rates than other urban areas in the United States. Urban Maricopa County had 464 traffic fatalities in 2006, falling to 259 in 2009, but increasing back to 439 in 2020.[42]

Urban Maricopa freeways are the safest roads in the region, with 5.6 billion fatalities per billion vehicle-miles between 2006 and 2020. Non-freeway arterials are the most dangerous, with 17.7 fatalities per billion vehicle-miles. Collector roads had 12.2 and local streets 8.5 fatalities per billion vehicle-miles. In 1985, the Phoenix urban area had 275 lane-miles of freeways that carried just 13 percent of the region's motor vehicle travel. By 2019, freeway lane-miles had octupled and freeways carried more than a third of the region's motor vehicle travel, thus relieving congestion and increasing safety by attracting vehicles away from other arterials.[43]

Nearly half the difference between national and Maricopa County urban fatality rates is due to Maricopa's significantly higher fatality rates for pedestrians, cyclists, and motorcyclists. Between 2006 and 2020, pedestrian fatality rates per billion vehicle-miles were 72 percent higher, motorcyclist rates were 80 percent higher, and cyclist rates were 100 percent

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higher than the national averages.[44] These rates may be higher due to increased walking, cycling, and motorcycling in Phoenix, but this increase should also have made auto and truck drivers more aware of the presence of more vulnerable street users.

The trend of declining fatalities to about 2010 and increasing thereafter appears to be independent of whether the roads are urban or rural. One factor that is probably contributing to this increase is the proliferation of smart phones and other distracting devices.

The first smart phones appeared in 2007. According to surveys by Pew Research, 35 percent of adult Americans had smart phones in 2011, increasing to 56 percent by 2013, 72 percent by 2016, and 85 percent by 2021.[45] Surveys by Traveler's Insurance found that texting or emailing, checking social media, and other on-line distractions while driving were much higher in 2021 than 2019.[46] All of these increased still further in 2022.[47] This period also saw an increase in fatalities despite a decline in driving, thus significantly increasing fatality rates.

Drivers aren't the only ones distracted by smart devices. At least one report on the rise of pedestrian fatalities has put part of the blame on "pedtextrians," pedestrians distracted by their smart phones.[48]

Many of these fatalities are preventable but only if transportation planners improve their planning systems. After several fatal airline crashes in the 1990s, airlines, pilots' unions, and airplane manufacturers developed a data-driven incident reporting system that was aimed at fixing problems, not on finding people to blame for the problems. The result is that there have been no fatal commercial airline crashes in the United States since 2009.[49] The National Highway Traffic Safety Administration already has a database, known as the Fatality and Injury Reporting System Tool (FIRST).[50] Phoenix transportation planners should use and enhance this system to identify and solve real safety problems.

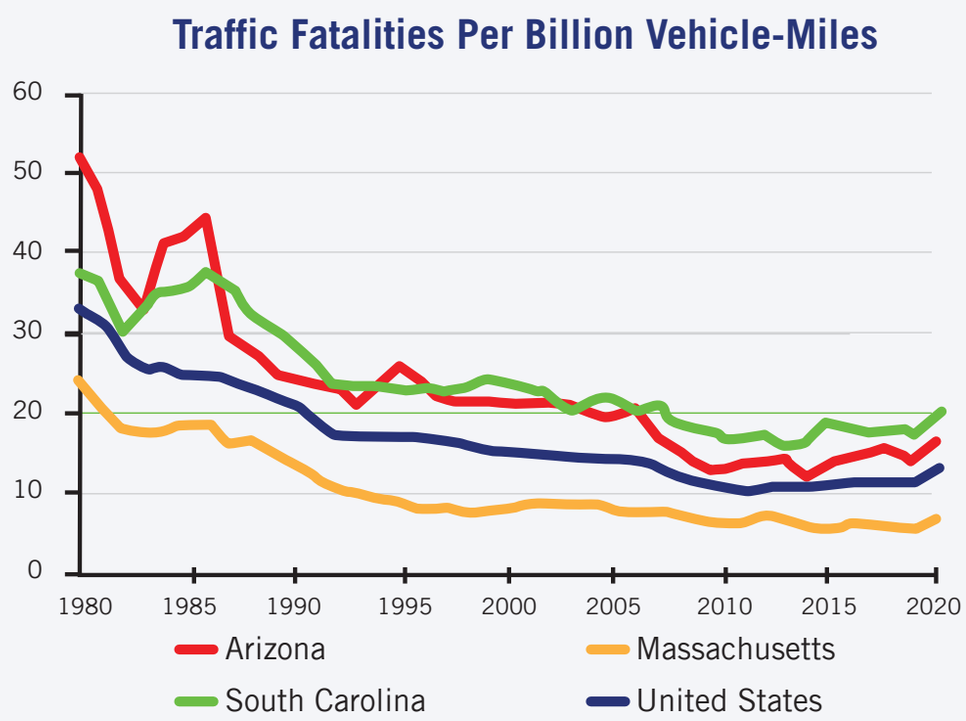


***Figure 8:*** *In the mid-1980s, Arizona had the highest traffic fatality rates of any state in the nation. South Carolina has since taken that dubious title, but Arizona remains significantly higher than the national average. For most of the last 30 years Massachusetts had the lowest rates. Source: Calculated from 2020 Highway Statistics, tables FI-220 (fatalities) and VM-202 (vehicle-miles).*

For example, 80 percent of urban Maricopa pedestrian fatalities take place at night and more than 76 percent of them take place when pedestrians are crossing streets away from intersections. Thus, efforts to reduce pedestrian fatalities should focus on discouraging pedestrians from crossing streets outside of designated crosswalks, especially at night.

