Land Use as a Strategy for Transportation, Housing, and the Environment

Opportunities for State and Local Governments

Cincinnati, Ohio
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White Paper — January 2025

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The nexus between land use policy and outcomes for transportation system performance, housing costs, and environmental outcomes has received increasing attention from policymakers in recent decades. A nationwide housing shortage has driven up the cost of housing, with the percentage of renters spending 30 percent or more of their household income on rent more than doubling since 1960 to 45 percent in 2023 (Council of Economic Advisors, 2024). Housing and transportation costs were the two highest categories of spending in the 2022 Consumer Expenditure Survey. Additionally, the Infrastructure Investment and Jobs Act (i.e., Bipartisan Infrastructure Law), passed in 2021, added a new optional provision to the metropolitan transportation planning process aimed at developing regional goals for the integration of housing, transportation, and economic development strategies (Sec. 11201). This and other processes like it represent an opportunity to leverage land use policies to achieve safer, more fiscally and environmentally sustainable, and more affordable communities.

Land use policy is a foundational lever of transportation policy because it can impact the location of trip origins and destinations, and thus the extent to which travel is required in the first place, the form the travel is likely to take, and the need for transportation infrastructure investments. Many transportation policies, processes, and investments attempt to rectify issues that ultimately stem from land use policies. Applying transportation solutions to land use policy problems leads to undesirable outcomes, including higher household transportation costs, infrastructure operating and maintenance costs, air and water pollution, safety cost burdens, and longer travel times to ultimately access fewer destinations. The motivating factor for this white paper is the significant potential of a coordinated approach to allowing additional housing supply and job growth near location-efficient sites, especially near transit stations, to reduce household housing and transportation costs simultaneously. Simply put, land use policy represents the most fiscally responsible transportation solution that achieves many national policy objectives.

This white paper first lays out the rationale for state, regional, and local units of government to use land use policies as one strategy for achieving improved outcomes in transportation system performance, reducing fiscal burdens of infrastructure maintenance on local and state budgets, reducing household cost burdens, and reducing emissions. Second, it summarizes different land use policies and their relevance to these various outcomes. Lastly, it provides examples highlighting a growing number of state, regional, and local actions to foster more transportation-efficient development patterns, reduce household cost burdens, and safeguard the environment. While the main focus of the discussion and examples in this white paper tends toward larger metropolitan areas, many of the highlighted land use strategies used to reduce housing and transportation cost burdens would still be relevant in smaller cities and towns in rural areas, though perhaps in a more limited fashion.

Background

Land use in the United States is principally shaped by a mixture of market forces, land use regulations, and direct and indirect influences from public investment choices. Land use regulations, including the application of zoning, are the framework by which governments control land use, and generally regulate

which uses are permitted or prohibited, while often defining what size, density, and placement of structures is legally permissible on a given plot of land. A key element of many land use regulations is to separate incompatible uses, such as preventing heavy industry from locating near homes. In the United States, zoning is a *police power* derived from State constitutions, but it is generally delegated all or in part to local jurisdictions to implement and enforce (e.g., zoning enabling acts).[1] Thus, the role of the United States Department of Transportation (USDOT) in land use, and that of the Federal government as a whole, is mostly indirect, especially when considering land that is not owned and managed directly by the Federal government.

While USDOT does not have control over land use regulations, it does encourage compatible land development in several key areas, including land near airports and new transit investments. For example, the Federal Aviation Administration discourages residential development of any density near airports, regulates building heights near airports to ensure safe flight paths, and has noise regulations that effectively prohibit residential or commercial development near airports where decibel levels would be 65 or higher.[2] Additionally, as part of the Capital Investment Grant Program, the Federal Transit Administration encourages enabling transit-oriented development around station areas and transit-supportive zoning and densities along transit corridors, but does not require it.[3]

USDOT's indirect, but significant, influence over land use policies and outcomes largely results from the incentives created by the infrastructure funding that USDOT provides, such as through formula funding and discretionary grant programs. These include the land use pattern impacts of projects funded or financed by USDOT, as well as state, regional, and local policies indirectly influenced by criteria in notices of funding opportunities, planning and programmatic guidance, regulations, or research. While state, regional, and local governments plan, design, and prioritize most transportation infrastructure, USDOT's funding and financing indirectly influences these processes.

For example, USDOT funding programs such as the Safe Streets and Roads for All Grant Program, the Reconnecting Communities Pilot Program, and the Neighborhood Access and Equity Grant Program have encouraged adjustments to infrastructure that may reduce transportation-related externalities burdening nearby populations, lowered the generalized cost of travel by enabling active transportation modes through improved intra-neighborhood connectivity and safety for these modes, and sometimes opened up land for other, higher value uses when infrastructure is removed or rightsized. The Reconnecting Communities Pilot Program encouraged land use policies that reduce displacement by scoring applications higher in places where the local government has adopted policies to increase infill development and allow missing middle housing.[4,5] Such land use considerations are critical in programs that fund infrastructure project types which are likely to make nearby land parcels more desirable to people and firms, given that

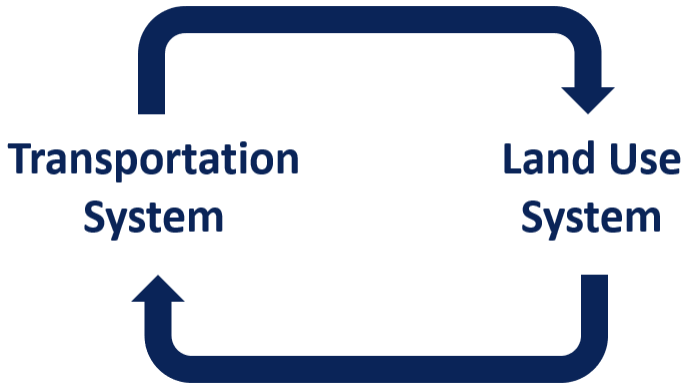
[1] A police power refers to the capacity of the States to regulate behavior and enforce order within their territory for the betterment of the health, safety, morals, and general welfare of their inhabitants.
[2] Part 150, Airport Noise Compatibility Planning
[3] Guidelines for Land Use and Economic Development Effects for New Starts and Small Starts Projects
[4] Notice of Funding Opportunity for the FY2024 Reconnecting Communities Pilot Discretionary Grant Program
[5] Missing middle housing generally refers to housing types with more units than single-family homes, but fewer than mid-rise apartment buildings, such as accessory dwelling units, duplexes, triplexes, quadraplexes, townhomes, cottage courts, and small apartment buildings.

elastic housing supply reduces displacement pressure, both regionally and locally (Been, Ellen, & O'Regan, 2023).

The planning, design, funding, and investment prioritization decisions by state, regional, and local governments are other key factors directly affecting land use patterns.[6] For example, construction of limited access highways negatively impacted many urban neighborhoods near urban cores, while redistributing growth outwards, leading to more dispersed land use patterns (Baum-Snow, 2007; Brinkman & Lin, 2024).

While transportation policy undoubtedly affects land use, the land use policies enacted by state, regional, and local governments, and their associated development pattern outcomes, also directly impact the effectiveness of USDOT's programs and transportation system performance more broadly, as illustrated in Figure 1. Indeed, these two processes are inexorably intertwined, with both constantly influencing one another. For example, researchers at the University of Utah found that a ten percent increase in compactness reduced vehicle miles traveled by 7.8 to 9.5 percent, reduced fatal crashes per 100,000 by 13.8 percent, increased public transit commute mode share by 11.5 percent, and reduced transportation costs relative to income by 3.5 percent (Ewing & Hamidi, 2017).[7]

Figure 1: Relationship Between the Transportation System and the Land Use System



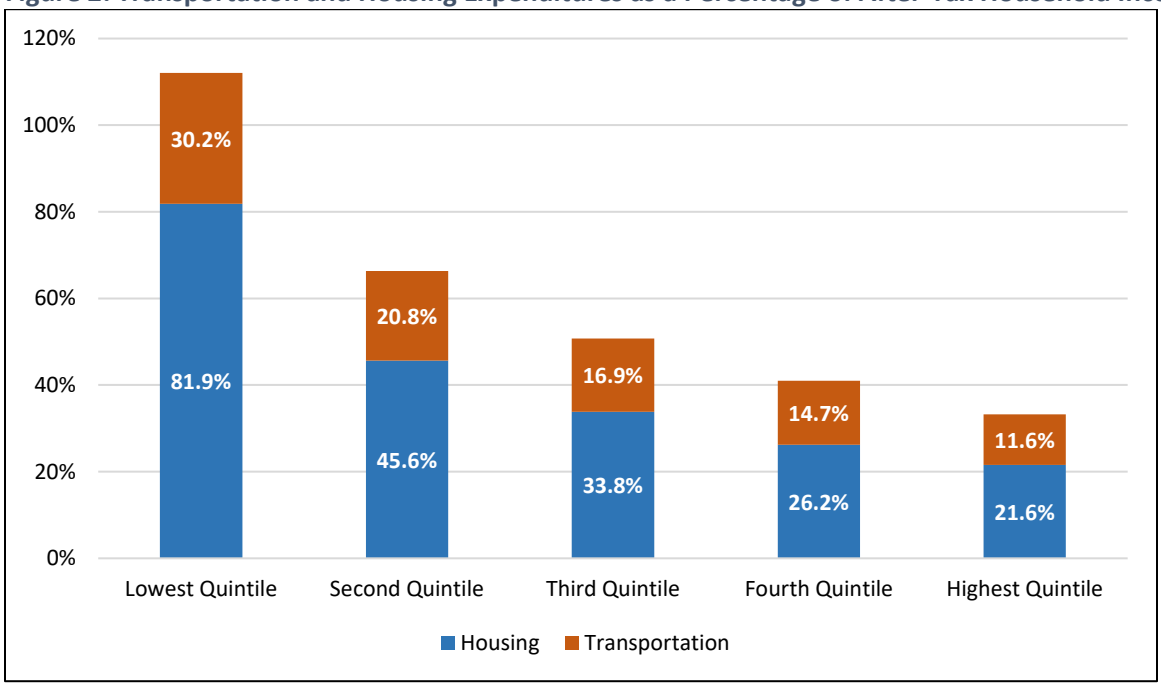
While this white paper describes how the transportation system affects the land use system, the principal focus is how the land use system affects the transportation system, with some discussion of feedback loops where relevant. Most of the direct policy decisions surrounding land use, especially within metropolitan regions, are made at the state, regional, and local level. Thus, while USDOT can play a role in fostering land use patterns that increase the affordability of housing, as well as the efficiency and environmental sustainability of the transportation system, the land use policies enacted by states, regions, and local governments are even more critical to realizing those outcomes.

[6] These of course can also be influenced by USDOT funding, financing, policies, guidance, regulations, and research, both directly and indirectly.

[7] Compactness in the study was defined as an index score of population and job density, mixing of jobs and homes, roadway connectivity, and centricity.

Land use strategies are key mechanisms to reduce housing and transportation cost burdens. Housing and transportation costs are the first and second largest expenditure categories for consumers in the U.S. overall. As shown in Figure 2, for households with incomes in the lowest quintile, housing and transportation costs represent 112 percent of the average after-tax income.[8] This is significantly higher, as a percent of total after-tax income, than for other income quintiles, highlighting the disproportionate burden these costs have on households with lower incomes. Nationwide housing supply has failed to keep up with demand over the last several decades, leading to a nationwide shortage of 1.5 to 3.8 million homes and driving up the cost of housing (Calanog, Metcalfe, & Fagan, 2023; Khater, Kiefer, & Yanamandra, 2021; Lee, Kemp, & Reina, 2022). As a result, 45 percent of renters are now cost-burdened, meaning that they spend 30 percent or more of their family income on rent, more than twice the share who were cost-burdened in 1960 (Ruggles, et al., 2023).

Figure 2: Transportation and Housing Expenditures as a Percentage of After-Tax Household Income



Source: 2022 Consumer Expenditure Survey, U.S. Bureau of Labor Statistics

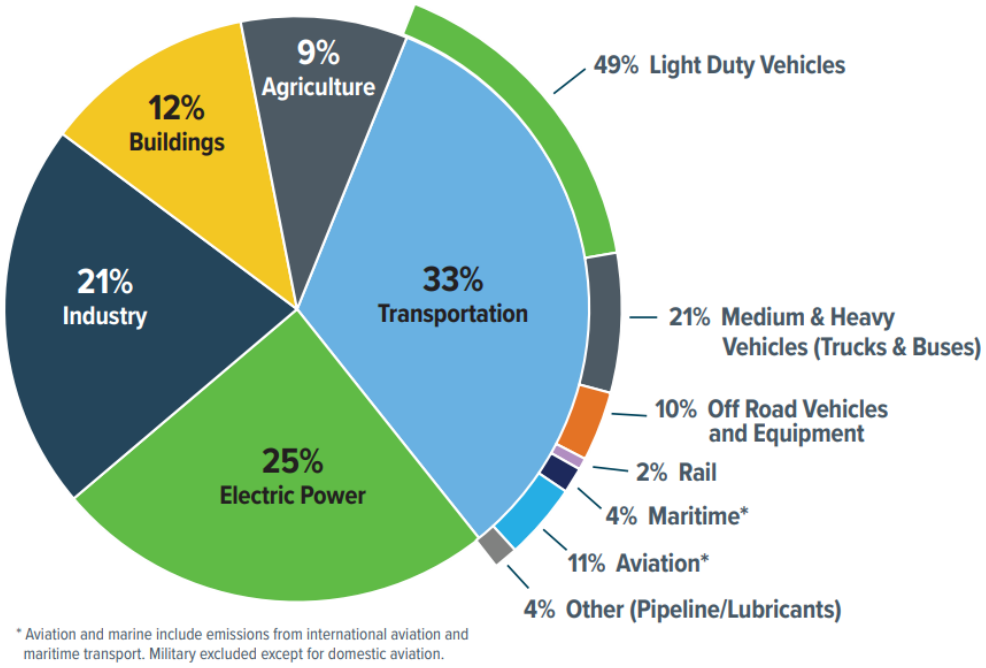
Research consistently finds that overly stringent land use restrictions, that is, those that prevent the supply of housing units from adjusting to demand, lead to lower housing construction and a lower price elasticity of the housing supply, while less stringent land use restrictions lead to a higher price elasticity of housing supply and an increased supply of smaller, lower-cost housing (Baum-Snow, 2023; Gyourko & Molloy, 2015; Stacy, et al., 2023). Restrictions that prevent new housing in neighborhoods with high-quality amenities reduce labor mobility and overall economic productivity while also reducing the intergenerational economic mobility of children (Chetty & Hendren, 2018; Moretti & Hsieh, 2019; Peri, 2012; Osman, 2020).

[8] Spending levels greater than 100 percent of income can be the result of households taking on debt, the presence of certain households with non-traditional income in the lowest income quintile (e.g., students, retirees accruing income through certain sources), and survey respondents not accounting for all types of government transfers.

Conversely, land use policies that make low-cost modes of transportation (e.g., walking, cycling, public transportation) increasingly possible, practical, safe, and comfortable are inherently equitable policies. Such cost-savings to low-income households have a disproportionate impact as a percentage of total household expenditures. Similarly, land use policies that allow for housing and jobs, goods, and services to locate closer together are inherently equitable, particularly in locations that have travel distances and land uses such that they are already naturally walkable or bikeable, or those that have existing transit service. These locations and development formats allow for viable affordable transportation alternatives, even without further improvements to alternative modes or new infrastructure. Furthermore, if land use policies do not allow the development of walkable and amenity-rich neighborhoods to keep pace with demand for them, then such neighborhoods are likely to become unaffordable, especially to low-income households for whom transportation cost savings may be most impactful.

Environmental outcomes are also heavily influenced by land use policies, particularly air pollution effects via land use patterns influencing travel behavior, but also through other mechanisms such as energy efficiency in heating and cooling certain types of buildings. As shown in Figure 3, the transportation sector represents the largest source of U.S. greenhouse gas emissions, with buildings representing the fourth largest source.

