

Transit-oriented development helps cities ease off the gas

November 27 2014, by Diane Boudreau



Devine Legacy on Central Ave. is a mixed-income apartment community along the light rail corridor supported through the Sustainable Communities Collaborative. The building, owned by Native American Connections, is also LEED Platinum certified by the U.S. Green Building Council. Credit: Diane Boudreau

Like a teenager lobbying for the car keys, Phoenix came of age in the era of the automobile. The area's explosive growth in the mid-20th century reflected America's similarly growing love affair with cars.

As a result, the Valley of the Sun is designed for driving, with wide, well-

maintained streets, ubiquitous turn lanes and abundant parking. Unfortunately, car-friendly amenities like sprawling parking lots can make other ways of getting around more difficult. And increasing evidence shows that a gasoline-fueled car culture isn't sustainable for our environment or our health.

Many cities, including several in the Valley, have committed to more sustainable transit. Researchers at Arizona State University are playing a role, providing evidence-based information on how to design our cities to promote transit options that are good for the environment, the economy and our bodies.

Why not drive?

It's easy to understand why driving is so popular. Cars are fast, comfortable, private and convenient. Unfortunately, there are a lot of drawbacks to driving, ranging from air pollution and greenhouse gas production to the danger of collisions. And those are just the effects from the act of driving.

"In terms of impacts we typically think about the vehicle – like a car, which consumes gasoline and emits pollutants," says Mikhail Chester, an assistant professor in the School of Sustainable Engineering and the Built Environment at ASU. "But the reality is there's a whole transportation system that needs to be put into effect. There's a road that's constructed and maintained. There are refineries that consume energy and turn crude oil into gasoline. There's the manufacturing of the vehicle itself. There are all sorts of supply chains and infrastructure to ensure that your vehicle can move."

Chester conducts life-cycle assessments (LCAs) of various modes of transportation, to figure out the full costs of different options from cradle (manufacturing) to grave (landfill). LCAs quantify impacts that

don't typically get factored into the cost of transportation, such as environmental and health costs associated with refining oil or paving roads.

Over the full life cycle, cars take a heavier toll on the environment than public transit options like buses and light rail. Unless you live in a city where drivers always carpool while trains and buses routinely run empty, public transit is the cleaner option.

Public transit goes hand-in-hand with human-powered transit like walking and biking. These options are obviously environmentally friendly, but they also provide health benefits.

"Physical inactivity has been labeled by some as the 21st century's greatest public health challenge," says Steven Hooker, a professor in ASU's School of Nutrition and Health Promotion. "We know from many large studies that being physically active will significantly reduce the risk of many of the leading causes of death in the U.S., which include cardiovascular disease, cancer, high blood pressure and type 2 diabetes. More data is coming out on the role it plays in reducing the risk of conditions like Alzheimer's disease and dementia."

A [2005 study](#) found that Americans who use public transit spend an average of 24.3 minutes per day walking to and from transit stations. people who use active or public transportation also have lower body mass index (BMI) and percent body fat than people who drive, according to a [2014 British study](#). Interestingly, the effects were similar for both people who walked and biked and people who rode buses or trains.

Only about five percent of urban Americans typically commute to work using public transportation, according to 2009 U.S. Census data. But that number varies greatly by metro area – from 30.5 percent in New York to .4 percent in Oklahoma City. Phoenix ranked 32nd among the 50 largest

metro areas, with only 2.3 percent of commuters saying they used public transportation.

What accounts for these vast differences? Recall the wide roads and vast parking lots mentioned at the start of this story. Compare them with New York's narrow streets and high-density development (think up, not out). It turns out the way we build our cities can help drive people's transportation preferences.

Hooker studies the relationship between physical activity and the built environment. He cites several features of city design that can encourage people to ditch driving in favor of buses, bicycles and their own two feet. These include:

- short blocks
- intersections that are easy to cross
- short distances between destinations
- well maintained sidewalks
- lighting and other safety features
- an aesthetically pleasing environment

Tale of the rail

Many cities are now focusing on planning and development that encourages use of public and human-powered transit, a concept known as transit-oriented development. The Phoenix area is also revving up transit-oriented development efforts, largely around the Valley METRO light rail system introduced in 2008.

Today, a single line extends from the Christown Mall in north Phoenix through downtown Phoenix, Tempe and Mesa. Over the next few years, both ends of the line will be extended, with plans for additional corridors under consideration.

"When we started working with the light rail, I thought, 'How long can it really take?' I have a real appreciation for the complexity now," says Bonnie Richardson, an architect and principal planner for the City of Tempe. "We are different from a lot of cities because we started with three separate municipalities making decisions collaboratively, rather than a separate transit agency. It was a great exercise because we learned to work together."

