# Tempe and the Transition to a 20-Minute City

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Home to one of the ten top largest public universities in the nation, the city of Tempe is an ever growing community for students, families, and professionals alike. With a population of more than 170,000 people, Tempe is known for simultaneously hosting a unique atmosphere for social outings, corporate expansion, residential growth, career building, and innovative urban development ("Tempe, Arizona - City Information, Fast Facts, Schools, Colleges, and More", 2005). As the population of the city grows annually, so do the progressive developments within the community. One of such developments is the Valley Metro Public Transit system. Connecting Tempe to surrounding communities promotes continued growth and unity with other cities in Arizona; projects such as the construction of the Valley Metro light rail across Tempe Town Lake in 2006 display Tempe's initiative for a connected city ("Historic Timeline of Tempe", 2018). Tempe is currently setting goals for a 20-minute city, one that will encourage "a vibrant mix of commercial, recreational, civic and residential establishments for most residents... within a one-mile walking distance, a four-mile bicycle ride or a 20-minute transit trip" (Graves, 2017). One method of progressing the goal of a 20-minute city is by implementing bus rapid transit (BRT) into the current bus systems. A group of four undergraduate students at ASU's School of Sustainability interviewed riders on the 72 line along Scottsdale/Rural road for two months, analyzing the satisfaction with timeliness within the system. This article will discuss the findings of such interviews, analyze the success of implementing BRT systems in other cities around the globe, present the environmental, economic, and employment benefits for a dedicated bus lane within the city, and transition methods for implementation. These results will portray how a bus rapid transit system will improve unity with the neighboring cities of Scottsdale and Chandler with Tempe, for a more connected and progressive community.

As population continues to grow in the city of Tempe, so do the number of cars on the road. In order to help reduce growing traffic congestion, Tempe has adopted the goal of becoming a 20-minute city: an urban area where residents can reach everything they need within a 20-minute walk, cycle, or public transit ride. These goals are listed out in the Transportation 2040 plan which was voted on and approved in 2015. Part of this new transit plan calls for increasing North-South connectivity, with the implementation of a BRT system. To help with development and addition of a BRT system, surveys were conducted along the current North-South bus line 72. This route runs from North Scottsdale at Thompson Peak Parkway, along Scottsdale/Rural road, and ends at the Chandler Fashion Center. This route includes important destinations including multiple large shopping centers, downtown Scottsdale's event district, and Arizona State University. These popular locations make the route a prime candidate for the implementation of a BRT system.

The surveys conducted along the 72 bus route were designed to gather quantitative and qualitative data assessing the users experience of the current system. The questions helped to measure the satisfaction of the current bus line, ease of use, reliability, and rider opinion on needed improvements for the bus system. The survey began by asking transit users their age and how often they used public transit. Of the 70 individuals interviewed, approximately 53% of respondents fell between the ages of 19 and 30. This data was expected, as Arizona State University is one of the main destinations along this route. The following questions addressed the frequency of use and other transportation options. Seventy percent of the respondents stated they used public transit five or more days per week, and 40% responded that public transit was the only transportation method they had access to. Subsequently, this data implies that there is a

heavy dependence on the public transit system, which suggests that an implementation of BRT would be extremely beneficial to the current transit users. With the data collected, it was evident that a majority of respondents felt that the current transit system was easy to use and understand, however the data indicated that there was significant inconsistencies with operational functions in regard to wait times. The following graph represents the data collected when asking respondents how long they waited for pick up at bus stops.

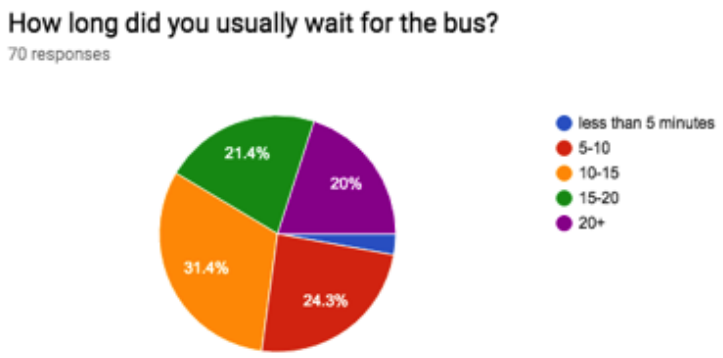


Figure I. Wait Times.