Figure 3: 2022 U.S. Greenhouse Gas Emissions



Source: EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks

Furthermore, via the same mechanisms, land use policies impacting travel behavior also affect criteria pollutants, with the transportation sector accounting 43.5 percent of carbon monoxide emissions and 52.8 percent of nitrogen oxide emissions in 2020. Lastly, land use patterns can affect the total area covered by impermeable surfaces and the total amount of land consumed for human activities, impacting water pollution, noise pollution, and habitat loss and fragmentation.

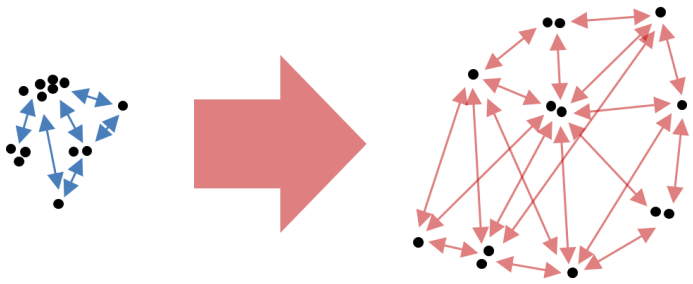
Land Use as a Transportation Strategy

Much of transportation policy focuses on lowering the generalized cost of transport, making it faster, more affordable, more reliable, easier, safer, or more comfortable to get from "point A to point B." An additional layer of transportation policy focuses on minimizing the societal costs of transportation, for example, reducing externalities such as air pollution, water pollution, safety impacts, or noise created by the transport sector, as well as mitigating or minimizing the negative effects of the construction of transportation infrastructure. Land use policy is a foundational lever of transportation policy because it can impact *where* "points A and B" are, and thus the extent to which travel is required in the first place, the convenience of alternative forms of the travel, and the resulting need for transportation infrastructure investments.

The Travel Extent

Land use strategies have the potential to reduce the generalized cost of travel, both in terms of time and out of pocket costs, by allowing origins and destinations to be located closer to one another. Most travel on the transportation system represents an intermediate cost related to accessing and engaging in activities at a given destination.[9] Given this, in most cases, travel itself represents a cost, in terms of direct out-of-pocket costs and the opportunity cost of time, which may be further affected by other qualities of the journey (such as the level of discomfort). Transportation system users incur these costs to access goods, services, employment, or meet other wants and needs. As illustrated in Figure 4, land use policies that prevent origins and destinations from locating nearer to one another lead to longer travel distances, and potentially to longer travel times.

Figure 4: Impact of Origin and Destination Location on Travel Extent

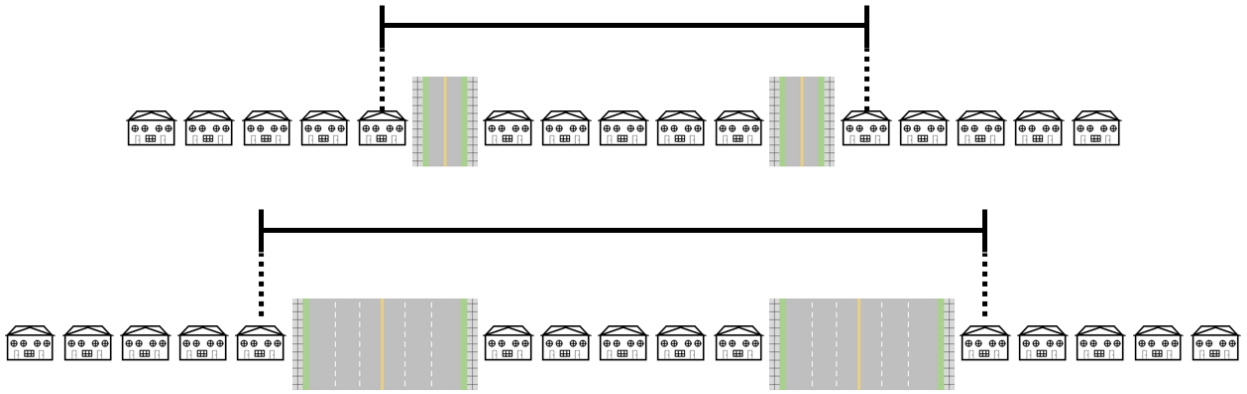


Additionally, more dispersed origins and destinations also mean there are fewer opportunities for convenient trip chaining at clustered destinations, meaning that additional trips are required to access the same sets of destinations.

Land set aside for transportation infrastructure, either in the initial development of land or through the removal of existing property for use as right-of-way dedicated to transportation, also increases the average distances between origins and destinations, as shown in Figure 5. Note this added distance increases cumulatively as more transportation corridors are crossed on a given trip.

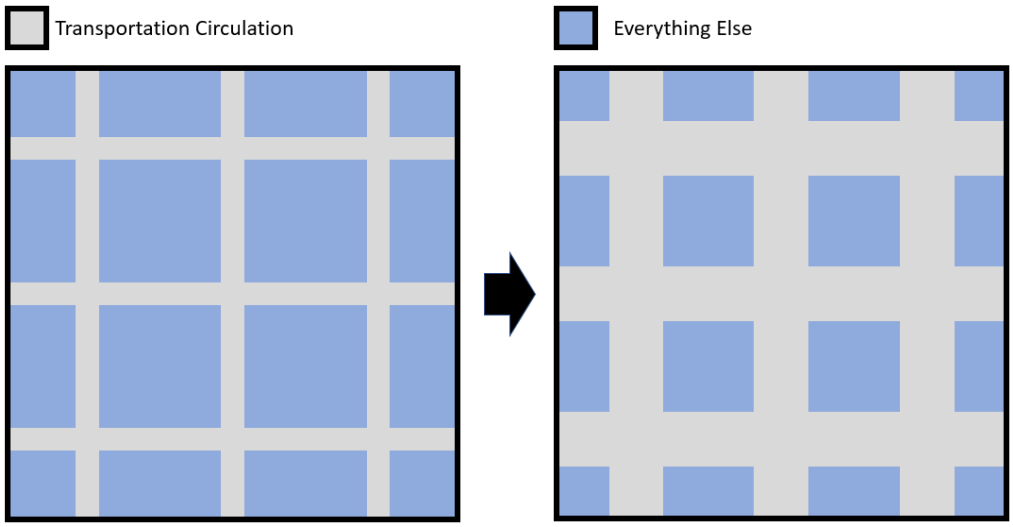
[9] Some common exceptions include exploratory or recreational travel, consumption of scenic views from a transportation corridor, etc.

Figure 5: The Effect of Land Set Aside for Transportation Infrastructure on Trip Distance



For private automobiles and trucks, the parking infrastructure that is often provided at both the origin and destination of a trip adds further to these impacts on average travel distances. In addition to the direct effects on trip distance, infrastructure for surface transportation circulation comes at an opportunity cost of land not available for other uses, be it residential, commercial, industrial, or other public spaces such as parks or recreational facilities, which can indirectly exacerbate travel distances even further as shown in Figure 6. As land set aside for surface transportation circulation increases, there is less space for these other uses, which must then either locate at more distant locations or be vertically stacked.

Figure 6: Opportunity Cost of Land Set Aside for Transportation Circulation



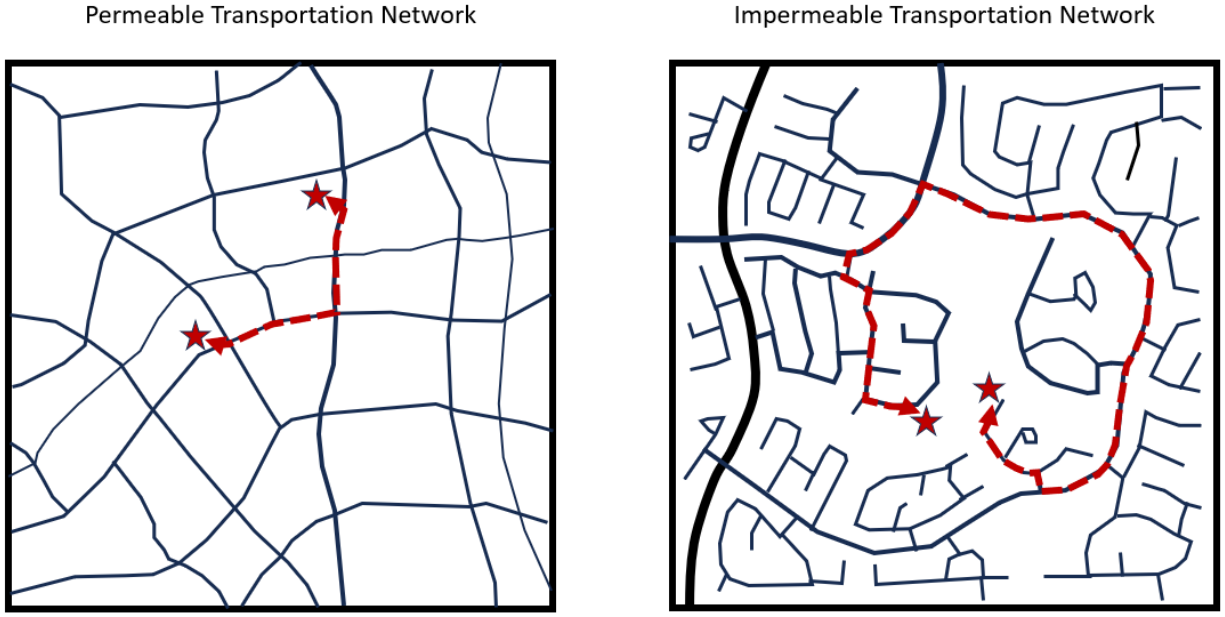
While some land uses can adapt to this constraint by being vertically stacked, others, such as recreational open space or certain industrial uses, may be costly or highly impractical to elevate. Additionally, as discussed in later sections, vertical construction comes at significantly higher costs. According to a 2024 analysis by researchers at the University of Pennsylvania, dedicating more land for housing, offices, and other land uses instead of roadways would likely increase net social benefits on average (Guerra,

Duranton, & Ma, 2024). The researchers acknowledge that from a theoretical perspective, a city with no space set aside for transportation circulation would all but preclude most uses on land for residential, commercial, or industrial activities, but conclude that for the 316 metropolitan areas in the United States, a ten percent reduction in urban roadway space from removing, narrowing, or downgrading roadways would produce net economic benefits largely through higher and better use of land.

Whether shrinking an existing facility is worth the reductions in externalities and dedication of land to other purposes is context-specific, and additional research and analysis is needed, the tradeoffs inherent to dedicating land to transportation circulation should not be ignored. These considerations are also relevant when planning out infrastructure for new peripheral development in cases where developers may be required to set aside land for future transportation infrastructure. Lastly, as discussed below, different transportation modes have different spatial efficiency, and the spatial efficiency differences should be one key consideration when comparing different modal options given the tradeoffs discussed in this section.

Lastly, as demonstrated in Figure 7, the layout of a transportation network also impacts travel extent, with permeable networks such as grids allowing for more direct access routes to destinations relative to networks that force travel onto higher order facilities. When new neighborhoods are planned and developed without land set aside for direct neighborhood-to-neighborhood linkages to adjacent future neighborhoods, the future transportation network will lack the connectivity necessary for shorter vehicle, walking, cycling, or public transportation trips. While these linkages can be added later, this usually comes at greater expense and difficulty than if they were planned in from the beginning, as residents near proposed linkages often oppose alterations that would allow cut-through travel.[10]

Figure 7: Comparison of Transportation Network Types and Required Travel Distances

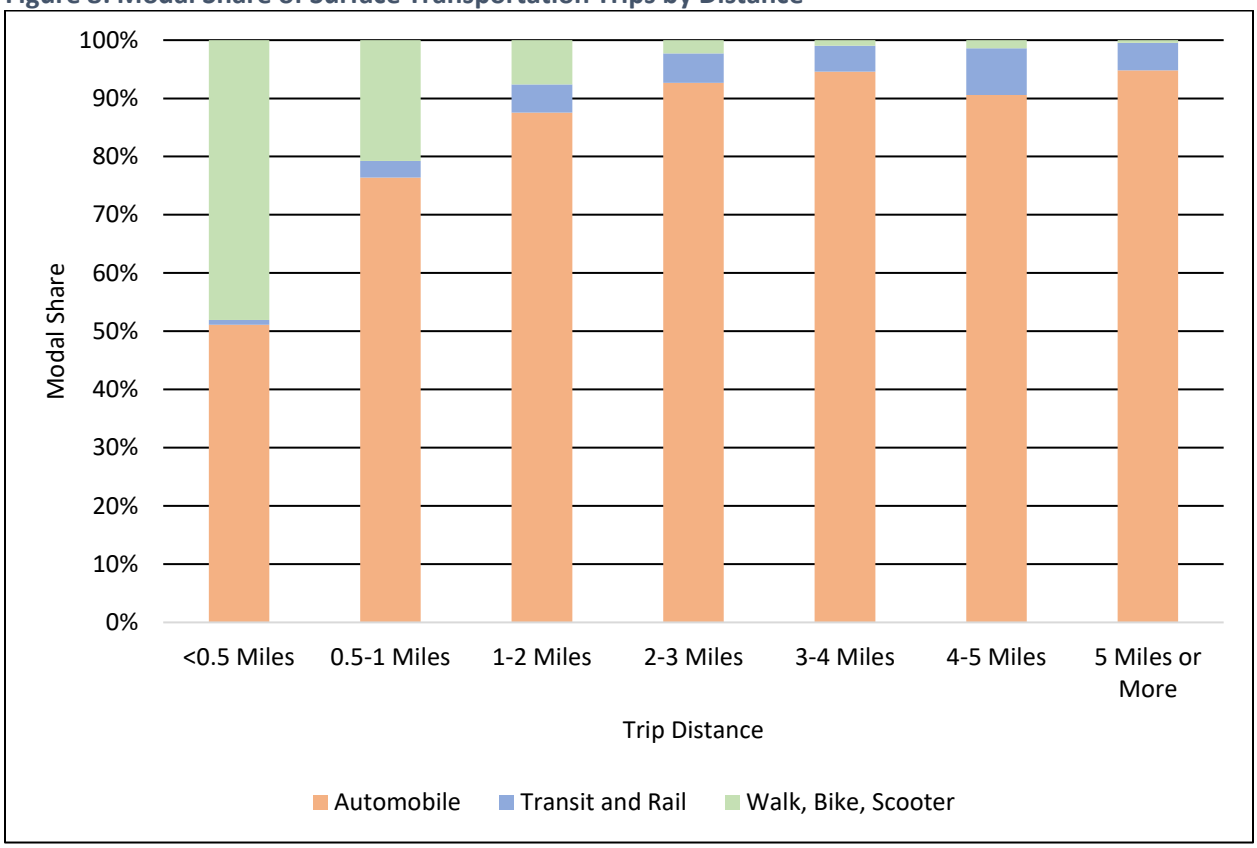


[10] Modal filters, such as those that only allow cyclists and pedestrians to pass through the linkages, can sometimes lessen this opposition.

The Form of Travel

Increasing distances between origins and destinations can affect the modal choices made by users of the transportation system. For example, modes such as walking and cycling, which have relatively low average speeds, become less practical at longer distances. Thus, land use planning and regulations that result in highly dispersed origins and destinations can mean average travel distances are such that most trips would practically require either an automobile or access to the transit network.