Use of the light rail has exceeded all predictions. But it faced some pretty strong opposition when it was proposed.

"Because it was the first in Arizona, most people were uncomfortable with the concept, and that was a big challenge. We had a large population that believed that everyone should have a car or two or three, and so there were more people initially who were against rail than for it," says Richardson.



Arizona State University engineer Mikhail Chester says that there are 1-1.5 billion parking spaces in the United States—roughly four spaces per car. “The amount of space we allocate to storing cars is enormous compared to any other transit system, and a car spends 95 percent of its life parked.” Credit: Rob Roberson

"There were many people in the Valley that were skeptical whether light rail would work in the Phoenix area," adds Michael Kuby, a professor in ASU's School of Geographical Sciences and Urban Planning. "Do we have the density? Is it too hot?"

In 2003, Kuby developed a new model for predicting light rail ridership, based on some of the region's unique concerns. Unlike many models, this one used data from other cities with existing light rail systems. Kuby's team compared ridership numbers with variables such as housing and jobs within walking distance of each station, number of bus lines and park-and-ride stations, and size of the total metro area.

After the light rail opened, Kuby and a former graduate student, Chris

Upchurch, compared their predictions to actual ridership and to predictions from the Maricopa Association of Governments (MAG) metropolitan transportation model.

"Our model did a better job in predicting some of the stations and MAG's model did a better job of other stations," says Kuby, adding that actual ridership exceeded projections from either model. "It's an ongoing process to be able to explain and predict these things better over time."

Because of Arizona's extreme heat, the researchers threw in a variable no one had looked at before – climate. It turned out to be hugely significant, accounting for a 300-riders-per-station-per-day difference between the mildest city (San Diego) and the most extreme (Buffalo).

Richardson says heat was a big consideration in designing light rail platforms. For example, all stations provide shaded areas. One station in Phoenix even offers a push-button cooling system.

The ASU study also found that employment located within a half-mile of a station was an important factor in ridership – more so than residences within a half-mile, although both were significant.

"That's because for most people, they have a number of ways to get to the station from home – park and ride, get dropped off, ride a bike. But when you get off at the other end, people usually only have one option – walk," Kuby says.

Equitable economics

Locating homes, stores and workplaces near transit isn't just convenient. It's also economically smart.

Aaron Golub, an associate professor in the School of Geographical

Sciences and Urban Planning and the School of Sustainability at ASU, recently conducted a study to assess the impact of light rail on real estate markets, requested by the Maricopa Association of Governments.

"We found that proximity to light rail is rewarded in real estate markets by positive price differentials. And the closer you get, the more that price bonus grows," he says. "As soon as the light rail was announced there was a change in market value. As the light rail was further along we saw value increase over time."

He adds: "One reason we were eager to look at this is that we want to recommend to cities that if they want to secure land near rail they should do it earlier in the process than later, to preserve that affordability. Our paper was a bit of a warning to the affordable housing community."

Displacement of low-income residents through transit-oriented development is a nationwide concern. As real estate prices rise around transportation services, the people who need these services may no longer be able to live there.

One group working to ensure equitable development is the Sustainable Communities Collaborative, a partnership among the cities of Phoenix, Tempe and Mesa; ASU; and local housing, health, and community development organizations. This non-profit partnership supports transit-oriented development along the [light rail line](#) that promotes the economic, environmental and social well-being of the communities it serves.

The collaborative has attracted \$20 million in private investment from Local Initiatives Support Corp. and Raza Development Fund. It has helped support more than 900 mixed-income housing units, a healthcare center and the Native American Connections office building. It also supported The Newton, an example of adaptive reuse of the historic

Beef Eaters restaurant building. Today, the space houses a locally owned bookstore, job incubator, restaurant and community gathering space.

In 2012, Golub began co-leading a project called "Reinvent Phoenix," a partnership between ASU, the City of Phoenix, the U.S. Department of Housing and Urban Development (HUD) and St. Luke's Health Initiatives. Jointly funded by the HUD, the Department of Transportation and the Environmental Protection Agency, the project examined affordability, health, recreation and climate in lower-income areas along the light rail.

The ASU team met with residents of these areas to develop steering committees from each neighborhood – committees that can remain informed and active long after the grant has ended.

"A lot of residents were willing to trade risks of some displacement for some development," says Golub. "A lot of areas in East Phoenix are probably so deprived that they aren't even to the point where you'd have displacement. There's a lot of empty land and abandoned industrial sites. There is a lot of opportunity to preserve without displacement."