Figure I shows a relatively equal distribution between the time options, with respondents experiencing anywhere from a 5-20+ minute wait. This inconsistency makes it difficult for riders to rely on the transit system. It is imperative to establish a more consistent and accurate schedule in order to make the public transit option more attractive to current and future riders.

To gain a better understanding of the riders transit experience, an open ended question was asked to assess what transit users would like to see improved. Responses ranged from minor improvement suggestions to the desire to see a completely revamped system. Noteworthy responses included: improvements in safety, shorter wait times, real time bus tracking, more shading at bus stops, bike racks at bus stops, and better bus sanitation. With the implementation

of a new BRT system, many of the respondents dissatisfactions could be mitigated, which would help to improve ridership within a new system.

As stated, the purpose of this project was to study how Tempe can improve public transportation and transition to a 20-minute city. Members of this group worked closely with the city's sustainability program manager, Braden Kay, and interviewed various stakeholders throughout the city to better understand the current issues residents have with public transit in the city.. Our group researched the transit systems of major cities in the US and internationally who have had success implementing improved and more sustainable transportation methods. It was our goal to identify these methods and learn how they they could be successfully implemented in order to better connect Tempe with Scottsdale and Chandler. It was found that the development of BRT systems was a common method that cities used to improve public transit in their regions.

There are many diverse benefits that come from increased and improved transportation infrastructure in cities, especially with bus rapid transit (BRT) systems. Şükrü İmre, a professor with Lund University, wrote that effective public transportation networks "can cut traffic congestion, foster social inclusion and reduce pollution" (İmre, 2016). For many the condition of their local public transit system is a major determinant in their quality of life. In a statement from the LA Bus Riders Union it was written that "affordable, efficient, and environmentally sound mass transit is a human right" (LA BRU, 2016). Beyond just serving the needs of urban communities, effective public transportation networks also provide a desirable alternative to commuting in traffic all day. Passengers on public transit networks have the ability to use their time however they wish. When a transit network is properly utilized it also significantly reduces

pollution when compared to automobiles. Effective transportation systems bring many assets to urban environments, as well as innumerable community benefits.

The City of Tempe has been a community of economic success, with ASU centrally located within the city and several successful public parks and business attractions. There are 16,792 businesses in Tempe and roughly 49,000 workers commuting in on a weekly basis (Koenig, 2018). These businesses and Tempe's comprehensive development have created an economically successful and vibrant city. Yet despite this economic success, Tempe has not improved the conditions of its public transportation to meet the needs of its riders or attract new ridership. Typically when deciding on how to improve public transportation systems in urban environments, cities prefer the relatively low cost and short construction times of BRT systems (Koenig, 2018). Studies have shown that BRT systems bring substantial benefits to the local economies of corridors surrounding the line. Weisbrod, a researcher in Sydney, found that their BRT line improved job market access along its corridor, specifically in the education, financial, communication, and health sectors. Their research also discovered that local retail and manufacturing companies saw significant cost savings after the line began operation (Weisbrod, 2016). Another important factor is that these benefits seem to adapt to the conditions of the wider economy. "A recent study performed by the American Public Transportation Association and the National Realtors Association also showed BRT lines were beneficial in stabilizing home prices during the most recent recession" (Petrie, 2013). The findings of this study show that the benefits of an effective BRT line are extremely resilient to the unpredictability of the American economy. BRT lines are also known for generating significant investments along their corridors. As an example, the BRT Silver Line in Boston has seen upwards of $571 million in investments in the

areas surrounding the rail since 2008 (Petrie, 20013). In her research, Melanie Koenig has found that there is little readily accessible information that contradicts the economic gains caused by BRT lanes (Koenig, 2018). While implementing a bus rapid transit system into Tempe may initially be expensive compared to the traditional bus system, the city would likely see a boom in investments and economic growth following the opening of BRT lanes.