Figure 8: Modal Share of Surface Transportation Trips by Distance



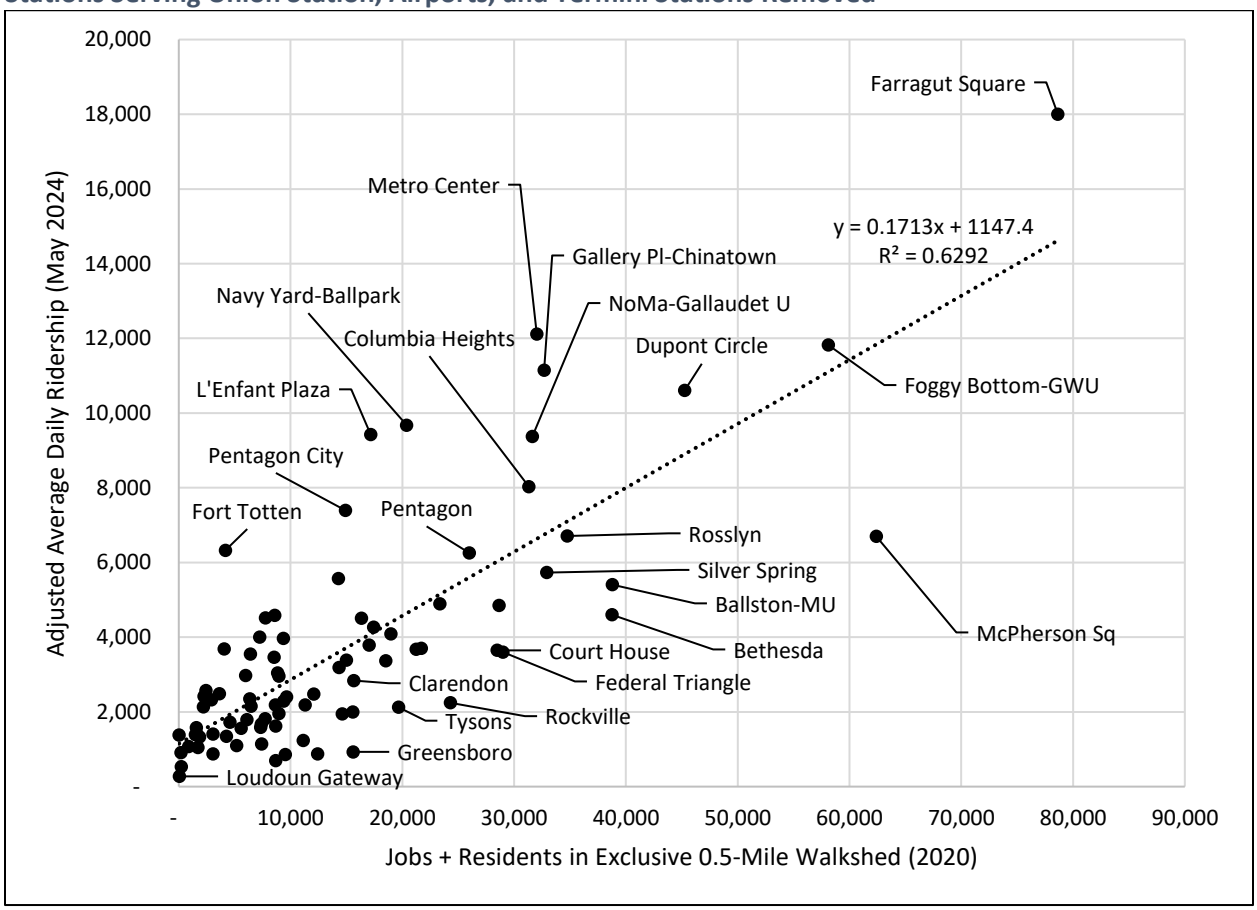
Source: 2022 National Household Travel Survey

While revealed preference research suggests increasing traffic volumes and speeds increase the generalized cost of transport for pedestrians walking along a roadway facility by reducing comfort, observed route choice decisions also suggest that certain land use and urban design characteristics along sidewalks also influence the desirability of walking, such as the presence of ground-floor retail and building setbacks (Sevtsuk, Basu, Li, & Kalvo, 2021; Broach & Dill, 2015). Thus, land use, public space provisioning, and urban design decisions affect the generalized cost of travel within a given mode, directly or indirectly playing into modal choice decisions for individual trips.

In addition to their effects on walking and cycling, land use patterns also play a key role in the use of mass transportation systems, with station-area land use being the single most important factor in ridership generation at most stations. There are some exceptions, for example, such as stations serving major intercity rail stations, major airports, or termini stations that tend to draw a significant portion of their ridership from beyond areas close to the station itself. To illustrate, Figure 9 shows the correlation between average daily ridership at Washington Metrorail stations and the number of residents and jobs

located within the exclusive 0.5-mile radius of the station after removing the termini stations, the station serving Washington Union Station, and the two major airport stations.[11]

Figure 9: Washington Metrorail Station Average Ridership Versus Walkshed Jobs and Residents with Stations Serving Union Station, Airports, and Termini Stations Removed



Source: Washington Metropolitan Area Transit Authority; U.S. Census; Longitudinal Employer-Household Dynamics

Approximately 63 percent of the variation in station ridership is associated with variation in the number of walkshed jobs and residents.[12] Land use policies that influence the intensity of development near mass transit facilities is one of the more important factors, if not the most important factor, in influencing transit ridership. Even at outlying stations, which may draw commuters from outside the walkshed of the station, the generated ridership still depends upon land use around other stations on the network. Thus, land use policy has significant relevance, not only for transportation and environmental policy generally,

[11] Exclusive means that only portions of the 0.5-mile walkshed are included for a given station if that station is the closest one for a given point, which adjusts for multiple stations serving the same dense job and residential districts. For the purposes of the analysis, the totals for the two adjacent Farragut Square stations were combined and average daily ridership for all stations was adjusted to remove the effects of occasional construction-related station closures during May 2024.

[12] Including all stations results in an R^2 of 0.59, using residents only results in an R^2 of 0.11 and using jobs only results in an R^2 of 0.54, suggesting proximity to jobs is more strongly associated with transit ridership than proximity to residents. However, all four correlations are statistically significant at the 95% confidence interval.

but for the fiscal health of mass transportation systems, especially as many systems are facing additional fiscal stress after pandemic-related drops in ridership and fare revenue (Freemark & Rennert, 2023).

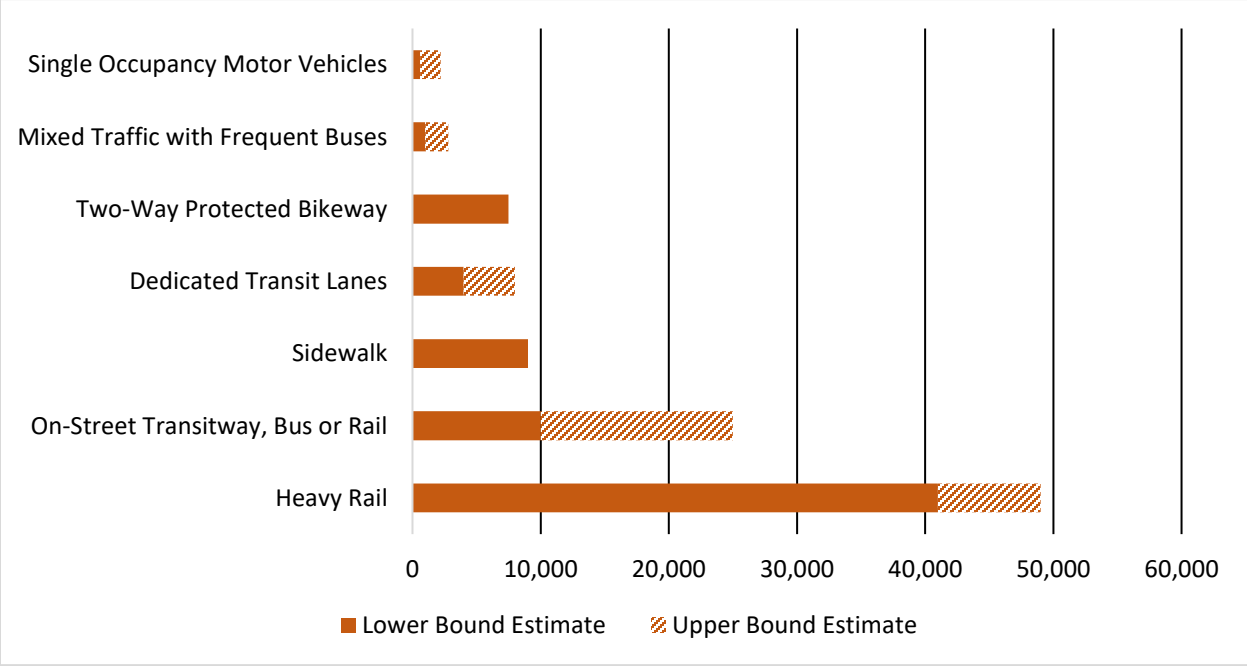
Land Use Policies and Transportation Infrastructure Investments

Because land use policies impact the form and extent of travel over the transportation system, they have downstream effects on the types and amount of infrastructure investments needed to accommodate travel demand. While such decisions about transportation investments are technically separate policy decisions, many of them have a practical relationship with, and tend to follow naturally from, land use policy choices and the effects of those choices on travel distances and modal choice propensity.

For example, in areas where many destinations are available within a short walking or cycling trip, relatively low-cost infrastructure such as sidewalks and cycling lanes can accommodate a larger proportion of travel demand. Because of the spatial efficiency of walking and cycling, this means far less space, and corresponding transportation infrastructure, can accommodate the same volume of trips, as opposed to if these trips *all* required travel in a single-occupancy vehicle due to longer average travel distances. As shown previously, accommodating travel demand with modes that are less spatially efficient also makes individual average trips between origins and destinations longer, because transportation infrastructure itself often generates additional travel distance, unless that infrastructure does not impact surface-level development.

Different modes have different throughput capacity for a given amount of space. While exact figures are difficult to estimate, Figure 10 provides an *approximate* illustration and ranges of maximum person-throughput capacity of a single 10-foot lane of traffic, compared to approximately the same sized space for bikeways, sidewalks, on-street transit, and a single track of a heavy rail line.

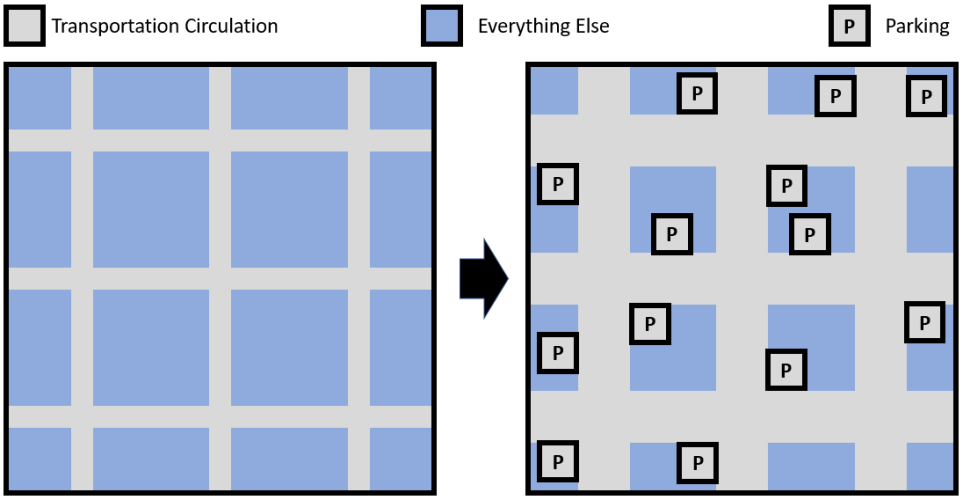
Figure 10: Maximum Persons/Hour of a 10-foot Width Equivalent by Mode



Source: National Association of City Transportation Officials, Transit Capacity and Quality of Service Manual 3rd Edition

This comparison of spatial efficiency by mode does not account for the varying spatial needs for vehicle storage. Walking trips require no special storage infrastructure at either end of the trip, and cycling parking is relatively space-efficient compared to the space required for automobile infrastructure.[13] Automobile travel requires far more vehicles for a given number of trips than rail systems or buses, and, unless the automobile trip is provided by a third-party taxi service, each vehicle generally requires at least one parking space at the beginning and end of each trip. Some of this parking infrastructure is provided publicly, such as on-street parking or public parking lots and garages, while some is provided off-street on private property by property owners. Thus, parking further increases the space required for accommodating travel demand via automobiles, as illustrated in Figure 11. According to an analysis by the Parking Reform Network, an average of 20 percent of land in American city centers is devoted to parking in the 100 most populous urban areas, ranging from 0.4 percent in New York City to 49 percent in San Bernardino (Parking Reform Network, 2025).

Figure 11: Opportunity Cost of Land Set Aside for Transportation Circulation and Vehicle Storage



While minimum parking requirements can lower the price of parking by creating an oversupply and reduce parking search costs, policymakers, urban planners, and transportation planners must weigh the tradeoffs of dedicating space to vehicle movement and storage, both in existing neighborhoods and when planning and approving new ones. While the urban form is relatively slow to change in most cases, removing parking minimum requirements can allow more land currently dedicated to vehicle storage to transition to more space for housing, businesses, recreational space, or other uses over time. Similarly, land set aside for transportation circulation can be adjusted as part of traffic calming or rightsizing projects, opening up more urban land to other uses. Adjusting policies that require developers to dedicate sections of their land to transportation infrastructure and parking as a condition of constructing new neighborhoods or development projects can also alleviate this issue before it even appears.[14]

[13] Transit systems also requires space for stations, circulation, and vehicle storage, though station and circulation elements are sometimes placed underground in high-value locations, and vehicle storage often takes place in peripheral locations.

[14] California A.B. 3177 (2024), included in the State and Local Examples section, illustrates the amending of such a process.

Land use policies that make possible shorter trips or travel on modes with higher spatial efficiency can reduce the overall infrastructure required to accommodate travel demand, correspondingly reducing the capital and operating cost burdens (e.g., maintenance costs) for all levels of government.

Interactive and Cyclical Effects

Given the interactive effects of land use on travel distances, trip mode choice, and varying spatial efficiency of transport to accommodate volumes, the transportation investment decisions that tend to arise out of these interactions can create unintended compounding effects. Such cyclical effects have been discussed in urban planning circles for decades, including such works as *The Death and Life of Great American Cities*, where author Jane Jacobs observes (Jacobs, 1961, pp. 349-353):

"Erosion of cities by automobiles entails so familiar a series of events that it hardly needs describing. The erosion proceeds as a kind of nibbling, small nibbles at first, but eventually hefty bites. Because of vehicular congestion, a street is widened here, another is straightened there, a wide avenue is converted to one-way flow, staggered-signal systems are installed for faster movement, a bridge is double-decked as its capacity is reached, an expressway is cut through yonder, and finally whole webs of expressways. More and more land goes to parking, to accommodate the ever increasing numbers of vehicles while they are idle…

…Thus does erosion, little by little, subtract reasons for using an eroded district, and at the same time make it less lively, less convenient, less compact, less safe, for those who continue to have reasons to use it. The more concentrated and genuinely urban an area, the greater the contrast between the smallness of what is delivered and the significance of what is lost by the process of erosion."

In a perhaps more technical translation, attempting to increase speeds of roadway vehicles in an urban neighborhood by expanding the roadway and removing infrastructure such as crosswalks can affect the generalized cost of other modes such as walking and cycling.[15] It can make trips on alternative modes more circuitous and time consuming, less comfortable, and less safe, leading to even more modal shift away from active transportation modes to the use of roadway vehicles. Even when attempts are made to accommodate pedestrian and cycling trips across dangerous arterials more quickly, such as via pedestrian bridges, such infrastructure often still increases travel times and travel costs by requiring more circuitous access and elevation gains to use.