Low-income residents may not be able to afford cars, so having convenient access to other transit options is imperative. Other groups, such as children, the elderly and people with certain disabilities, also may not be able to drive and can benefit from well-planned transit-oriented development.

In fact, Hooker notes that the biggest predictor of whether people will choose to walk in their neighborhood is not socioeconomic status, age or gender – it's whether the built environment makes walking safe, convenient and attractive.



The Valley Metro light rail passes Arizona State University's Sun Devil Stadium.
Credit: Valley Metro

Connecting the dots

Earlier this year, the City of Phoenix adopted a "complete streets" ordinance designed to promote streets that are safe and welcoming for pedestrians, cyclists and transit users as well as drivers. Features of a complete street might include wider sidewalks, protected [bike lanes](#), shade and traffic calming measures to reduce speeding. Hooker notes that trees not only provide shade but have a natural traffic-slowing effect as well.

"Have you ever driven down a very tree-lined road?" he asks. "You just naturally slow down."

But a whole forest of trees won't support green transit unless the shady

sidewalks, bike lanes and modes of transit connect seamlessly to get people to their desired destinations.

"Our philosophy is to provide a menu of alternatives for transportation. In Tempe we have light rail, the Orbit free shuttle, bus and express bus," says Richardson, noting that the city will soon offer a downtown streetcar that will allow people to easily hop on and off, as well.

While the Valley is not yet known as a leader in [public transit](#), it does have a reputation for being bicycle friendly. In its 2014 list, "Top 50 Bike-Friendly Cities," Bicycling magazine rated Tempe No. 17 and Scottsdale No. 20. ASU was also named a gold-level Bicycle Friendly University by the League of American Bicyclists.

However, bikers struggle with connectivity in certain areas.

Golub and Kuby were approached by Salt River Project (SRP) to analyze bicycle networks across its service area. SRP provides electricity and power to more than two million people in Central Arizona and manages an extensive system of canals throughout the Phoenix area. Residents frequently bike, walk and run along the canal banks, many of which have been upgraded with sidewalks, lighting, landscaping and crossing signals at intersections.

SRP wanted to assess how well bikers could connect to popular destinations such as schools and colleges, shopping centers, transit stations and large employers – including SRP – using canal paths, neighborhood streets, bike lanes, green belts and other bicycle-friendly infrastructure. Working through the ASU Walton Sustainability Solutions Initiatives' Global Services program, the researchers mapped the entire network for nine cities in the Phoenix area and analyzed it in terms of connectivity to likely destinations.

"One thing we identified in the study is that there are key gaps that cause disconnections in the network," says Golub, who bikes to work himself and is actively involved with Tempe Bicycle Action Group. "You can't get through those neighborhoods. We need to connect these pieces."

One of the trouble spots is about to be upgraded. The City of Tempe is putting Broadway Road on a diet – narrowing the thoroughfare from five lanes to four and adding bike lanes between Mill Avenue and Rural Road. Sidewalks will be upgraded to accommodate people with disabilities and lighting will also be improved.

"I'd say it's one of the more radical steps being taken in the Valley," says Golub, noting that the narrowing will be unlikely to inconvenience drivers. "They did a test – closed one lane on Broadway – and it had very little effect. The feared congestion did not materialize."

Changing culture

Congestion is still a fear of residents, however, based on comments submitted to the city about the plan. They represent an important aspect of TOD that can't be managed through building or zoning. Local culture and public perception play a huge role in whether citizens will support, and ultimately use, alternative transit.

"Social norms are so critical. Even now some people think the light rail is for people who don't own a car or have a job. That's really unfortunate, because that's totally different from Chicago or New York or DC, where people use these systems regardless of background or job," Hooker says.

But Richardson notes that the climate is changing.

"My son didn't get his license until he was 21. He rides the light rail.

There are stats that the millennials really don't want that car culture," she says. "The car culture in Arizona has been so damaging because of the sprawl. Now more people understand that."

Chester adds, "We have a lot of people coming here from other places. They've seen that things are a certain way elsewhere, and Phoenix could be doing things differently."

Ultimately, the shift to more transit-oriented development will make our cities more sustainable in ways that go beyond saving the planet.

"The city can't be sustainable unless the actual individuals and the populations living, working and playing there are sustainable with regard to their health. And one of the ways we can promote health is by having cities built so that people can walk and bike on a regular, routine basis," says Hooker. "And we know that businesses flourish more in highly pedestrian-oriented neighborhoods. These things just make sense."

Provided by Arizona State University

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