Evidence from two other cities suggests that a high percentage of these nighttime pedestrian fatalities may be homeless people. According to the city of Portland, 70 percent of 2021 pedestrian fatalities in that city were homeless.[51] San Jose reports that 20 percent of all 2021 traffic fatalities, which probably means more than half of pedestrian fatalities, were homeless.[52] Homeless people often camp near arterial streets that are the most dangerous to pedestrians. Encouraging these camps to move away from arterials might do more to reduce fatalities than any major changes to street designs.

In contrast to pedestrians, cyclist fatalities happen mostly during the day. While about 60 percent of cyclist fatalities take place away from intersections, only 23 percent result from motorists hitting the cycles from behind. To reduce this, the regional transportation plan includes $50 million a year for making cycle lanes and pedestrian paths, but cycle lanes do little to prevent the other 77 percent of cyclist fatalities that come from crashes at intersections, motor vehicles turning into and out of driveways, and similar accidents.

A better solution would be *bicycle boulevards*, which would be installed on local streets that parallel arterials and collectors. The local streets would be redesigned to allow bicycles to use them with as few stops as possible. They would still be left open to local auto traffic, but a few barriers would be added to discourage auto drivers from using them for through traffic.

The city of Phoenix had 495 motorcycle fatalities between 2006 and 2020, which is 29 fatalities per 100,000 residents (using the city's 2020 population). This is much higher than in other cities with similar climates: Las Vegas had 18; San Diego 15; and Los Angeles 17 motorcycle fatalities per 100,000 residents. The difference is that California and Nevada require motorcyclists to wear helmets, which the National Highway Traffic Safety Commission says reduces motorcycle fatalities by more than 40 percent.[53]

Together, efforts to protect pedestrians from nighttime accidents, bicycle boulevards, and encouraging motorcyclists to wear helmets are just three examples of ways that a data-driven safety analysis could save dozens of lives per year. The regional transportation plan should include such an analysis to help identify where funds should be spent in the region to improve traffic safety.

Traffic accidents are not the only transportation-related safety problem in the Phoenix area. Phoenix's light-rail system caused 18 fatalities between 2014 and 2021, during which time light-rail trains carried about 764 million passenger-miles. That works out to almost 24 fatalities per billion passenger-miles, making the light rail nearly as dangerous as the most dangerous non-freeway arterials in Phoenix. For comparison, Valley Metro buses were involved with fewer than 10 fatalities for every billion passenger-miles they carried.[54]

Crime is another deterrent to people riding Phoenix's expensive light-rail system. Assaults and other crimes associated with the light rail have risen in recent years. Though they declined slightly in 2020, ridership declined even more, so crime rates continued to grow through the pandemic.[55]

Nationwide, light rail attracts more crime than any other form of transit.[56] This is due to its use of an "honor system" for fare collection. While heavy-rail lines have turnstiles requiring people to pay fares before boarding the trains, and most bus systems require drivers to enforce fare payment, light rail has no turnstiles and only sporadic fare enforcement by on-board fare inspectors. Under the "broken-windows" hypothesis, enforcement of minor crimes such as fare evasion will discourage more serious crimes. Buses such as San Francisco trolley buses that also use an honor system also suffer high crime rates

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for the same reason. MAG and Valley Metro should consider installing walls and turnstiles around every light-rail stop in order to deter crime.

# RESILIENCE

The COVID-19 pandemic has awakened Americans to the need to have a resilient society. One form of transportation has proven to be most resilient to shocks ranging from natural disasters, economic panics, and most recently the pandemic: motor vehicles and highways.

Highways are resilient because they are basically just low-cost (relative to rail lines) infrastructure that can be used by pedestrians, cyclists, motorcyclists, automobiles, buses, and trucks.

Once built, they are available to users even if budget cuts limit the amount highway agencies have to operate the roads. In contrast, various forms of mass transportation require operating funds or they disappear.

Unlike transit, highways didn't require billions of dollars in "relief" funds when COVID reduced travel in the United States. When New Orleans was flooded after Hurricane Katrina, those with automobiles were able to evacuate, while those who relied on public transit were stuck in the city. If a highway is closed by a wildfire or other natural disaster, there are usually alternate escape routes, something that isn't often true for rail lines. For all these reasons, the MAG plans' turn away from the highways that carry 95 percent of the region's passenger travel and all of its freight will reduce the resiliency of the region to withstand shocks, which is the opposite of what the plan should do.

# PUBLIC INVOLVEMENT

MAG justifies many of its questionable plans by claiming they are supported by the public as evidence by its public input process. This process asked people vague questions such as "What do you think a world-class transportation system looks like?" and "What are your highest transportation priorities?" Planners note that a large number of people supported more transit, but planners never revealed to them the costs of that transit.[57]

Phoenix transit agencies currently spend more than six times as much money to move someone a passenger-mile as Americans spend driving their cars. Even the most efficient transit systems in the country spend three times as much.[58] Spending more money on transit will increase the cost per passenger-mile without significantly increasing transit ridership. Without this kind of information, it is hard for members of the public to make rational responses to vague surveys.