Over time, shifts in demand away from more spatially efficient modes of transport towards those which require far more space, or alternative means, such as pricing, to remain uncongested, increase pressure to accommodate still more single and low-occupancy vehicle travel. This creates a slow and steady feedback loop that quietly removes the practicality and comfort from walking, cycling, and transit modes. While there may indeed be gains from projects to increase capacity and speeds for automobile users, the drawbacks and tradeoffs for other modes, as well as higher order effects on metropolitan development patterns and access, must also be acknowledged for optimal decision making. For example, researchers at the University of California, Los Angeles and the University of Virginia found that faster travel speeds by automobile were not actually associated with increased access to jobs in the Los Angeles and San Francisco metropolitan areas (Mondschein, Osman, Taylor, & Thomas, 2015; Osman, Thomas, Mondschein, & Taylor, 2016). Somewhat paradoxically, the land use patterns required to keep automobile

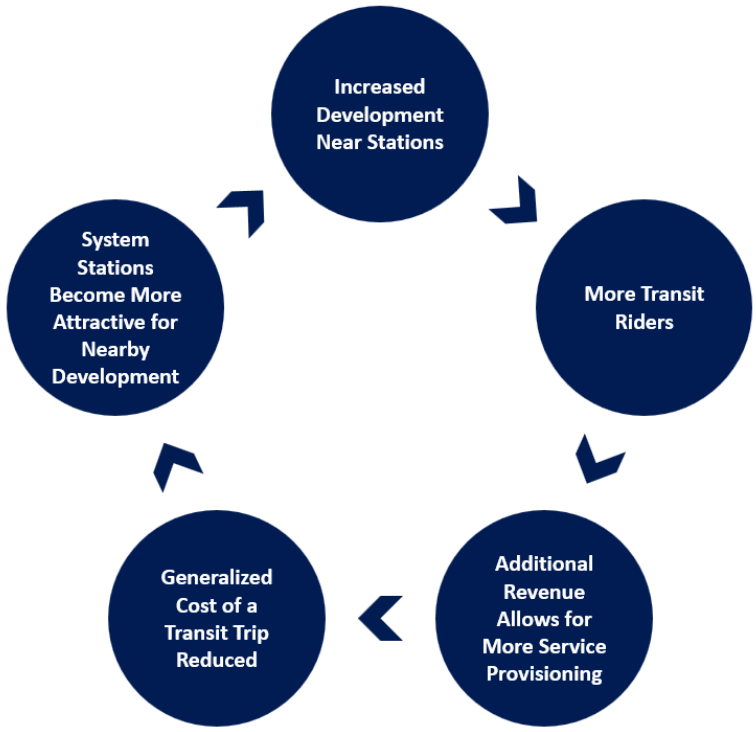
[15] This can impact transit as well, given transit often requires a walking or cycling trip at one or both ends of a trip.

speeds free-flowing limited density in such a way that net access to employment was reduced, with workers traveling faster, but reaching fewer jobs.

Conversely, efforts to make the cycling and walking experience easier, safer, and more comfortable can create the same feedback loop in reverse, making the area more attractive for infill development and negating the need for the same extent of costly parking infrastructure that often creates physical and financial hurdles to adding additional density. As more origins and destinations locate within the same area, automobile use is required for a reduced portion of daily trips, and in some cases automobile ownership may no longer even be a necessity to access goods, service, and other destinations.

Similarly, for mass transportation systems, land use policies that lead to additional development in the walkshed of transit stations can create a positive feedback loop, as illustrated in Figure 12. As nearby development increases ridership at both the nearby station and throughout the transit network, the additional fare revenue can support more frequent transit service, reducing wait times for both existing and induced transit users via shorter headways. This lowers the generalized cost of travel on trips throughout the transit network, making every station throughout the entire network more attractive to development, which can continue the cycle. Similar feedback loops can influence micro-mobility options as well, as increasing development intensity makes more locations viable for docking stations, expanding the reach of the network.

Figure 12: Relationship Between Land Use Policies and Transit Ridership

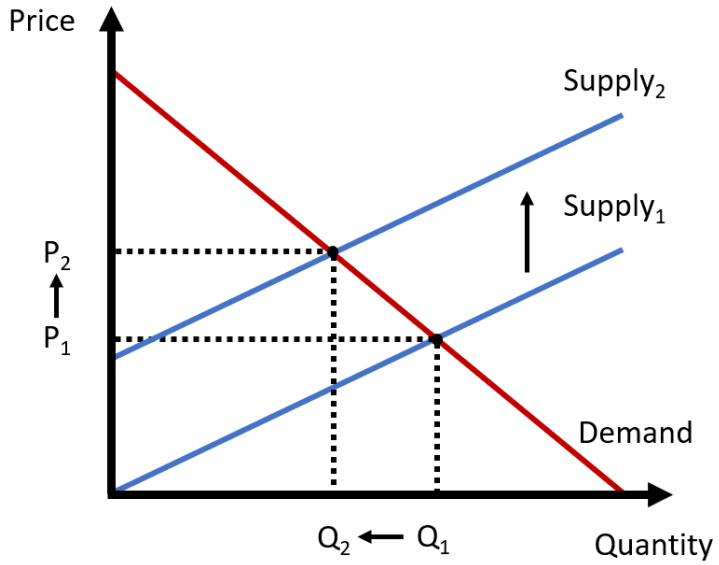


Land Use as a Housing Strategy

Land use decisions are a critical component for ensuring that regional housing supply growth keeps pace with regional housing needs. When housing demand in an area grows, such as with economic and job growth, housing supply must keep pace with the resulting population growth, otherwise additional

consumers of housing will compete for a restricted supply of homes, driving rents and home prices upward faster than the rates of growth in income and inflation. Increasing regulatory costs, especially since the 1970s, as well as restrictive zoning and land use policies have been cited as key contributors to housing supply shortages (Weinstock, 2023; Fischel, 2015). Economists attribute the growing gap between housing prices and physical construction costs in U.S. housing markets to land prices, which largely reflect the impact of restrictive land-use regulations (Gyourko & Molloy, 2015). Such increases in the costs of production of housing lead to fewer housing units supplied and higher average prices for consumers, as shown in Figure 13.

Figure 13: Effects of Increased Marginal Production Costs on Price



When a given area becomes relatively more desirable as a location for housing, either through changes in transportation access, regional or local job growth, or a change in another factor, additional consumers of housing will attempt to procure for-sale or rental housing units in that area. Over time, this process reduces vacancy rates for apartments, and the supply of housing units available for sale on the market. As vacancy rates for rental units and the supply of for-sale homes trends lower, consumers will begin to compete for the relatively scarcer supply of housing units available, which allows owners of apartment buildings and for-sale housing to sustainably increase asking rents and prices beyond the rate of inflation. This increase in the future stream of revenues means that, at the margin, more potential projects for suppliers of homes and apartments become financially feasible to construct. Thus, absent restrictions that would otherwise prevent this, suppliers of housing will respond by providing additional housing units, increasing rental vacancy rates and the supply of for-sale homes. This in turn increases competition among landlords and sellers of homes for potential tenants and homebuyers, stabilizing the growth in per square foot rents and home prices back towards the economy-wide inflation rate.

However, in most American metropolitan areas, new housing supply can only be delivered on land parcels where permitted by land use regulations. In many cases, this may require zoning changes to permit more intensive levels of development (i.e., zoned capacity) than what currently exists on a given parcel of land. Thus, while some metropolitan areas experience scarcity of available land, land where marginal increases in housing development is possible is often made to be artificially scarcer than land overall via land use

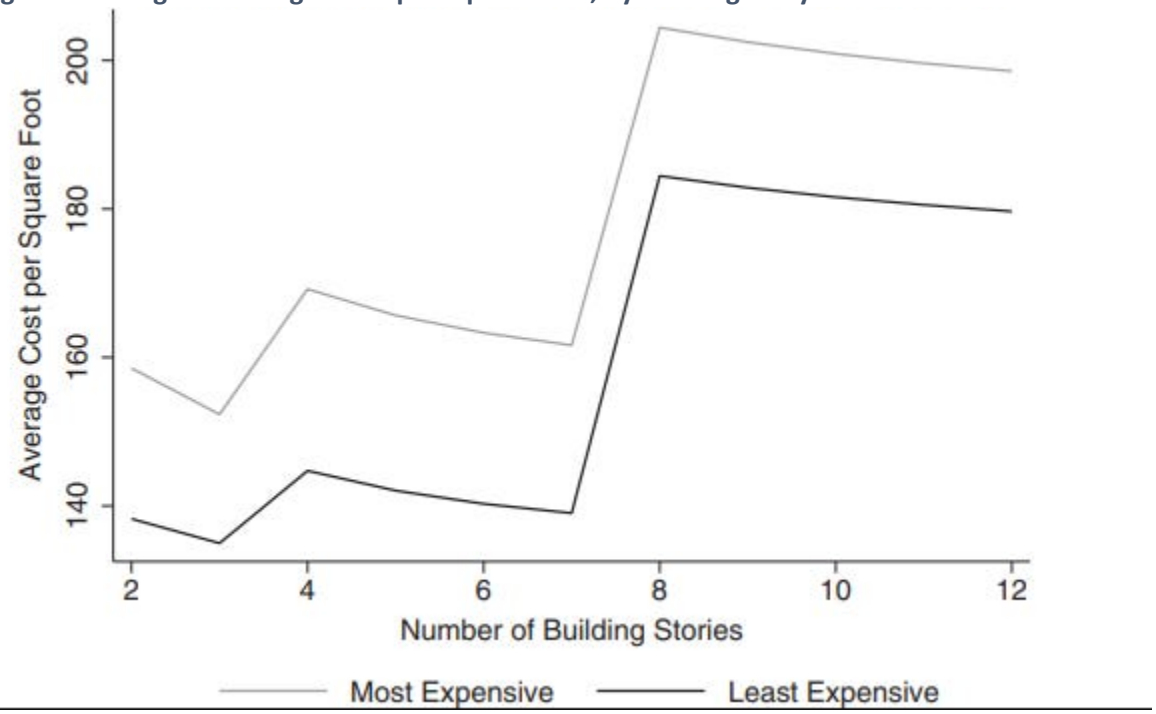
regulations. In some metropolitan areas or local communities, suppliers of additional housing may receive an "upzoning," or an adjustment to land use regulations to permit more intensive development, relatively quickly and easily, allowing the supply of housing to grow to meet housing demand and stabilize prices. In other areas, land use regulations may be not only strict but rigid, meaning that suppliers of housing do not compete for land generally, but land with sufficient zoned capacity in particular. This prevents many new market entrants for housing suppliers while also increasing the price of the scarce parcels available for additional housing supply, thus impeding new housing units.

Given the foundational role land use regulations play in determining housing prices and rents, there are numerous opportunities for State and local governments to reform land use policies and processes to foster greater housing supply and housing abundance, leading to broad housing affordability (U.S. Department of Housing and Urban Development, 2023).

Construction Costs Versus Housing Prices

One observation about higher density housing types is the cost per square foot of different construction techniques, with certain construction methods, such as high-rise vertical concrete construction, generally having a higher construction cost per square foot than low and mid-rise wood-frame construction (Raetz, Forscher, Kneebone, & Reid, 2020, p. 14). Figure 14 below illustrates the construction price per square foot from a recent survey in the 50 largest cities in the United States (Eriksen & Orlando, 2022).

Figure 14: Range in Average Costs per Square Foot, by Building Story



Source: Michael Eriksen and Anthony Orlando. Real Estate Economics, 2022.

Occasionally, this observation could generate a concern that denser development, usually being more expensive to construct, cannot lower housing prices. However, the use of higher cost construction techniques, to the extent multiple techniques are available, are a *response* to higher prices and not a *cause* of higher prices. Suppliers of housing will deliver housing types so long as the future stream of revenues of that type exceeds the future stream of costs for construction and building operations, and

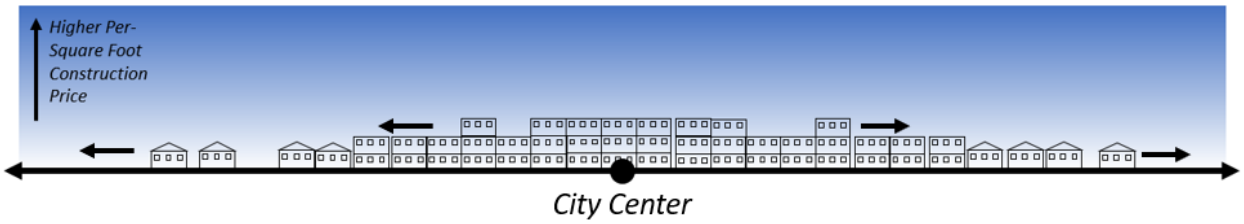
will generally deliver the housing types that maximizes net revenue, at least within the regulatory constraints they face.

In general, in smaller metropolitan areas, housing typologies with lower per square-foot costs of construction will generally be the first types of housing units to be delivered, including single-family homes, townhomes, smaller apartment buildings, or other low-rise structures often built with wood-frame construction. Initial growth is largely accommodated through outward expansion, illustrated in Figure 15.

Figure 15: Stylized Depiction of a Small Expanding Metropolitan Area

However, as a metropolitan area grows, the distance between the center and the exurban fringe increases. Eventually, growing transportation costs to reach central areas mean that households are willing to trade less space for more proximate access, and they begin to compete for space nearer to the center of the metropolitan area. This competition lowers housing vacancy rates and available housing supply, pushing up per square foot prices in more proximate locations. At first, suppliers of housing will attempt to utilize lower per square foot construction practices to redevelop existing properties into denser housing typologies, delivering more units on the same piece of land, as shown in Figure 16.

Figure 16: Initial Land Use Intensification Using Lower-Cost Construction Practices

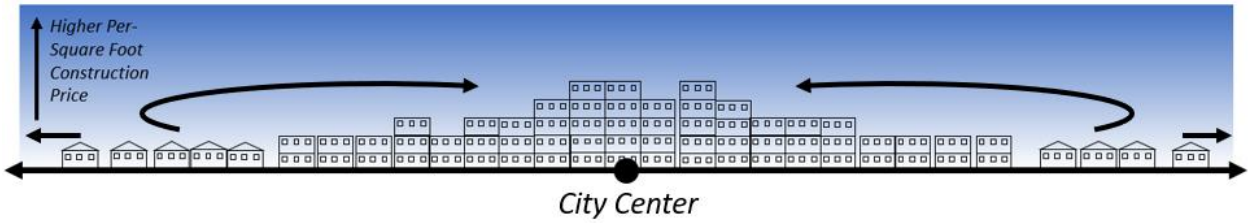


There are limits, though, to the heights and density lower-cost construction methods can achieve, and thus there are limits to the amount of housing units that can be delivered in locations where more housing is demanded using these methods of construction. Eventually, as more and more nearby parcels are built to this practical limit, housing supply in a given location can no longer adjust to meet housing demand, driving down available housing units and vacancy rates, which again leads to real increases in housing prices and rental rates.

Eventually, with continued growth of the metropolitan area, these real increases in housing prices lead to per square foot future revenue streams exceeding per square foot construction and operating costs of housing typology types that tend to have higher construction costs per square foot, such as techniques for mid-rise and high-rise buildings. Thus, once such prices have been reached in a given area of a metropolitan region, suppliers of housing will start to construct additional housing supply utilizing these more expensive construction methods, at least to the extent allowed by regulatory constraints, as shown in Figure 17. The delivery of these new units increases local and regional rental vacancy rates and for-sale

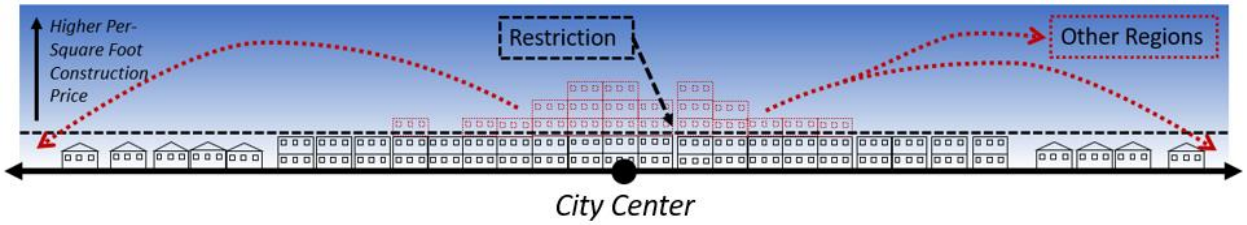
housing inventory, arresting the rise in per square foot housing prices beyond the higher construction costs per square foot.

