The Role of Urban Infrastructure in Supporting Transit-Oriented Development

4-10-17

Rebecca Santiago

Executive Summary

It is widely recognized by scientific communities that human activity is altering Earth’s atmospheric composition and contributing to global climate change. Greenhouse gases (GHG), while naturally occurring elements, absorb and emit radiation within the thermal infrared range. Activities that emit GHGs, such as transportation, manufacturing, and land use changes, concentrate these gases though, resulting in the greenhouse gas effect, which is the primary cause of global climate change. In the United States, the transportation industry emits roughly a quarter of the nation’s GHGs and has consequently become a target for improvement over the past several decades. In particular, municipalities are pursuing strategies to reduce single-occupancy vehicle trips to not only help reduce GHG emissions, but also address congestion, noise pollution, and infrastructure demands.

However, many cities in the western states were built around the automobile and weaning people from their cars has proven especially difficult. Phoenix, Arizona is especially car-dependent and is infamous for its sprawling environment. Like many cities, Phoenix has also turned to enhanced public transportation, specifically light rail, as a solution to automobile dependency. As land use and transportation planning co-evolve, efforts to create dense transit-supportive environments have coalesced into a “sustainable development” model known as transit-oriented development (TOD).

The literature characterizes TOD as having a mix of land uses, moderate to high density, pedestrian-oriented infrastructure, transportation options, reduced parking spaces, and quality design. In creating environments within which all one’s daily needs are within a short walking, biking, or transit trip away, the practice aims to reduce the amount people drive. TOD is publically and privately supported because of the economic and environmental benefits associated with the model; however, recent research on how the built environment shapes travel behavior suggests there may be more to the equation. Notably, the literature points to the need for employment locations near transit over retail and housing.

---


As a key stakeholder in public transit projects across the nation, the project client, HDR, Inc., supported exploring the literature in the context of the Valley Metro light rail system, which has significant variation in ridership and investment at stations along the alignment. The goal of the project was to understand what urban infrastructure characteristics around TOD result in higher ridership, and to develop recommendations for shaping the built environment in a way to better support public transit. In this way, the study sets the foundation for a more advanced framework for sustainable transportation and land use planning in Phoenix.

Six Valley Metro light rail stations were selected for examination based on daily ridership and the number of TOD projects within a half-mile of the station since 2005, when the light rail began construction. Stations were evaluated based on ten criteria that can be generally grouped into three overarching categories: transportation, urban design, and land use. Criteria were selected based on their connection to TOD elements prevalent in the literature and agency documents. Data from geospatial and quantitative analyses were transposed into an Excel matrix where a relative ranking system was used to compare station characteristics.

Results from the comparative analysis suggest transportation and urban design play a more significant role in the overall TOD performance compared to land use. This calls into question the emphasis on the land use element of TOD outlined by the literature and encouraged by cities and planning agencies. The findings suggest TOD implementation strategies should be revisited to reinforce the primary TOD objectives and provide pathways for developments to achieve those objectives. Specifically, zoning codes, overlays, implementation plans, and other policies/strategies should be enhanced to ensure new developments are truly transit-oriented and not just transit-convenient. HDR should develop, or assist the municipalities it works with in developing, a more rigorous framework for TOD implementation, define what success looks like in the context of that city, and create metrics for evaluating success.

Though the study contributes to the growing literature on sustainable transportation and land use planning, urban environments are complex systems and further exploration of how social, economic, and built environment forces interact to influence travel behavior should be pursued. Most notably, analysis of ridership before and after the opening of TOD projects would provide insight on what types of developments most influence ridership.