The reality is that the public has revealed its preference by how it travels. Residents of the Phoenix urban area do more than 95 percent of their passenger travel by automobile. The roads that support that travel are also used to support nearly all freight movements within the region. The experience of many other cities that have spent huge amounts of money on other modes of travel show that doing so does not change people's travel habits. The public involvement process used by MAG was designed to support the planners' preconceived notions, not to find out how people really use the region's transportation system. ■

# THE FAILURE OF PAST EFFORTS

## TO REDUCE DRIVING

Fifty years ago, American automobiles were gas guzzlers that killed 55,000 people a year in traffic accidents and darkened urban skies with photochemical smog and other pollution. Many cities and regions responded to these problems by trying to reduce the amount of driving people do. They stopped building new roads. They reduced road capacities by converting general purpose lanes to exclusive bus or bicycle lanes. They spent heavily on transit improvements such as light rail.

**By 2019, the world had transformed. For every mile of driving, the average car on the road used half as much fuel, produced 95 percent less pollution, and was 77 percent less likely to be involved in a fatal collision as the average car in 1970.**[59]

None of these changes resulted from efforts to get people out of their cars, which failed miserably as total miles driven tripled from 1.1 trillion miles in 1970 to 3.3 trillion in 2019.[60] If anything, efforts to reduce driving did more harm than good, as increased congestion wasted fuel and produced more pollution.

Instead, all of the improvements in fuel economy, pollution, and safety resulted from making better motor vehicles and safer roads for those motor vehicles to drive on. For example, automobiles use the least fuel per mile at freeway speeds.[61] Freeways also tend to be the safest roads in an urban area while non-freeway arterials are the most dangerous, so new freeways that attract traffic off of non-freeway arterials improve fuel economy, reduce pollution, and improve safety.

In turning away from new freeway construction and emphasizing instead light rail, streetcars, and other ways to get people out of their cars, MAG has adopted a strategy that has proven to fail wherever it has been tried. This would have been revealed if MAG had written rational transportation plans that evaluated a full range of alternatives and monitored the results. ■

# TRANSPORTATION EQUITY
## & THE ENVIRONMENT

In recent years, transit advocates have tried to divert attention away from the inefficiencies of transit and to equity and environmental arguments instead. Phoenix transit fails even these tests, but nothing in the regional transportation plan hints that this might be true.

Unfortunately, transportation planning today is more rhetoric than reality. When the pandemic decimated transit ridership in April 2020, transit agencies argued that they needed continued subsidies because they were carrying "essential workers" to their jobs, including low-income people who didn't have access to cars.[62] Yet the data show that there are very few such workers and there are far less expensive ways of getting those few people to work.


In 2019, 21,638 transit commuters in the Phoenix urban area earned less than $25,000 a year. That was just 3.6 percent of workers in that income class and was a 26 percent decline from 2013, when 29,401 low-income workers commuted by transit.[63] In 2021, this number had been reduced to just 9,219, or less than 1.9 percent of low-income workers.[64]

The census data do not say how many low-income people lacked access to an automobile, but they do say that just under 52,000 workers in the Phoenix urbanized area lived in households with zero motor vehicles in 2019.[65] This declined to 48,600, or 2.5 percent of the region's workers, in 2021. Curiously, of the workers in households without cars, more than 20,000 (41 percent) drove alone to work in 2021—probably in employer-supplied vehicles—and another 3,800 (8 percent) carpooled, while just 5,700 (12 percent) took transit to work.[66] Thus, transit didn't even work for most people who don't have cars.

Transit attracts few commuters in the Phoenix urban area and residences are finely spread out across the landscape. While places like New York City have large concentrations of downtown jobs, less than 2 percent of jobs in the Phoenix area were located in downtown Phoenix before the pandemic, and it is probably an even smaller share since the pandemic.[67] This means that, for most residents, transit is a slow and clumsy way of getting to work.

Researchers at the University of Minnesota estimate that, in 2019, a typical resident of the Phoenix urban area could reach almost twice as many jobs in a 20-minute auto drive as a 60-minute transit trip (figure 9). In fact, residents could reach more than twice as many jobs on a bicycle as by transit in trips of 40 minutes or less.[68] Since it is inferior to both automobiles and bicycles, transit is third-class transportation.