Figure 17: Land Use Intensification in City Center in Response to Metropolitan Growth



In this way, denser building typologies must be understood as *responding* to increased prices, and not *causing* them; cities do not become expensive because they are dense, they become dense because they become expensive. Following on this, the placement of regulatory constraints on denser housing typologies will not lower housing prices but will instead accelerate their rise. Additionally, because such restrictions often prevent households from moving to locations that are more proximate to jobs, services, and other destinations, they increase household transportation costs by forcing households into longer and more expensive travel distances and times than these households would willingly choose, illustrated in Figure 18. When individuals seeking jobs cannot afford to live near to where jobs are located, these workers are burdened with longer commutes with negative impacts on recruitment and retention (Christina, et al., 2019). Alongside those longer travel distances and times come all the externalities and challenges that accompany more dispersed development patterns. Lastly, some development may be shifted to other regions entirely as households and businesses are priced out of the metropolitan area.

Figure 18: Effect of Restriction on the Spatial Distribution of Development



The Effect of Housing Supply Across Space and Market Segments

Another common concern about increases in housing supply is its effect on housing prices, both across a metropolitan region and in local neighborhoods, as well as across different market segments. As discussed above, when demand for housing in a given location increases, vacancy rates and supplies of for-sale homes fall as additional consumers attempt to rent or buy homes at that location. Competition between consumers for scarcer housing units means that home prices and rental rates can increase faster than the economywide rate of inflation. Rising rents and prices can lead to involuntary displacement, particularly for individuals and households with lower incomes. At the same time, rising rents and prices lead to producers of housing units increasing the supply of units available, leading to additional housing construction projects to begin, to the extent they are allowed to occur. Thus, rising rents and prices cause both involuntary displacement and new construction, but because these two effects often occur in the same neighborhoods at the same time, some housing market observers may conclude that new housing supply causes involuntary displacement across a local neighborhood. Additionally, because new housing construction is often targeted at higher-income households, it is often assumed that new housing

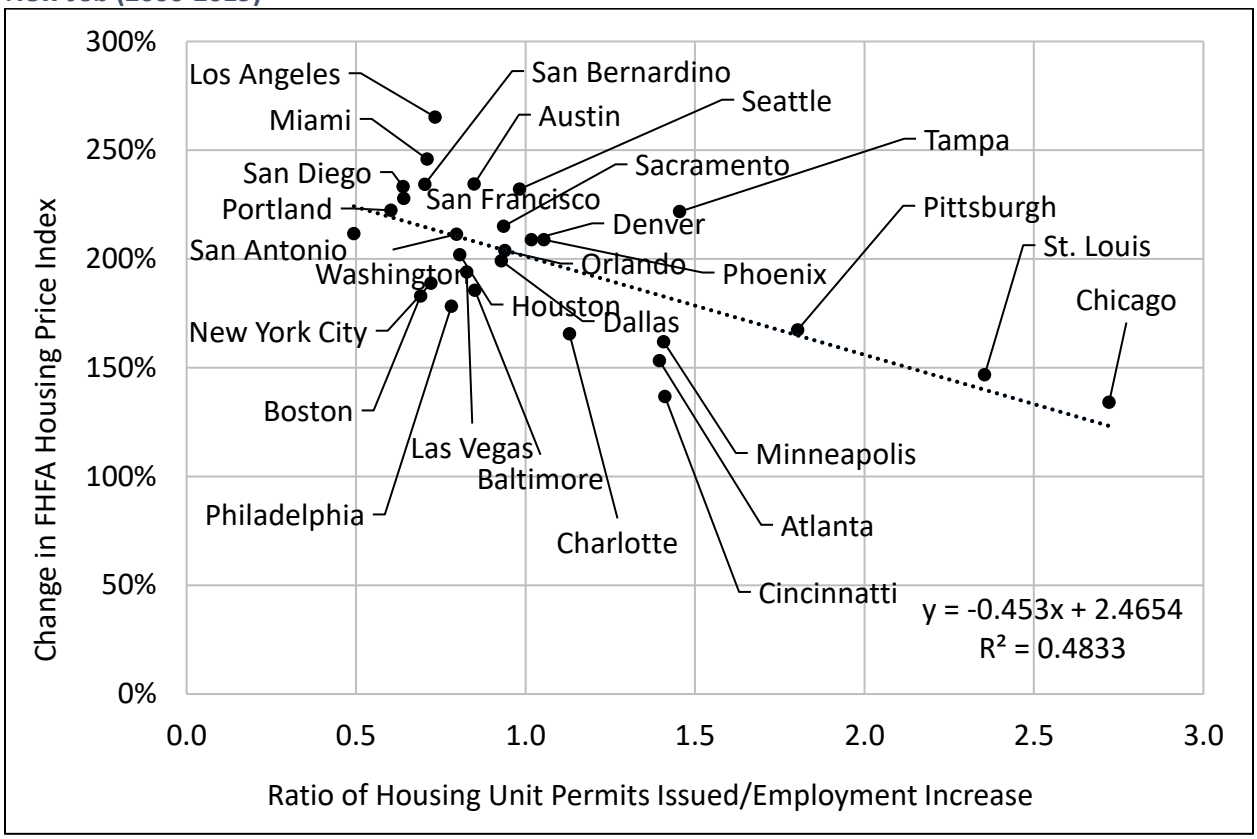
construction does not increase the supply of lower cost housing (California Legislative Analyst Office, 2016).

Taken together, these observations raise concerns the land use strategies that foster additional housing supply could unintentionally work crosswise to the policy goals of reductions in disparities and improvements to the lives of low-income residents and vulnerable communities. Concerns about new housing supply and involuntary displacement typically occur at three spatial scales: (1) across a metropolitan region, (2) in the local neighborhood where development occurs, and (3) on the individual parcel where a new housing development occurs.

At the metropolitan level, however, constraints that prevent housing supply from keeping pace with economic and population growth are associated with rising rents across the metropolitan region. In a review of the literature, New York University researchers compared common concerns and claims about the impacts of housing supply to empirical evidence, finding "*the preponderance of evidence suggests that easing barriers to new construction will moderate prices and therefore make housing more affordable to low and moderate income families*" (Been, Ellen, & O'Regan, Supply Skepticism: Housing Supply and Affordability, 2018, p. 3). Figure 19 shows how housing price growth in the largest 30 metropolitan areas between 2000 and 2019 correlates with housing unit permits relative to that employment growth.[16] While it is true that it is often regions with the largest employment growth tend towards higher rates of housing price increases, and areas with slower employment growth tend towards lower rates of housing price increases, the housing supply relative to that employment growth is correlated with price variation in a statistically significant manner. For example, from 2000 to 2019 the Chicago metropolitan area added 194,500 additional jobs and permitted 529,394 housing units, while the Los Angeles metropolitan area added 705,500 additional jobs and permitted only 517,194 housing units.

[16] The Detroit metropolitan area was not included due to negative employment growth during this period.

Figure 19: Change in Metropolitan Housing Prices Relative to the Ratio of Housing Unit Permits Per New Job (2000-2019)



Source: Federal Housing Finance Agency House Price Index All Transactions CBSAs, U.S. Bureau of Labor Statistics, U.S. Census Bureau

Beyond the shorter-term movement chains generated by policies that foster housing abundance, ample housing supply also assists in the creation of housing units that are affordable to lower-income households through the longer-term process of "filtering." Filtering is the process by which housing comes to serve different residents over time, and usually refers to the process of housing units becoming more affordable to lower-income households as the unit depreciates with time.[17] Filtering is an important mechanism for creating housing units affordable to low-income households because the vast majority of low-income renter households are housed on the private market (Weicher, Eggers, & Moumen, 2017). A 2014 econometric study on filtering estimated that occupant income in a given unit filters downward at 2.5 percent per year, while owner-occupied housing filters at 0.5 percent per year, or 72 percent and 22 percent, respectively, over a 50-year period (Rosenthal, 2014). However, several studies have found that in areas with restrictive land use policies, this filtering process is slowed, and in certain areas where housing supply falls far short of housing demand, the filtering process can even reverse, with older units "filtering up" (Been, Ellen, & O'Regan, 2023; Lie, McManus, & Yannopoulos, 2022).

Failing to foster broad housing abundance not only drives up housing prices, but also lowers rental vacancy rates, increases rents relative to incomes, and is thus associated with significantly increased rates of homelessness. Research by John Quigley et al. at the University of California found that, consistent with

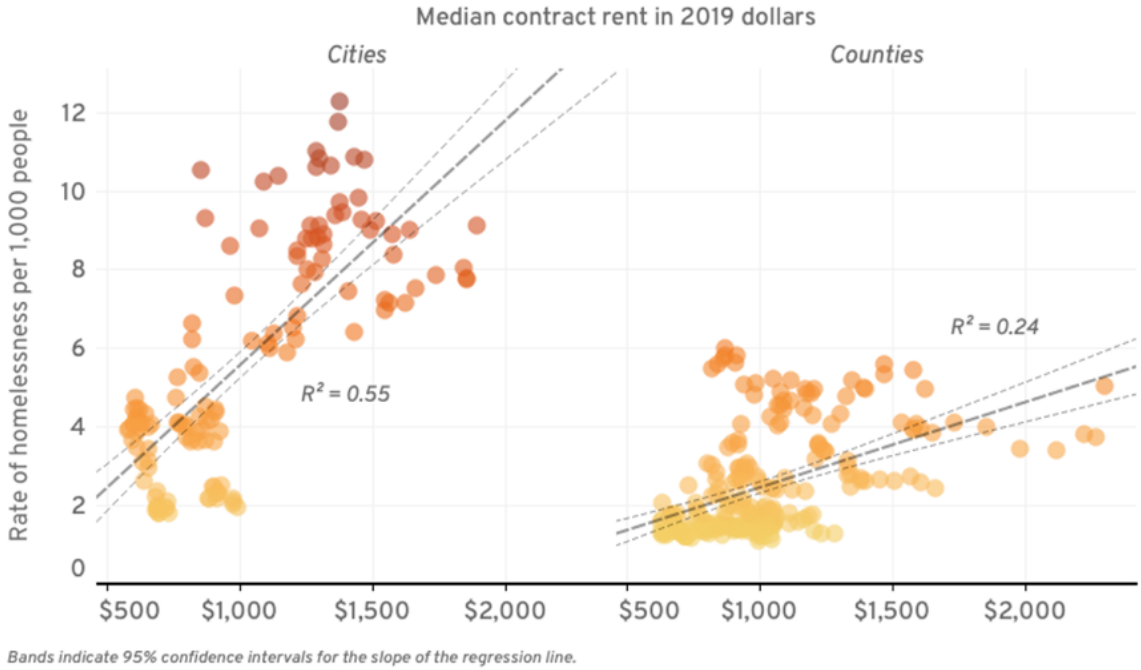
[17] Such units are sometimes referred to as "naturally occurring" affordable housing, as opposed to units with income-restrictions provided via public programs or policies.

data across the United States, a one percentage point increase in the rental vacancy rate combined with a decrease in the ratio of average monthly median rent to median household income would be associated with a 25 percent drop in the rate of homelessness (Quigley, Raphael, & Smolensky, 2001). Housing supply constraints were found to offer more explanatory power on rates of homelessness than other commonly cited attributions, such as substance abuse rates or poverty.

These findings are supported by additional research into the variation in point-in-time (PIT) counts of persons experiencing homelessness among different regions in the United States. For example, as illustrated in Figure 20, higher median rent prices are positively correlated with higher rates of homelessness (Colburn & Aldern, 2022).

Figure 20: Median Contract Rent versus PIT Count (Per 1,000 People)

Dashed lines indicate a linear regression of per capita PIT counts onto median contract rent between 2007 and 2019 for a sample of U.S. regions.

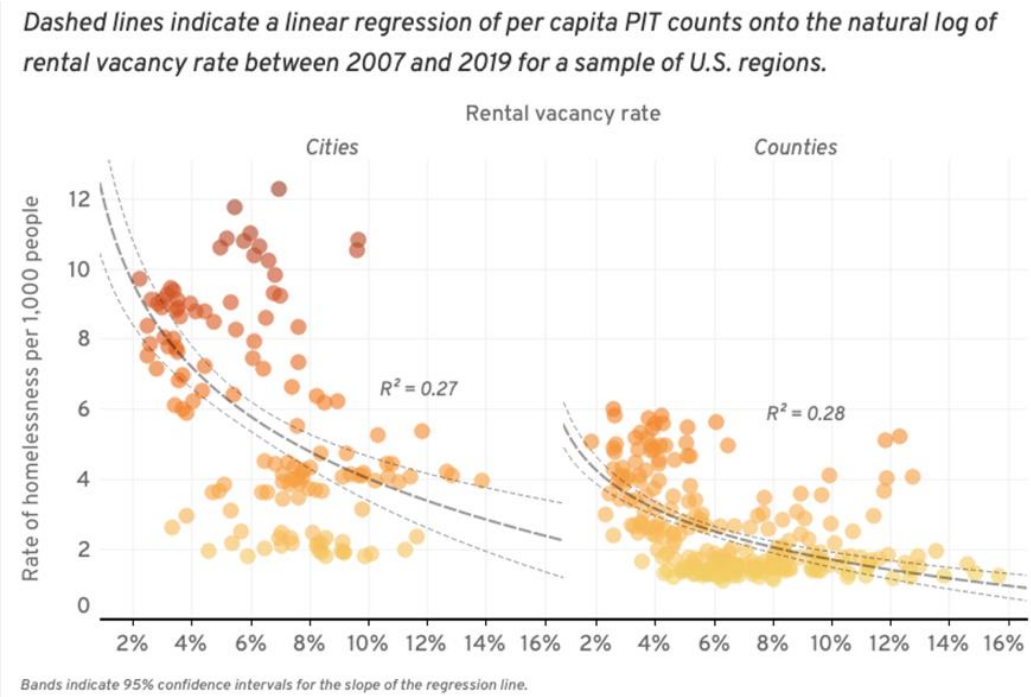


Bands indicate 95% confidence intervals for the slope of the regression line.

Source: Gregg Colburn and Clayton Page Aldern. Homelessness is a Housing Problem, 2022.

Similarly, lower vacancy rates in rental markets are associated with higher rates of homelessness, as shown in Figure 21 below (Colburn & Aldern, 2022).

Figure 21: Rental Vacancy Rate versus PIT Count (Per 1,000 People)



Source: Gregg Colburn and Clayton Page Aldern. Homelessness is a Housing Problem, 2022.

While additional housing supply is associated with lower housing costs across an entire metropolitan area and across market segments, some observers suggest that new housing might lower prices regionally, yet still increase prices locally. For example, because new housing construction is often targeted at higher-income households, significant new market-rate housing development in a neighborhood may attract other goods, services, jobs, and amenities that seek to serve a local population as it increases in size and, potentially, average income. Thus, according to this hypothesis, these secondary localized effects could offset the price reduction effects of new units as they capitalize into pre-existing for-sale housing units or increase the relative desirability of an area and increase rents in pre-existing rental units.

Such a hypothesis is empirically testable, and most empirical research on the topic suggests that the price reduction effects of new housing supply outweigh any secondary amenity effects of new market-rate housing units. That is, new market-rate housing supply reduces housing prices both regionally *and* locally, as well as across market segments. Research by Kate Pennington at the University of California found that new construction leads to rents falling by two percent for parcels within 100 meters of new construction, and the risk of renters being displaced to a lower-income neighborhood falls by 17 percent, with both effects being observable within a 1.5 kilometer radius (Pennington, 2021). A study by Xiaoda Li compared neighborhood price increases within 500 feet of new high-rise construction, compared to prices further away, finding "*for every 10 percent increase in housing stock, rents decrease by 1.0 percent; and for every 10 percent increase in condo stock, condo sales prices decrease by 0.9 percent*" (Li, 2022). While this study also found high-rises attracted new amenities, the supply effect dominated this amenity effect, causing net reductions in the rents and sales prices of nearby residential properties. Research from the W.E. Upjohn Institute for Employment Research, using migration data from across metropolitan areas, found that new market-rate construction in low-income areas decrease nearby rents, concluding that *"new buildings decrease rents in nearby units by about six percent relative to units slightly farther away or near*

sites developed later, and they increase in-migration from low-income areas" (Asquith, Mast, & Reed, 2023).