Public transportation has shaped the culture and form of urban communities since the earliest streetcar systems. These transit networks have given citizens opportunities for increased accessibility, mobility, employment opportunities, economic growth, and resilience in cities throughout the United States (The Importance of Public Transportation, 2002). Yet the introduction of the mass-produced automobile has completely altered the role of public transit networks within cities. It has been observed that the most significant benefits of mass public transit were found in the economic, functional and environmental realms of the community. Public transit networks also helped to conserve many essential environmental aspects of urban landscapes such as "air quality, land conservation, energy usage, and many other natural elements" (Kennedy, 2018). Efficient public transit networks get automobiles off the streets, encourage high-density growth, and improve social equity. Transportation systems in the United States are responsible for 29% of the nation's national greenhouse gas emissions (GHG), which create the air pollution that is found in many urban areas (U.S. Department of Transportation, 2015). This air pollution creates many health challenges in these urban areas such as increased rates of asthma. Almost a third of the United States GHG emissions are caused by our transit services and the majority of that 29% is emitted from automobiles. BRT and light rail systems have been shown generate 76% less GHG emissions per passenger mile than individual

automobile vehicles (U.S. Department of Transportation, 2015). BRT systems and other effective transit systems also encourage high-density growth in urban areas rather than the low-density design of The United States' current suburban cities. The use of public transit networks also conserves significant amounts of fuel, while increasing the nation's energy independence. A study from 2004, conducted by the ICF International, found that public transportation services saved 947 million gallons of fuel annually (Bailey, Linda, et al, 2008). If public transportation in the United States was used to its fullest potential, and transit systems began to switch to greener technology, the amount of fuel savings would be astonishing. The money spent on gas could be used to improve the quality of life for automobile users in many different ways or diverted into other underfunded social programs. Public transportation networks are the most essential environmental aspect of a city as they affect its entire urban landscape. A BRT system in Tempe would reduce the significant air pollution, reduce our dependence on fossil fuels, encourage high-density development, and lessen the environmental impact of the city.

Effective public transportation networks should bring more to a city than economic growth and reduced environmental impacts; they should also foster inclusiveness and social equity. Anders Wretstrand, a professor with Lund University, conducted interviews where riders of public transit networks "pointed at discomfiture of some public spaces, and called for more participative democratic structures in the planning process, challenging the hierarchical expert systems" (Wretstrand, 2008). In this regard, public transportation is less of a concern of infrastructure, but rather a relevant social justice issue. It was observed that "the issue of safety is first and foremost when determining the efficiency of a transit system" (Labelle, 2018). Labelle

goes on to write that under-maintained transit systems become extremely dangerous which then deters riders from utilizing the service (Labelle, 2018). When riders who have access to other forms of transit are deterred from bus and rail lines due to safety concerns, conditions of the public transit service have been observed to decline. The hope of a BRT system in Tempe is one that services a wide variety of races, social classes, and age groups; which all increase safety and foster more tightly knit communities.

Many cities across the globe have successfully implemented sustainable public transit systems through the use of BRT. Cleveland's Regional Transit authority implemented a BRT system in 2008, the Healthline, that brought nationwide attention to Bus Rapid Transit systems. The six mile long corridor cost a total of $200 million, with a large return on investment of $114 gained for every dollar spent ($6.3 million in overall economic development) (*Greater Cleveland RTA*, 2017). In addition to the extensive economic benefits, Cleveland's Healthline reduced travel time from 40 minutes to 28, while doubling job opportunities along the Euclid corridor (*Greater Cleveland RTA*, 2017). The Healthline reduced emissions by 90% compared to traditional bus vehicles, and operates 24/7 with a frequency of every 8 minutes (*Greater Cleveland RTA*, 2017). This BRT is recognized as one of the top in the nation, and has set precedents of opportunity for similar transportation systems in communities across the United States.

Outside the nation, many international cities have implemented similar systems with large success. Mexico City implemented a BRT system in 2005, and have since observed significant reductions of Carbon Monoxide, Nitrogen oxides, and sulfur dioxide (Bel, 2018). They concluded that the introduction of the BRT system was an effective environmental policy.

Furthermore, Mexico City's BRT system also helped reduce accidents by 30% and reduced travel times by 50%.

Many cities have found that BRT systems are more immune to limitations, such as lack of funding, than light rail or subway projects. Rather than investing in rail lines and additional infrastructure that is needed for heavy rail projects, cities can invest in cheaper and more feasible infrastructure upgrades to their existing bus systems. Such examples include pre-boarding ticket booths, at-level boarding stations, and hybrid buses with subway-like features. These improvements are simply more cost effective for cities with limited budgets and have had proven success. Another example of a successful BRT system is found in Curitiba, Brazil. They developed the world's first BRT system with dedicated busways, a feature that is essential to a full BRT system (Lindau, 2010). This might be the most difficult aspect of BRT systems since observing public opinion about these busways can often be very negative when first implemented. The implementation of bus-only lanes will in fact increase traffic and travel times for those who are driving personal vehicles, but it would dramatically improve transit times for the buses. In Mexico city and Curitiba, it became more convenient to take the bus system instead of driving personal vehicles. The simple incentive of reduced travel times for riders helped to increased ridership rates of the BRT system, and fueled its long-term success and expansion.