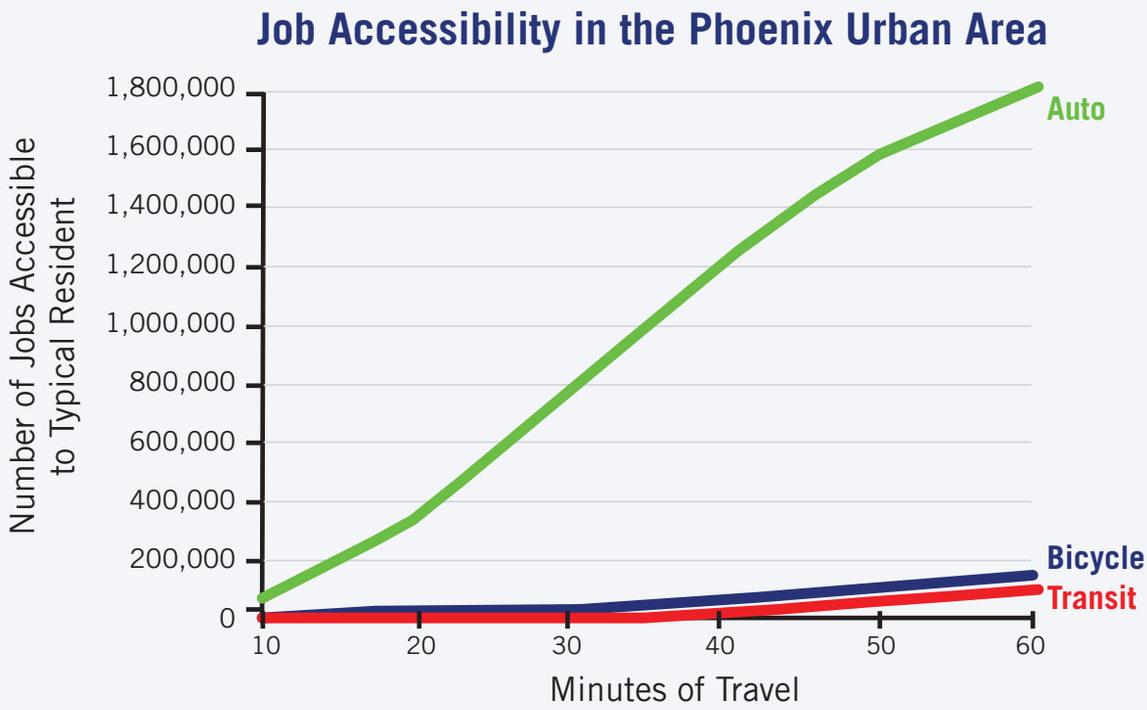


***Figure 9:*** *Transit is third-class transportation as a typical resident of the Phoenix urban area can reach more jobs by bicycle and far more jobs by automobile in a fix amount of time than by mass transit. Source: University of Minnesota Accessibility Observatory.*

Today, many transit advocates equate subsidies to transit with social justice.[69] In fact, most of the taxes used to subsidize transit are regressive. If only 1.9 percent of low-income workers in the Phoenix area are taking transit to work, that means the other 98 percent are disproportionately paying taxes for transit rides they rarely if ever take. Consigning poor people to third-class transportation and making other poor people pay for it is doubly socially unjust.

Low-income workers know that transit doesn't work for them. The Census Bureau estimates that the number of Phoenix urban area workers earning under $25,000 a year who took transit to work was 29,401, or 4.7 percent of all workers earning under $25,000, in 2013. This declined to 21,638, or 3.6 percent, in 2019. The pandemic accelerated this trend, reducing the number to 9,239, or 1.9 percent, in 2021.[70]

Making low-income people, 98 percent of whom rarely if ever ride transit, pay regressive taxes so Phoenix can build a transit system designed to get well-to-do people out of their cars is the very definition of social injustice. Many social justice advocates believe the best remedy for this is to offer free transit, but this would only increase inequities.

The United States today has what may be the most egalitarian transportation system in the world in the form of automobiles and highways. Everyone, whether they own an ancient Toyota Corolla or a new Bentley Continental, has equal access to highways. Automobile ownership is nearly universal: in the Phoenix urban area, 95 percent of households have at least one automobile. More than 97.5 percent of workers live in a household with at least one automobile and more than 75 percent live in households with two or more.[71]

The main barrier between many low-income people and car ownership is not the cost of a car or the cost of operating it, but the finance charges. Banks will typically charge 20 to

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25 percent interest to people with poor or no credit ratings who want to buy a used car, which can nearly double the monthly payment on such a car.[72]

Non-profit organizations in California, Oregon, Texas, and at least a dozen other states have attempted to reduce this barrier by offering low- or zero-interest loans to low-income people to buy a car or repair one that is out of service.[73] Since these are loans, not grants, their cost is low. Yet the benefits are large: follow-up studies by the groups offering such loans have shown that most people who buy cars under these programs end up with higher-paying jobs, better housing, and are less reliant on housing, food, and other welfare subsidies.[74] Unlike other proposed programs to help people who are in poverty, such as free transit, low-interest loans for cars actually helps people get out of poverty. A program like this could have been included in one of the alternatives considered by Phoenix's regional transportation plan—but was not.

The taxes and fees used to pay for transportation are less egalitarian. According to the Federal Highway Administration, about a fifth of Arizona fuel taxes and vehicle registration fees go to "general purposes" instead of highways.[75] Only about half of funds for state and local highways in Arizona come from user fees.[76] Taxpayers, most of whom rarely if ever ride transit, pay 85 to 98 percent of the Phoenix's transit operating costs and all of its capital costs. This is not equitable.

The other argument often made to justify transit subsidies is that transit can help save energy and reduce greenhouse gas emissions. But in 2019, before the pandemic, Phoenix transit used more than 5,400 British thermal units (BTUs) and emitted nearly 400 grams of carbon dioxide per passenger-mile. For comparison, the average car used less than 2,800 and emitted less than 300 grams of CO2 per passenger-mile and the average light truck (pickups, SUVs, and vans) used under 3,300 BTUs and emitted under 300 grams of CO2 per passenger-mile.[78]

Phoenix transit was even worse in 2021, using more than 7,500 BTUs and emitting more than 550 grams of CO2 per passenger-mile.[79] If a primary goal of the plan is to reduce greenhouse gas emissions and other pollution, then the plan should reduce funding for transit and encourage transit riders to drive fuel-efficient automobiles.

This could also be more cost-effective than transit. Operating subsidies to Phoenix-area transit were more than $345 million in 2019 and almost $374 million in 2021. If that $374 million were divided among the 9,200 transit commuters who didn't have cars in 2021, each would have enough to buy a well-equipped Toyota Prius or a fully electric car such as a Chevrolet Bolt. While I don't advocate doing that, another way of increasing the mobility of low-income people that cost much less than urban transit will be described below.