International research has also illuminated the effects across market segments and temporal effects. Research by Andreas Mense at the University of Erlangen-Nuremberg on German cities found that adding one new housing unit to the stock for every 100 rental housing units offered on the market in a given month reduces rents by 0.4 to 0.7 percent, with price effects beginning immediately upon building completion and across market segments, concluding that *"denser development has great potential to reduce the housing cost burden of low-income households—in addition to other possible benefits such as shorter commuting distances and larger productivity spillovers"* (Mense, 2020). A working paper by Christina Bratu at the VATT Institute for Economic Research summarized similar findings of the impact of housing supply on moving chains in the Helsinki region, concluding *"new market rate units trigger moving chains that quickly reach middle- and low-income neighborhoods and individuals"* and that *"new market-rate construction loosens the housing market in middle- and low-income areas even in the short run"* (Cristina, Oskari, & Tuukka, 2021).

These findings are particularly pertinent for land use planning done in conjunction with transportation infrastructure improvements, as such investments can change the relative desirability of one location relative to others, shifting patterns of housing demand and leading to implications for both housing policy and equity. For example, a new heavy rail station may increase the relative accessibility of a location, making it more desirable, attracting additional jobs and population to the walkshed of the station. If new housing supply is prevented from responding to this increased demand by land use regulations, higher equilibrium prices will result, reducing the affordability of the area for existing and future residents. Thus, well-intentioned policies to reduce development capacity in an effort to prevent neighborhood displacement, or prevent housing supply from responding to demand, are likely to have the unintentional effect of *accelerating* displacement, opposite of the stated policy goals.

The research, finding that the price reduction effect of new housing supply is stronger in units closer to new development than those farther away, also illustrates another important observation about housing construction and demand, namely, that units in the same or a proximate neighborhood are generally better substitutes than units in a distant neighborhood, all else equal. This means that if the policy goal is to prevent the rise in neighborhood housing prices, new housing supply must be allowed for in the locations where it is demanded, and that similar allowances for housing supply in more distant locations that are worse substitutes is likely to have more muted impacts on preventing the rise in neighborhood housing prices. For example, if housing prices are rising in or near the urban core, allowing more housing supply on the metropolitan fringe but not in or near the urban core reduces the effectiveness of the new housing supply to decrease price growth in the neighborhoods experiencing rapid appreciation, not to mention creating significant regional transportation system and environmental impacts from more dispersed development patterns in the process. *Where* regions allow growth in housing and jobs, and *how much* they allow it in those locations, are two key factors in reducing both housing and transportation costs simultaneously.[18]

[18] Note that transportation costs would include not only direct user costs, but also the societal costs of constructing and maintaining infrastructure networks. Such costs may fall on both public sector and private sector entities.

New housing development projects will often have practically unavoidable displacement impacts on the parcels where the construction occurs, as tenants usually cannot remain on properties during a construction project, and some construction-related impacts to nearby parcels are also unavoidable. Taking the broadest view, even if low-income tenants are directly displaced by new housing construction, so long as the overall supply of housing is being significantly increased, overall indirect displacement of low-income households around the region will be reduced by new housing development projects. However, there is a value to being able to remain either in one's existing home or neighborhood, even if the new construction allows many more people around the region to do the same in their own home or neighborhood. Given this, strategies to broadly upzone higher-income neighborhoods, as well as existing areas of lower-density housing typologies rather than older and denser apartment buildings, can minimize the direct displacement impacts or inequities from new construction projects while simultaneously minimizing indirect displacement across the entire region by fostering housing abundance.

Land Use as an Environmental Strategy

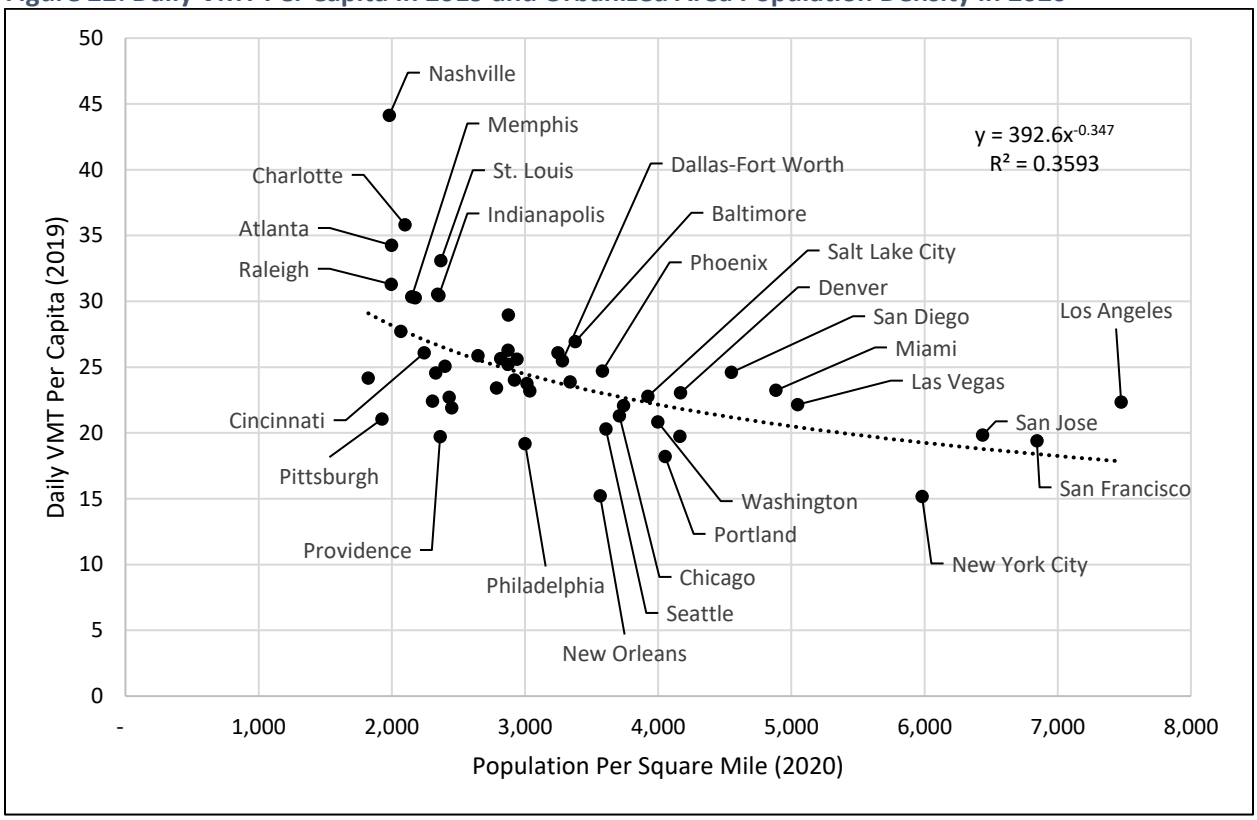
Land use policies have both direct and indirect effects on many different environmental outcomes, including emissions, water pollution, noise pollution, habitat loss and fragmentation, canopy loss, among many others. Land use policies directly and indirectly influence travel behavior, including the extent of travel owing to the distances involved, but also via impacts to modal choice stemming from a variety of interactive effects and feedback loops.

Reducing Transportation-Related Emissions

As shown earlier in Figure 3, transportation-related greenhouse gas emissions account for around one-third of total greenhouse emissions, with approximately half stemming for light-duty vehicle use. The transportation sector is also a major contributor to certain types of criteria pollutants, which are known to endanger public health and welfare.[19] Thus, land use policies that make it possible to access jobs, goods, services, and recreation with shorter travel distances can reduce transportation-related emissions by reducing vehicle miles traveled. The relationship between regional population density and vehicle miles traveled per capita is illustrated in Figure 22.

[19] The six criteria air pollutants for which limits are set in the U.S. Environmental Protection Agency's National Ambient Air Quality Standards include ozone (O_3), atmospheric particulate matter ($PM_{2.5}$/PM_{10}), lead (Pb), carbon monoxide (CO), sulfur oxides (SO_x), and nitrogen oxides (NO_x).

Figure 22: Daily VMT Per Capita in 2019 and Urbanized Area Population Density in 2020

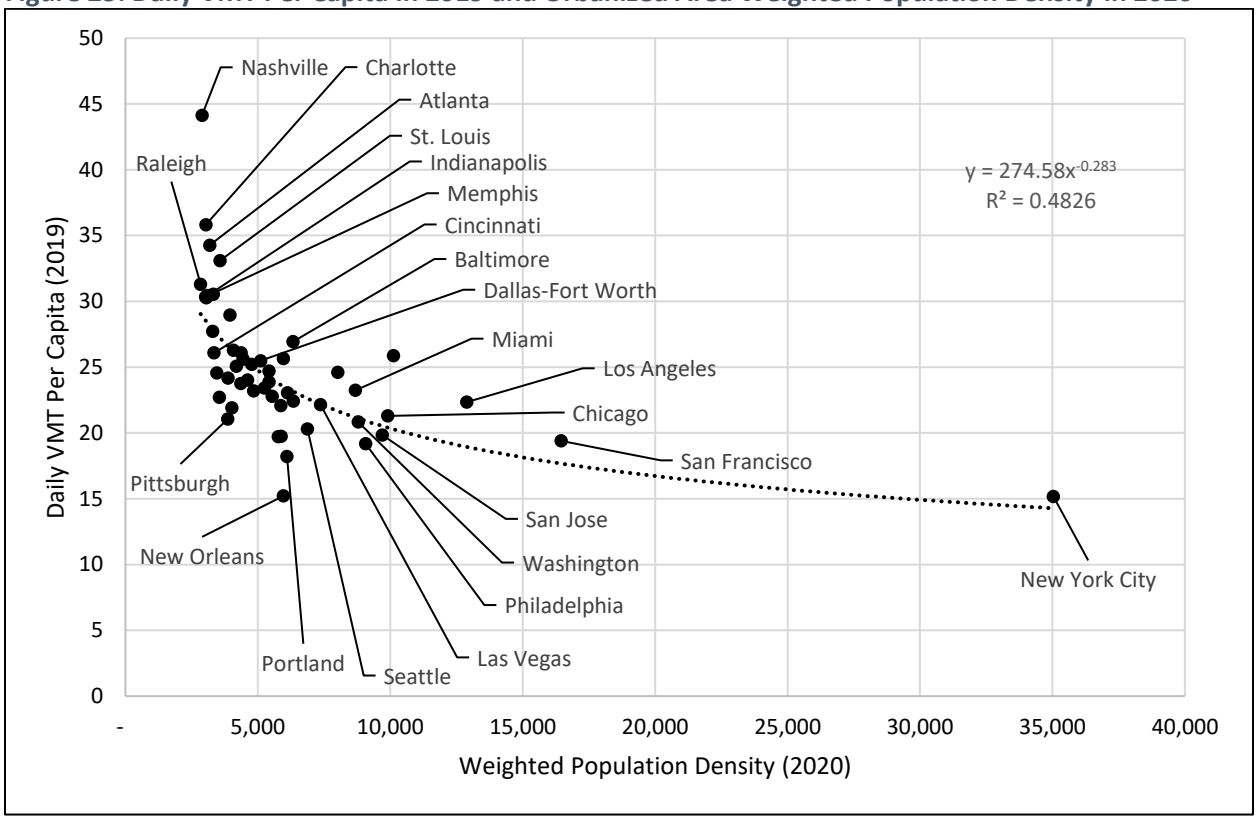


Source: U.S. Census Bureau, Federal Highway Administration Highway Statistics

As shown in Figure 22, the higher the regional average density, the lower daily vehicle miles traveled per capita. However, changes in average regional population density are associated with approximately 36 percent of the variation in vehicle miles traveled per capita, suggesting that other important factors are likely to influence travel behavior. How population density is distributed *within* an urban area is a more influential factor for travel behavior than the overall average population density, which can be demonstrated by the relationship between vehicle miles traveled per capita and census tract-weighted population density, as shown in Figure 23.[20]

[20] Weighted population density represents the "perceived" density for the median resident in an area, and accounts for density across a region being unequally distributed. The calculation uses the formula $D=\Sigma(P_i d_i)/\Sigma P_i$, where D is the population-weighted density of an area and P_i and d_i the respective population and density of each tract.

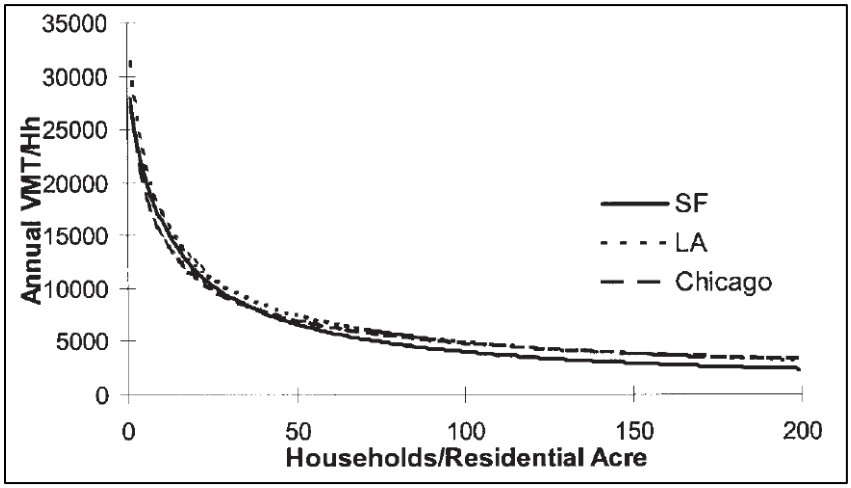
Figure 23: Daily VMT Per Capita in 2019 and Urbanized Area Weighted Population Density in 2020



Source: U.S. Census Bureau, Federal Highway Administration Highway Statistics

This relationship between lower vehicle miles traveled and increased tract-weighted density is corroborated by studies comparing travel behavior within metropolitan areas to neighborhood characteristics. For example, a 2000 study on neighborhood characteristics and automobile ownership and use in metropolitan Chicago, Los Angeles, and San Francisco, found that increasing residential density was associated with lower annual vehicle miles traveled per household, shown in Figure 24 (Holtzclaw, Clear, Dittmar, Goldstein, & Haas, 2002).

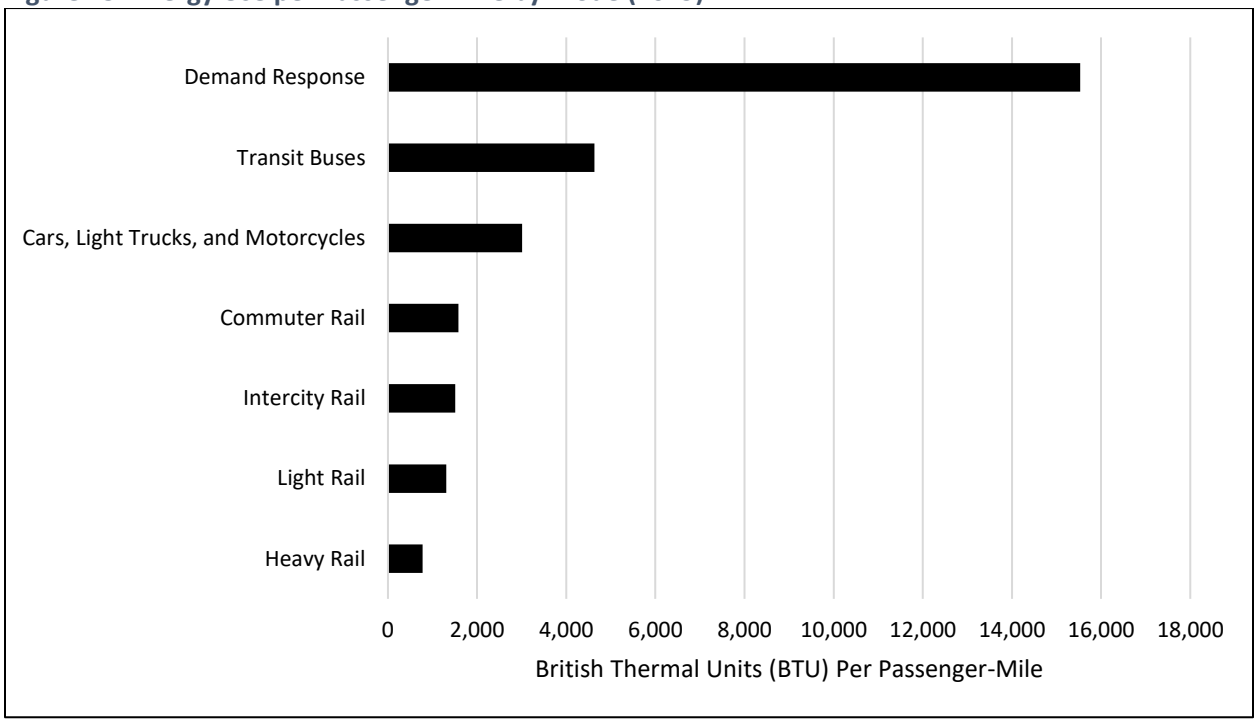
Figure 24: Driving versus Neighborhood Residential Density



Source: John Holtzlaw, Robert Clear, Hank Dittmar, David Goldstein, and Peter Haas. Location Efficiency: Neighborhood and Socioeconomic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles, and San Francisco, 2000.