Implementing a BRT system is a process that requires time and high engagement from stakeholders at multiple levels. During the process of analyzing the case study with Cleveland's Healthline, members of the group were given the opportunity to personally speak with Cleveland's Director of Programming and Planning, Maribeth Feke. Feke recommended five tips for adopting a similar system into Tempe, with three relevant points for transitioning. First,

engaging stakeholders is essential to the success of a bus rapid transit system. “Buy in by community leaders..depending upon the type of funding you use, you'll need assistance at all levels to garner support at all levels of government, and stakeholders can support the project through changes in political leadership and through the hard times.” (Feke, 2018). Maintaining stakeholder support at all levels including city, county, state, transit authority, and even country will only strengthen the transition through opposition. Secondly, to engage these stakeholders, it is necessary to provide detailed improvements upon which the transit system will undergo (Feke 2018). Whether these improvements are high mobility vehicles, premium service, or innovative infrastructure (bus stops, ticket machines, shade structures), they need to entice stakeholders to see potential for an increase in ridership and overall benefit to the city. Thirdly, these improvements need to be attractive. “Prettiness matters, newness matters..especially in older cities like Cleveland that do not have any growth (Feke, 2018). Improvements to the infrastructure, landscapes, streetscape, and overall environment has been proven to attract private investment in previous projects (Faruqi, Sofia, and Florence Landsberg, 2017). These efforts to engage and encourage stakeholder participation with tangible/feasible improvements will increase the likelihood of multi-level coordination and support for transitioning into a bus rapid transit system. Engagement should not only include the leaders of the community, but local level communities/individuals as well.

One entity of opposition is predicted to come from vehicle owners who commute by car on Rural road. The dedication of a bus lane will increase traffic and waiting time for such commuters. This is where strong public advertisement for the benefits of public transportation will come into effect. Billboards, surveys, commercials, and advertisements across public transit

vehicles will display the wide range of benefits for a dedicated bus lane for (specifically) residents of Tempe. Such components would include pro-environment factors (less emissions), more job opportunities, and economic growth along the corridor. Additionally, educational events would be hosted within and outside the classroom, informing the school communities about the safety, timeliness, luxury, and benefit of using public transportation (specifically the buses utilizing the dedicated lane). This representation of daily commuters and encouragement for community ridership would aid the transition by earning public support and increasing public transit participation with a new image. Rebranding the public transportation system would be a co-motive of such advertising, shifting the public perception of public transit as safe, clean, and reliable for all ages of riders.

After interviewing more than 70 individuals over the time frame of two months, a problem became apparent; a problem that was not being actively addressed in the city of Tempe. Riders cannot rely on the punctuality of the 72 line in their daily routine. Forty-nine percent of riders interviewed on the line rely on the bus for transportation every day. With wait times falling anywhere from five to 20 plus minutes daily, the inconsistency of headways is negatively affecting the academic, work, and/or personal life of those who do not have another form of transportation (40% of those interviewed). As residents and members of Tempe ourselves, personally witnessing a problem that affects the lives of our fellow neighbors and friends has driven each member of this group to give bus commuters a voice, create feasible solutions, and present such solutions to leaders of the community. The solution presented by members of this group was dedicating a bus lane on Scottsdale/Rural road along the route of the 72 line. This paper provides a direction to actively solve a pressing issue for those using public transit today,

by utilizing the research found from case studies of other successful BRT systems (both domestically and internationally), recommending already-proven successful transition strategies, as well as addressing the economic, environmental, and connectivity benefits BRT could bring to the city of Tempe. Support must be encouraged by engaging members of the community at the local, county, and state level for success. This entails public engagement through in-classroom education, surveys, advertising, and ridership incentives. While recognizing the challenges and objections that are bound to arise, starting the conversation for bus rapid transit has officially begun. The voices of bus riders have been heard by the members of this group, presented to the city of Tempe, and used to create momentum to connect the city of Tempe to the communities around it. Bus rapid transit is a method of improving the lives of public-transit commuters today, while encouraging others to participate tomorrow.

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