MAG planners assume that pollution is directly proportional to vehicle miles of travel (VMT), but it is more complicated than that. The average vehicle in America's automobile fleet uses less energy per mile at 55 miles an hour than at 20 miles an hour, so congestion that slows traffic increases pollution.[80] Automobiles also use more energy in stop-and-go traffic as they must frequently accelerate to normal speeds. As shown above, light rail has increased congestion in the region. Converting general purpose lanes to bus or bike lanes also increases congestion, which in turn wastes energy and increases air pollution.

**Without an evaluation of a full range of alternatives, MAG planners cannot lean on air pollution as a crutch to prop up their regional transportation plan. An alternative plan could have done more to reduce air pollution at a lower cost than the 2021 plan.** ■

# CONCLUSIONS

The Maricopa Association of Government's regional transportation plans have helped bilk Maricopa taxpayers out of billions of dollars spent on a light-rail system that was obsolete 94 years ago and that especially makes no sense in a region such as Phoenix that has no major job or population concentrations. Voters approved spending money on light rail because they were told it would relieve congestion, be more efficient than buses, and help low-income people, none of which are true. MAG could have avoided these and similar problems if it had followed a rational planning process that compared light rail with a range of alternatives.

Now that the pandemic has dramatically shifted American transportation habits, MAG should immediately revise its transportation plan to account for these new trends. When doing so, it should consider a full range of alternatives, including alternative ways of funding transportation such as mileage-based user fees or a county-wide gas tax as opposed to a sales tax that is both regressive and encourages wasteful spending.

## Some of the alternatives that should be considered in the plan include:

- **Alternatives to high-cost, low-capacity transit including bus-rapid transit using shared lanes as opposed to dedicated lanes;**
- **Safety improvements to existing light-rail lines to reduce fatal accidents and crime;**
- **Bicycle boulevards as alternatives to bicycle lans;**
- **Coordination of all traffic signals in the region;**
- **Strict freeway ramp metering to reduce freeway congestion;**
- **Low-interest loan programs to increase auto ownership for workers now having to use third-class transportation; and**
- **Alternatives to the sales tax as a funding method based upon user fees.**

The plan should also include a transparent monitoring program so that transportation users and taxpayers can know that the taxes and fees they pay are used in the most cost-effective manner to relieve congestion, reduce air pollution, and make transportation accessible to everyone. Making these changes will help Maricopa County save billions of dollars by focusing on transportation systems that best serve post-pandemic travelers. ■

# SOURCE NOTES


1. American Heritage Dictionary, 2022, https://ahdictionary.com/word/search.html?q=scheme.

2. Nigel Taylor, Urban Planning Theory Since 1945 (London: Sage, 1998), p. 68.

3. Brian J. McLoughlin, Urban and Regional Planning: A Systems Approach (New York: Praeger, 1969), p. 95.

4. Scenario Planning Report—Regional Transportation Plan: Momentum 2050 (Phoenix: Maricopa Association of Governments, 2021), pp. 15, 25, 45, 51.

5. Ibid, p. 32.

6. "INRIX Global Traffic Scorecard for Phoenix AZ," INRIX, 2023, https://inrix.com/scorecard-city-2022/?city=Phoenix%20AZ&index=272.

7. See, for example, Vladimir Livshits, et al., "MAG Behavioral Freight Model and Regional Microsimulation Model," Travel Model Improvement Portal, November 15, 2017, https://tmip.org/content/mag-behavioral-freight-model-and-regional-microsimulation-model-november-15-2017; and Rachel Copperman, et al., "100% GPS Prompted Recall Household Travel Survey in the Greater Phoenix Area: Survey Design and Preliminary Findings," Transportation Research Board, 2017, https://trid.trb.org/view/1439389.

8. See https://www2.census.gov/geo/maps/dc10map/UAUC_RefMap/ua/ua69184_phoenix--mesa_az/DC10UA69184_000.pdf for a map of the Phoenix urban area as defined by the Census Bureau for the 2010 census. The Census Bureau draws new lines around urban areas every 10 years, but in 2010 the Phoenix area included Chandler, Gilbert, Mesa, Scottsdale, Surprise, Tempe, and other adjacent communities, but not Avon, Goodyear, or Buckeye.

9. These numbers are based on surveys and data collected by the U.S. Department of Transportation. Motor vehicle data are from the annual Highway Statistics published by the Federal Highway Administration, table HM-71. Motorcycle data are from the same report, table VM-1. Transit data are from the annual National Transit Database Historical Time Series published by the Federal Transit Administration, table TS2.1. National walking and bicycling data are from National Transportation Statistics (Washington: Bureau of Transportation Statistics, 2022), table 1-40. These numbers are adjusted for Phoenix by comparing national and regional commuting data in the American Community Survey (Washington: Census Bureau, 2022), table B08301. For example, Phoenix urban area commuters are only 65 percent as likely to walk to work but are twice as likely to motorcycle to work as the national averages, so overall per capita walking and motorcycling are adjusted by these factors. Phoenix area residents are 97.5 percent as likely to cycle to work as the national average, so I didn't adjust cycling numbers.

10. "National Transit Database Monthly Module Adjusted Data Release," Federal Transit Administration, 2023.