Additionally, while travel extent is important to determining transportation-related emissions, so is the mode of travel. Figure 25 below shows the energy use per passenger mile of different modes of surface transportation (Davis & Boundy, 2022).

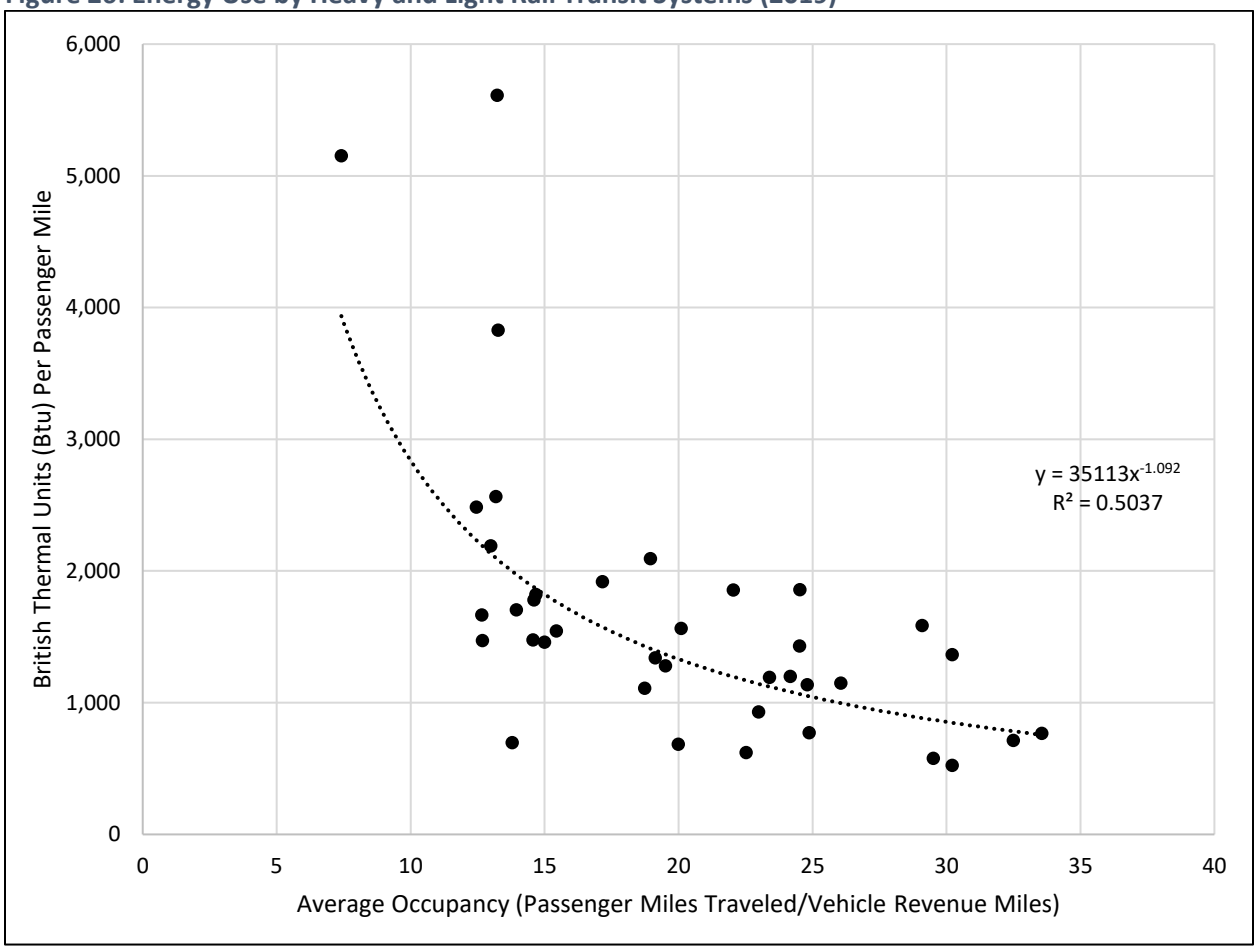
Figure 25: Energy Use per Passenger Mile by Mode (2019)



Source: Oak Ridge National Laboratory

Emissions from this energy use vary significantly based on fuel type and other factors. For example, heavy rail and light rail systems are fully electrified, while electrification is rarer in the United States for commuter rail, intercity rail, transit buses, personal highway vehicles, and demand response services. Energy use per passenger mile and any associated emissions also varies significantly within a given mode by the occupancy (U.S. Department of Transportation, 2010). Moreover, these average energy use figures are also based on current usage patterns, but shared modes like mass transportation systems can become even more energy efficient at higher levels of average occupancy, as shown in Figure 26.

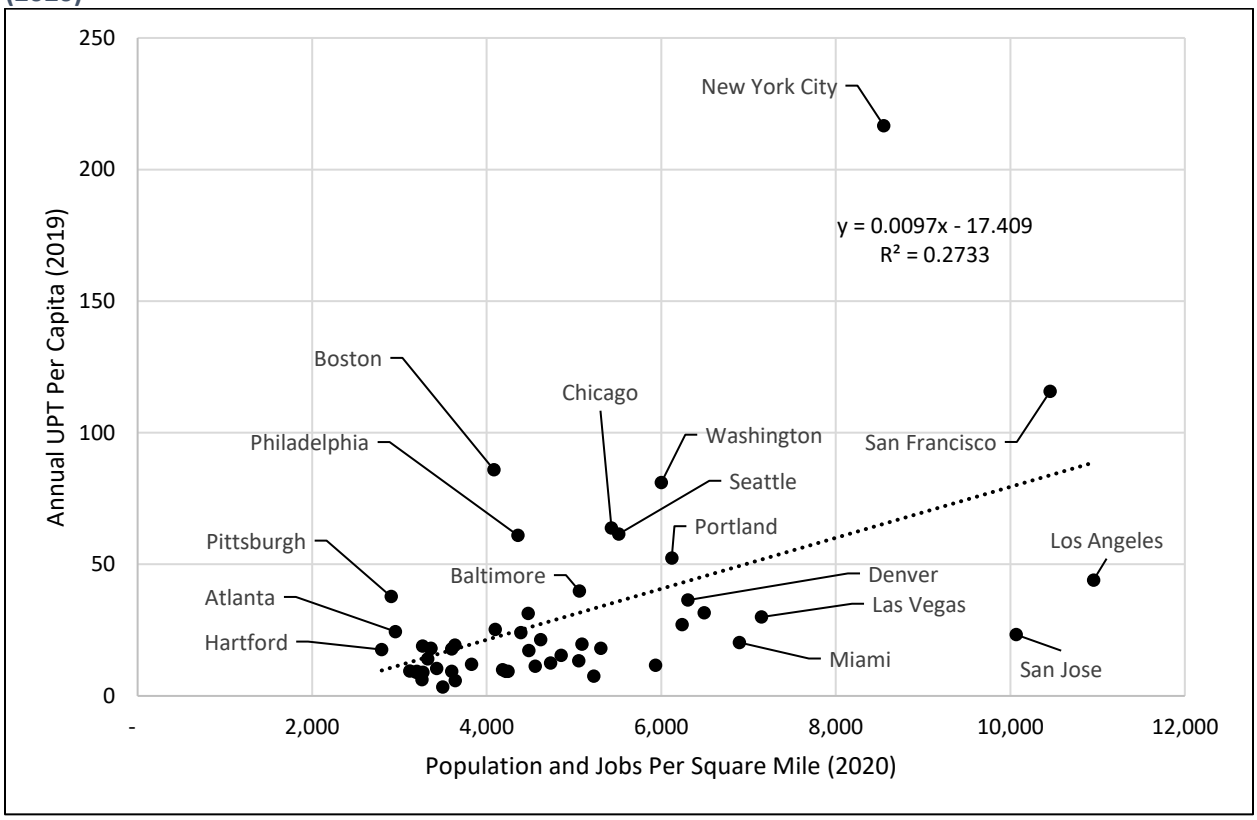
Figure 26: Energy Use by Heavy and Light Rail Transit Systems (2019)



Source: USDOT analysis of National Transit Database data

Thus, land use policies that foster more job and residential density near mass transportation facilities not only encourages emission reduction via modal shift to the systems, but also makes the systems themselves more energy-efficient and emission-efficient by increasing average occupancy, compounding the emission reduction impacts of transit. The number of unlinked passenger trips (UPT) is positively correlated with denser urban areas, as shown in Figure 27.

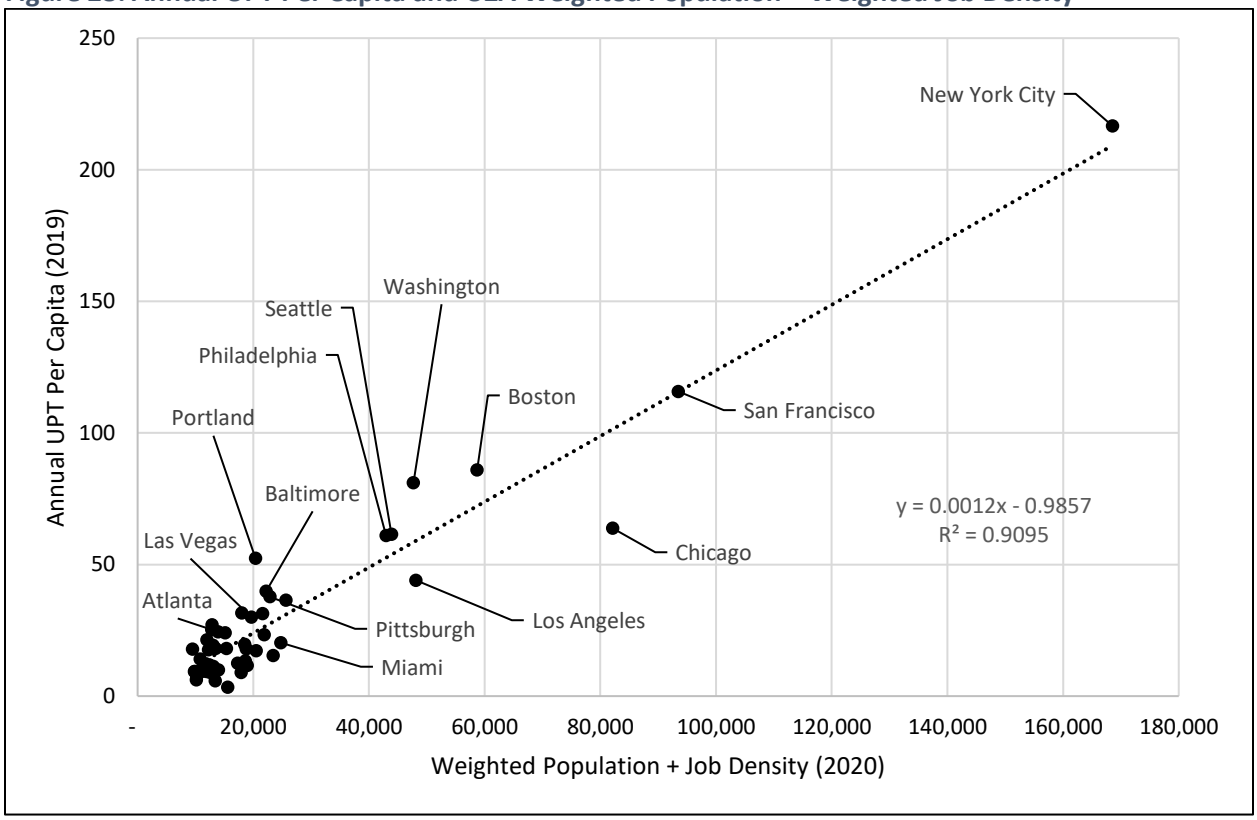
Figure 27: Annual Unlinked Passenger Trips Per Capita (2019) and UZA Population and Job Density (2020)



Source: U.S. Census Bureau, National Transit Database

As shown, the association between overall population density and propensity to use transit is relatively weak, with only approximately 27 percent of the variation in transit use per capita being associated with changes in average population density. Average density as a metric does not illustrate how that density is distributed within a region, and thus weighted-density of jobs and population are able to better represent the effective densities at which most people live and work within a region. Figure 28 shows the correlation between unlinked passenger trips per capita and the combined weighted density of population and jobs across major urbanized area in the United States.

Figure 28: Annual UPT Per Capita and UZA Weighted Population + Weighted Job Density



Source: U.S. Census Bureau, National Transit Database

Thus, land use policies that affect how density is distributed *within* an urban area are more likely to influence transit ridership than focusing on average density across the entire region. Allowing for significant clusters of job and residential density, especially near transit rail facilities, is a promising lever for fostering modal shift to transit and reducing transportation-related emissions per capita.

Reducing Suburban Sprawl and Loss of Open Space

Whether land use regulations reduce or increase suburban sprawl depends on the type of regulation. Regulations that seek to ensure marginal increases in real estate development internalize their public service and infrastructure costs, also known as impact fees, reduce suburban sprawl and lead to more compact development patterns (Geshkov & DeSalvo, 2012). Conversely, restrictions on height and density increase suburban sprawl as more land must be consumed to accommodate the same level of jobs and population, leading to higher housing and transportation costs (Mills, 2005; Pendall, 1999). Even in cities that have not adopted formal use controls, such as Houston, other types of regulations such as parking minimums, street width minimums, and setbacks lead to more dispersed development patterns (Lewyn, 2004).

When land use regulations require more dispersed development patterns, they necessarily increase the distances between origins and destinations, leading to a higher proportion of trips requiring an automobile. To accommodate this travel, a greater overall surface area must be devoted to impermeable uses, such as transportation infrastructure and parking, leading to net increases in stormwater runoff and commensurate losses of open space.

The Levers of Land Use

Land use in the United States is shaped by many different factors, but it is principally shaped by a mixture of market forces, land use regulations, and indirect influences from public investment choices. While infrastructure investment choices, perhaps more than any other investment choice, can directly shape land use patterns, infrastructure investment choices themselves are often shaped directly or indirectly by land use patterns. In this context, the land use regulatory framework must be seen as a *necessary*, but not always *sufficient*, condition for altering or maintaining land use and development patterns. For example, altering the land use regulatory framework in ways that allow origins and destinations to locate closer to one another does not guarantee that outcome, as development locations and intensity are determined by market forces and other factors. Importantly, however, a land use regulatory framework that makes it difficult or impossible for origins and destinations to locate closer together *will* all but guarantee that the outcome does not occur.

As summarized by Been et al, affecting land use outcomes via land use policies is quite complicated in practice, with the authors cautioning that predicting how much new construction actually will result from any land use change is challenging because it will be less than the capacity created if the parcels rezoned already have some development, will depend on demand, financing, labor, and supply constraints, and the ability and willingness of the regulators to comprehensively change all the different regulations and processes that may be serving to inhibit new construction (Been, Ellen, & O'Regan, Supply Skepticism Revisited, 2023). However, evidence suggests that such reforms can play a key role in addressing challenges, particularly fostering additional housing supply to improve affordability (Buchler & Lutz, 2024).