11. Driving numbers are based on urban arterial miles of driving in Arizona as a whole, not just Phoenix, taken from Traffic Volume Trends (Washington: Federal Highway Administration), table 4 for months and years indicated. Because the initial entries for these numbers are often revised, numbers from the 2020 reports (which show 2019 for comparison) were used for 2019 and so forth.

12. American Community Survey (Washington: Census Bureau, 2022), table B08301 for Phoenix urbanized area in 2019 and 2021.

13. Pengyu Zhu, Liping Wang, Yanpeng Jiang, and Jiangping Zhou, "Metropolitan Size and the Impacts of Telecommuting on Personal Travel," Transportation, vol. 45 (2018), pp. 385¬–414; Sandip Chakrabarti, "Does Telecommuting Promote Sustainable Travel and Physical Activity?" Journal of Transport and Health, vol. 9 (June, 2018), pp. 19–33; Joãode Abreu e Silva and Patrícia C. Melo, "Does Home-Based Telework Reduce Household Total Travel? A Path Analysis Using Single and Two Worker British Households," Journal of Transport Geography, vol. 73 (December 2018), pp. 148–162.

14. Glossary of Transit Terminology (Washington: American Public Transit Association, 1994), p. 23.

15. M. Anil Yazici, Herbert S. Levinson, Mustafa Ilicali, Nilgün Camkesen, and Camille Kamga, "A Bus Rapid Transit Line Case Study: Istanbul's Metrobüs System," Journal of Public Transportation, 16:1 (20013), pp. 153–177.

16. Alasdair Cain, Georges Darido, Michael R. Baltes, Pilar Rodriguez, Johan C. Barrios, Applicability of Bogotá's TransMilenio BRT System to the United States (Washington: Federal Transit Administration), p. xi.

17. "Brookville Contracted to Design, Build Six Off-Wire Capable Liberty Streetcar Vehicles for Valley Metro," Mass Transit Magazine, June 19, 2017, https://www.masstransitmag.com/rail/press-release/12345296/brookville-equipment-corporation-brookville-contracted-to-design-build-six-offwire-capable-liberty-streetcar-vehicles-for-valley-metros-tempe-streetcar-project.

18. Robert L. Bertini, "Bus Facility Capacity," Portland State University, May 2, 2006, p. 15, https://ti.org/pdfs/Bus_facility_capacity.pdf.

19. William A. Luke, Fageol & Twin Coach Buses: 1922–1956 Photo Archive (Hudson, WI: Enthusiast Books, 2002), p. 5.

20. Robert Peschkes, World Gazetteer of Tram, Trolleybus, and Rapid Transit Systems— Part Four: North America (London: Rapid Transit Publications, 1998), pp. 148–149.

21. Richard F. Weingroff, "Busting the Trust," Public Roads, vol. 77, no. 1 (July/August 2013), https://highways.dot.gov/public-roads/julyaugust-2013/busting-trust.

22. Richard F. Weingroff, "Creating A Landmark: The Intermodal Surface Transportation Act of 1991," Public Roads, vol. 65, no. 3 (November-December 2001), https://highways.dot.gov/public-roads/novemberdecember-2001/creating-landmark-intermodal-surface-transportation-act-1991.

23. Annual Report on Funding Recommendations: Fiscal Year 2023 Capital Investment Grants Program (Washington: Federal Transit Administration, 2022), project profiles.

24. David M. Brown, "Phoenix Freeway Melds Adroit Design, P3 Contract," Engineering News Record, September 19, 2019, https://www.enr.com/articles/47465-phoenix-freeway-melds-adroit-design-p3-contract.

25. Highway Statistics 2019, table HM-72. Assumes 1.72 people per vehicle as calculated from table VM-1.

26. Before-and-After Studies of New Starts Projects (Washington: Federal Transit Administration, 2013), p. 11.

27. "South Central Light Rail Extension/Downtown Hub Project," Federal Transit Administration, February, 2021, pp. 1-2, https://www.transit.dot.gov/sites/fta.dot.gov/files/2022-03/AZ-South-Central-Light-Rail-Extension-Downtown-Hub-Phoenix-FFGA-Project-Profile-AR23.pdf.

28. 2000 Census (Washington: Census Bureau, 2002), table P030 for Phoenix urban area, https://data.census.gov/table?q=2000&t=Commuting&g=400XX00US69184; 2008 American Community Survey, table B08301 for Phoenix urban area.

29. Calculated from 2008 and 2019 American Community Survey, table B08141, for Phoenix urbanized area. This table shows the number of people driving alone to work and the number of people commuting in 2-, 3-, 4-, 5-6-, and 7+ people carpools, making it possible to estimate the total number of vehicles used for carpooling.

30. Randal O'Toole, Valley Metro Light Rail Economic Development Claims Fall Flat (Phoenix: Arizona Free Enterprise Club, 2019), pp. 5–10.

31. Regional Transportation Plan: Momentum 2050 (Phoenix: Maricopa Association of Governments, 2021), p. 74.

32. Ethan Millman, "As Bus Ridership Plummets in Los Angeles, Efforts to Boost It Hit Speed Bumps," Wall Street Journal, August 25, 2019, https://www.wsj.com/articles/as-bus-ridership-plummets-in-los-angeles-efforts-to-boost-it-hit-speed-bumps-11566725400?mod=hp_lead_pos11.

33. Regional Transportation Plan: Momentum 2050, pp. 67–69.

34. Regional Transportation Demand Management (TDM) Plan (Phoenix: Maricopa Association of Governments, 2014), p. 3, https://azmag.gov/Portals/0/Documents/TC_2014-09-11_Item-06_Regional-Transportation-Demand-Management-(TDM)-Plan-Presentation.pdf?ver=J75XzRyQ93SDpsOmtfTGXw%3d%3d.

35. "FY 2022-2025 TIP Project Listing Final," Maricopa Association of Governments, 2022, https://azmag.gov/Portals/0/Transportation/TIP/FY_2022-2025_TIP-Project-Listing-Final.xlsx.

36. David Schrank, Luke Albert, Bill Eisely, and Tim Lomax, 2021 Urban Mobility Report (College Station, TX: Texas Transportation Institute, 2021), p. 26.

37. Schrank, et al, 2021 Urban Mobility Report, "Complete Data" spreadsheet.

38. Regional Transportation Plan: Momentum 2050, p. 23.

39. Safe System in Action: MAG Strategic Transportation Safety Plan 2020-2030 (Phoenix: Maricopa Association of Governments, 2019), pp. 3, 14.

40. Strategic Transportation Safety Plan: Task 5 & 6 (Phoenix: Maricopa Association of Governments, 2019).

41. State fatality rates calculated by dividing fatalities in 2020 Highway Statistics, table FI-210 (multiplied by one thousand) by vehicle-miles traveled as reported (in millions) in 2020 Highway Statistics, table VM-202.

42. Figures for Maricopa County and comparisons with national averages are based on the Fatality and Injury Reporting System Tool, National Highway Traffic Safety Administration, https://cdan.dot.gov/query. This tool produces tables that provide a wealth of information, but unfortunately they are not linkable. Urban Maricopa fatality rates are calculated by dividing fatalities reported by this tool (multiplied by one million) by the daily vehicle-miles traveled (times 365 to get annual) reported (in thousands) in Highway Statistics, table HM-71 for the appropriate year.

43. Freeway data from 1989 and later are from Highway Statistics for the given year, table HM-72. Data from before 1989 are from the data spreadsheet accompanying the 2012 Urban Mobility Report (College Station, TX: Texas Transportation Institute, 2013).

44. I use the terms "cyclists" and "cycling" to refer to non-motorized vehicles that the NHTSA calls "pedacycles."

45. "Mobile Fact Sheet," Pew Research, https://www.pewresearch.org/internet/fact-sheet/mobile/, accessed January 16, 2023.

46. "2022 Distracted Driving for Consumers," Traveler's Insurance, https://www.travelers.com/resources/risk-index/2021-consumer-distracted-driving, accessed January 16, 2023.

47. "2021 Distracted Driving for Consumers," Traveler's Insurance, https://www.travelers.com/resources/risk-index/2022-consumer-distracted-driving, accessed January 16, 2023.

48. Richard Retting and Heather Rothenberg, Pedestrian Traffic Fatalities by State: 2015 Preliminary Data (Washington: Governors Highway Safety Association, 2016), p. 28, https://www.ghsa.org/sites/default/files/2016-11/spotlight_ped2015.pdf.

49. Andy Pasztor, "The Airline Safety Revolution," The Wall Street Journal, Apr. 16, 2021, available at https://www.wsj.com/articles/the-airline-safety-revolution-11618585543.

50. Department of Transportation, National Highway Traffic Safety Administration, Fatality and Injury Reporting System Tool (n.d.), at https://cdan.dot.gov/query.

51. Saving Lives with Safe Streets: Vision Zero Traffic Crash Report 2021 (Portland: Portland Bureau of Transportation, 2022), p. 8.

52. Kiet Do, "San Jose Grapples With Alarming Increase In Pedestrian Deaths; Many Homeless Victims," KYMA News, February 2, 2022, https://kyma.com/news/2022/02/02/san-jose-grapples-with-alarming-increase-in-pedestrian-deaths-many-homeless-victims/.

53. "Universal Motorcycle Helmet Use Laws," National Highway Traffic Safety Administration, https://www.nhtsa.gov/book/countermeasures/countermeasures/11-universal-motorcycle-helmet-use-laws, accessed January 19, 2023.

54. Calculated from "Major Safety Events" spreadsheet, Federal Transit Administration, 2023, https://data.transportation.gov/api/views/9ivb-8ae9/rows.csv?accessType=DOWNLOAD&bom=true&format=true and National Transit Database Historical Time Series, table TS2.1.

55. Colleen Sikora, "Assaults, Drug Crimes on Valley Buses, Light Rail Have Risen in the Last 5 Years," 12News, May 27, 2022, https://www.12news.com/article/news/crime/assaults-drug-crimes-valley-buses-light-rail-risen-last-5-years/75-5de267bd-46f8-4ec9-a3c2-bed63ef74477.

56. Calculated from "Major Safety Events" spreadsheet and National Transit Database Historical Time Series, table TS2.1.

57. Early Phase Public Involvement Report (Phoenix: Maricopa Association of Governments, 2021), pp. 14–15.

58. National Transit Database 2019, Service, Operating Expense, and Capital Expense spreadsheets reveal that in 2019, Phoenix transit agencies spent $1.11 per passenger-mile on operating costs and 55¢ per passenger-mile on capital costs. Transit agencies in New York, probably the most efficient in the country, spend $1.00 on capital and operating costs per passenger-mile. For comparison, the Bureau of Economic Analysis' National Income & Product Accounts, table 2.5.5, says that Americans spent $1.225 trillion buying, operating, and insuring automobiles in 2019. Highway Statistics 2019 says that Americans traveled 4.894 trillion passenger-miles in cars and light trucks, for an average of 25¢ per passenger-mile.

59. Stacy C. Davis and Robert G. Boundy, Transportation Energy Databook Edition 39 (Department of Energy, 2021): Table 4-1; Department of Transportation, Federal Highway Administration, Highway Statistics Summary to 1995, Table VM-201. Office of Highway Information Management available at https://www.fhwa.dot.gov/ohim/summary95/; Department of Transportation, Federal Highway Administration, Highway Statistics 2019, Table FI-210 and VMT-421c. Persons Fatally Injured in Motor Vehicle Crashes, 1967-2019, available at https://www.fhwa.dot.gov/policyinformation/statistics/2019/fi210.cfm and Public Road Mileage, Lane Miles, and VMT, available at https://www.fhwa.dot.gov/policyinformation/statistics/2019/vmt421c.cfm; Environmental Protection Agency, National Tier One CAPS Trends (2021), available at https://www.epa.gov/sites/default/files/2021-03/national_tier1_caps.xlsx.

60. Department of Transportation, Federal Highway Administration, Highway Statistics 2019, Table VM-2. Functional System Travel available at https://www.fhwa.dot.gov/policyinformation/statistics/2019/vm2.cfm.
61. Davis and oundy, Transportation Energy Databook Edition 40, table 4-34.

62. Alex Davis and Aarian Marshall, "Public Transit Cuts Hurt 'Essential Workers' Who Need It Most," Wired, March 30, 2020, https://www.wired.com/story/transit-cuts-hurt-workers-who-need-most/.

63. 2019 American Community Survey, table B08119 for Phoenix urbanized area, https://data.census.gov/table?q=b08119&g=400XX00US69184&tid=ACSDT1Y2019.B08119.

64. 2021 American Community Survey, table B08119 for Phoenix urbanized area, https://data.census.gov/table?q=b08119&g=400XX00US69184&tid=ACSDT1Y2021.B08119.

65. 2019 American Community Survey, table B08141 for Phoenix urbanized area, https://data.census.gov/table?q=b08141&g=400XX00US69184&tid=ACSDT1Y2019.B08141.

66. 2021 American Community Survey, table B08141 for Phoenix urbanized area, https://data.census.gov/table?q=b08141&g=400XX00US69184&tid=ACSDT1Y2021.B08141.

67. Wendell Cox, United States Central Business Districts (Downtowns), (Belleville, IL: Demographia, 2020), table 1, http://demographia.com/db-cbd2000.pdf.

68. Andrew Owen and Brendan Murphy, Access Across America: Auto 2019 (Minneapolis: University of Minnesota, 2021), p. 6, http://access.umn.edu/research/america/auto/2019/documents/AccessAcrossAmerica-Auto2019_wb.pdf; Andrew Owen and Brendan Murphy, Access Across America: Transit 2019 (Minneapolis: University of Minnesota, 2020), p. 4, http://access.umn.edu/research/america/transit/2019/documents/AccessAcrossAmerica-Transit2019_sm.pdf; Andrew Owen and Brendan Murphy, Access Across America: Biking 2019 (Minneapolis: University of Minnesota, 2020), p. 5, http://access.umn.edu/research/america/biking/2019/documents/AccessAcrossAmerica-Bike2019_wb.pdf.

69. "Transit Justice," National Campaign for Transit Justice, 2021, https://transitjustice.org.

70. American Community Survey for years indicated in the Phoenix urban area, table B08119, https://data.census.gov/table?q=b08119&g=400XX00US69184&tid=ACSDT1Y2021.B08119 (for 2021).

71. 2021 American Community Survey for the Phoenix urban area, table B08141, https://data.census.gov/table?q=b08141&g=400XX00US69184&tid=ACSDT1Y2021.B08141 and table B25044, https://data.census.gov/table?q=b25044&g=400XX00US69184&tid=ACSDT1Y2021.B25044.

72. Shannon Bradley, "Average Car Loan Interest Rates by Credit Score," NerdWallet, January 11, 2022, https://www.nerdwallet.com/article/loans/auto-loans/average-car-loan-interest-rates-by-credit-score.

73. Randal O'Toole, Reducing Poverty by Increasing Auto Ownership (Camp Sherman, OR: Thoreau Institute, 2020), p. 4, https://ti.org/pdfs/APB54.pdf.

74. Lisa Brabo, Peter Kilde, Patrick Pesek-Herriges, Thomas Quinn, and Inger Sanderud-Nordquist, Driving Out of Poverty in Private Automobiles, paper written for Rediscovering the Other America: A National Forum on Poverty and Inequality, 2001, http://americandreamcoalition.org/automobility/jumpstart.pdf.

75. Highway Statistics 2020, tables SDF and LDF.

76. Highway Statistics 2020, tables SF-1 and LGF-1.

77. Calculated from 2019 National Transit Database, Energy and Service spreadsheets.

78. Davis and Boundy, Transportation Energy Databook Edition 40, table 2-14.

79. Calculated from 2021 National Transit Database, Energy and Service spreadsheets.

80. Stacy C. Davis and Robert G. Boundy, Transportation Energy Databook Edition 40 (Oak Ridge, TN: Department of Energy, 2022), table 4-34.

ARIZONA
free enterprise
CLUB

www.azfree.org

PO Box 32935
Phoenix, 85064

602-385-0757

info@azfree.org