Thus, limitations notwithstanding, zoning codes and other land use regulations represent some of the most direct public policy levers available to state and local governments with which to influence land use outcomes and development patterns.[21] Common aspects of zoning codes and related land use regulatory processes, further discussed below, include (but are not limited to):

- Floor Area Ratio Restrictions
- Height Restrictions
- Setback Requirements
- Minimum Lot Size Requirements
- Density Restrictions and Lot Coverage Controls
- Minimum Parking Requirements
- Use Controls
- Building and Fire Codes
- Minimum Street Widths
- Other Implicit Restrictions

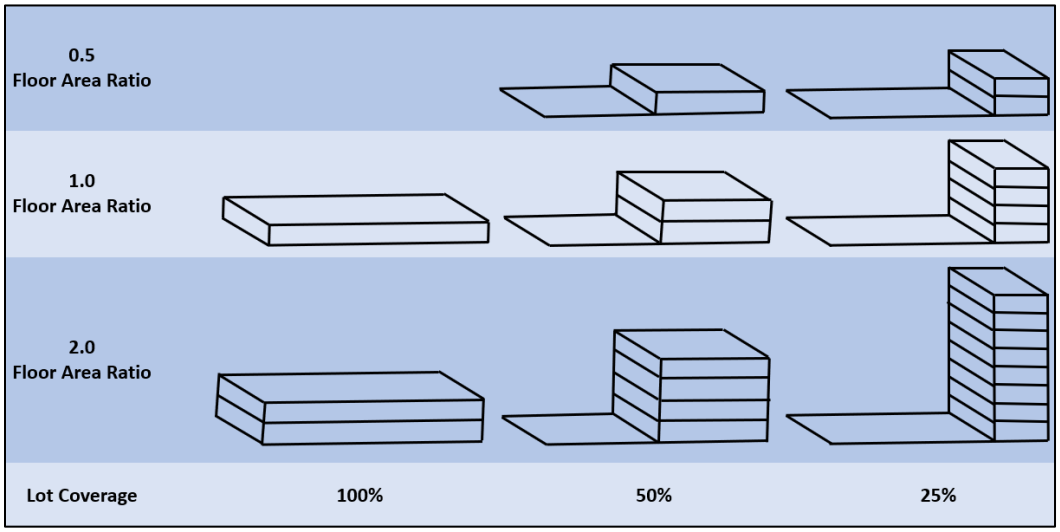
Given the heterogeneity in zoning codes and other land use regulations, a product of the high numbers of local units of government across the country, this list is not meant to be an exhaustive list of land use regulations and policies that explicitly or implicitly affect land use patterns and related outcomes. However, it represents commonly used mechanisms by which development patterns are incentivized and controlled, both directly and indirectly. Lastly, this section discusses how the extent of the listed regulations above, as well as characteristics of the approval process that often fall outside the zoning code, also impact development.

[21] Transportation infrastructure provisioning decisions are perhaps a close second, but that discussion and analysis is beyond the scope of this white paper.

Floor Area Ratio Restrictions

Floor area ratio is the gross floor area permitted on a site divided by the total net area of the site, usually expressed as a decimal to one or two places. For example, on a site with 100,000 net square feet of land area, a floor area ratio of 1.0 will allow a maximum of 100,000 gross square feet of building floor area to be built. On the same site, a floor area ratio of 1.5 would allow 150,000 gross square feet of building floor area to be built, and a floor area ratio of 0.5 would allow only 50,000 gross square feet of building floor area to be built. Restrictions to floor area ratio in land use regulations are usually applied on a parcel-by-parcel basis as opposed to an average floor area ratio for an entire land use or zoning district. Figure 29 illustrates hypothetical developments under different floor area ratios.

Figure 29: Examples of Development Under Various Floor Area Ratios

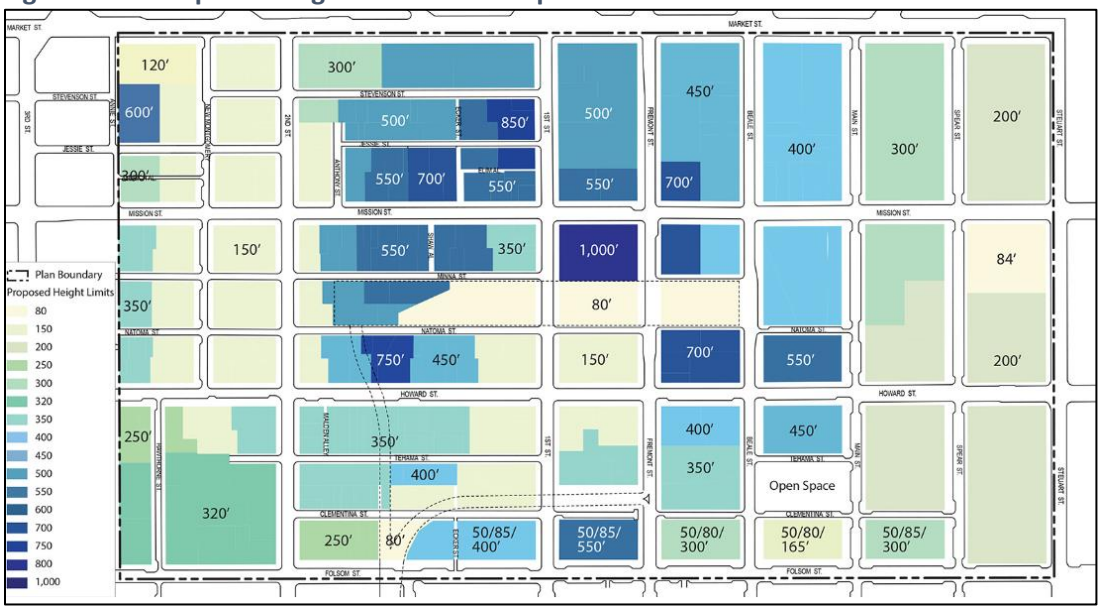


Floor area ratio restrictions limit the scope of potential leasable floorspace that may be constructed on a parcel, which, depending on local market conditions and the level of the maximum allowable floor-area ratio, can impact the financial viability of infill development.

Height Restrictions

Height restrictions usually set the maximum height above street level allowed for a building on an individual parcel or within a land use or zoning classification. Sometimes height limits are set in terms of floors (i.e., stories) in a building, with other regulations that may or may not define the required height of a single floor in a structure. An example of a height restriction map is illustrated in Figure 30.

Figure 30: Example of Height Restriction Map



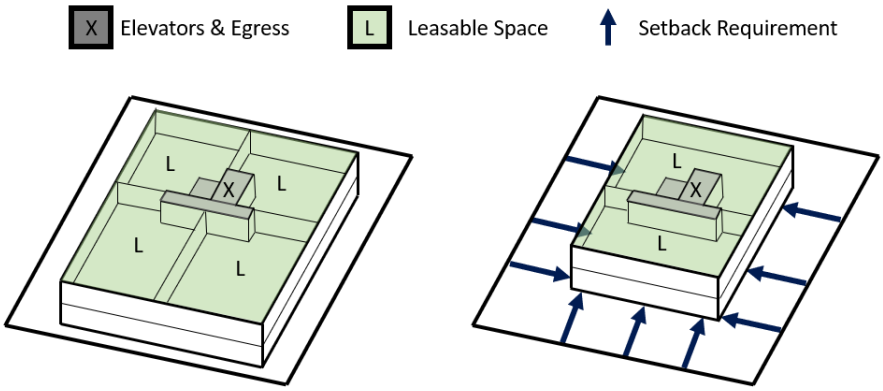
Source: San Francisco General Plan, Transit Center District Sub-Area Plan, Adopted 2012

Restrictions on building heights limit the scope of potential leasable floorspace that may be constructed on higher floors above an individual parcel which like other regulations can impact the financial viability of infill development. A 2022 study on the impact of height regulations on break-even rents of new housing supply found that height regulation often has large negative effects on housing affordability, with increasing magnitudes for more expensive land markets (Eriksen & Orlando, 2022).

Setback Requirements

A setback is the minimum distance required by zoning to be maintained between two structures or between a structure and a property line. Setback regulations generally require that buildings be set back a certain distance from the front, side, and rear lot line. The frontage or front of a lot is usually defined as the side nearest the street, though on corner lots the narrowest side is often determined to be the front lot line. Figure 31 illustrates an example of setback requirements.

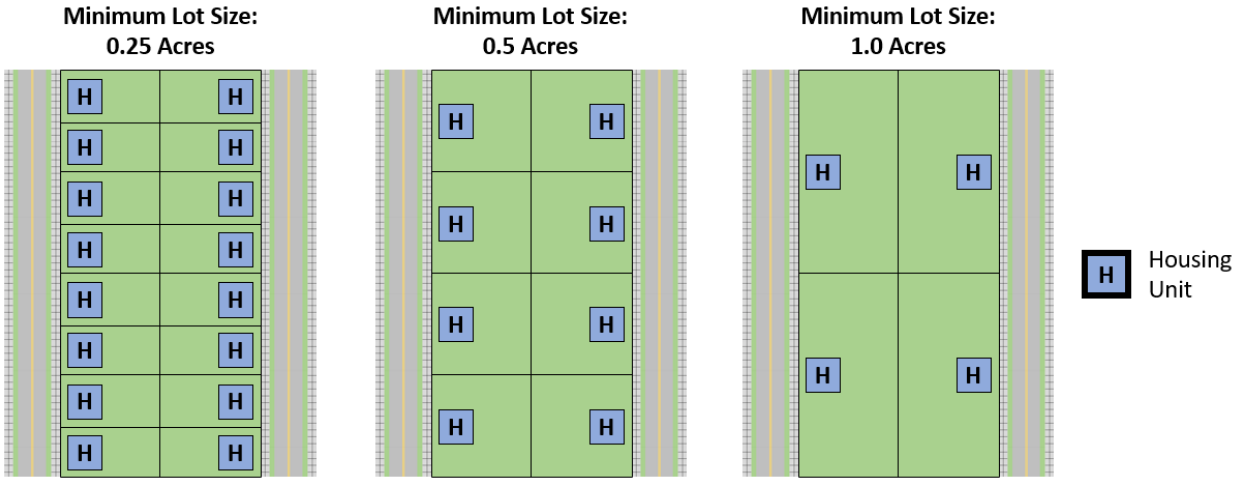
Figure 31: Example of Setback Requirements



Minimum Lot Size Requirements

Minimum lot size requirements generally mandate the minimum lot size on which a housing unit or sometimes other structures can be constructed. These requirements also generally limit lot-splits, or the subdivision of a parcel into smaller parcels that can be sold separately, if the new parcels would fall below the minimum lot size requirement. Figure 32 illustrates housing density at different minimum lot size requirements.

Figure 32: Examples of Minimum Lot Size Requirements



Minimum lot size requirements can force developers to build homes on larger lots than the market would otherwise provide (Furth & Gray, 2019; Gyourko, Hartley, & Krimmel, 2021). Owing to this effect, research finds that doubling minimum lot sizes increase sales prices by 10 percent and rents by 6 percent, while intensifying residential segregation (Song, 2024).

Density Restrictions and Lot Coverage Controls

There are other types of restrictions on density that may be applied in addition to, or in lieu of, restrictions on building heights, setbacks, and related requirements that explicitly lay out the buildable envelope for a development. Some examples of density restrictions that are not directly related to building dimensions include maximum dwelling units per acre, bedrooms per housing unit, restrictions on certain businesses locating near other businesses of the same type, occupancy restrictions, and use restrictions by gross floor area.

Another type of implicit restriction on density includes lot coverage controls, which generally set a maximum percentage of a land parcel that can be covered by a structure. While not identical to minimum lot size requirements, maximum lot coverage restrictions can implicitly operate in a similar manner as residential and commercial structures must be of a certain minimum size for economic viability.

Land use regulations can even include items that at first glance may appear unrelated to density, such as tree preservation ordinances, tree planting requirements, or open space requirements which can implicitly act in a similar manner to maximum lot coverage regulations by limiting the possible footprint of structures on a parcel of land.

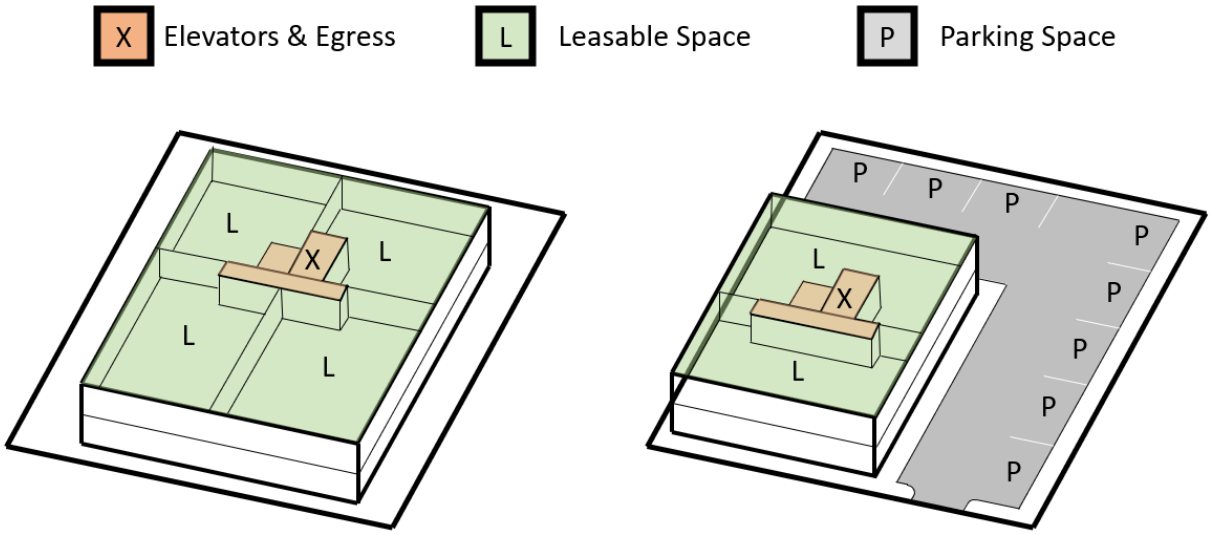
Minimum Parking Requirements

Minimum parking requirements determine how many parking spaces must be provided for residents, employees, patrons, or visitors to a development. These are often, though not always, specified in the form of parking ratios. A commercial development may be required to provide a certain number of parking spaces per 1,000 square feet of development. For example, a parking ratio of 2.0 per 1,000 square feet would mean that a commercial building that is 100,000 square feet would need to provide, at a minimum, 200 parking spaces. These ratios can also be relative to other metrics, such as the number of hotel rooms, the number of dwelling units, the number of bedrooms, the number of bowling lanes, and many others depending on the land use type.

Parking requirements impose space requirements that come at an opportunity cost of using a given parcel for other uses as well as cost requirements to provision the parking and circulation infrastructure itself, increasing the cost of housing. For example, research found that in the Los Angeles region, minimum parking requirements reduced the number of units in a typical apartment building by 13 percent (Shoup, 2014). A 2018 report by the Government Accountability Office estimated that parking structures were associated with increased per-unit costs of $56,000 for low-income rental housing, or 27 percent of the median per-unit cost (United States Government Accountability Office, 2018). Illustrating the binding constraint and economic costs these regulations can impose, another study on reducing parking requirements in Seattle found that developers built 40 percent less parking that would have been required before the reforms, resulting in 18,000 fewer spaces and savings an estimated $537 million in construction costs, ultimately leading to lower-priced housing (Gabbe, Pierce, & Clowers, 2020).

An example of the opportunity cost of parking space and circulation is illustrated in Figure 33, which assumes requirements of 1.5 spaces per unit, plus two visitor spaces, leading an apartment building with four units per floor to downsize to two units per floor to comply with the requirements.

Figure 33: Example of the Opportunity Cost of Space for Parking and Related Circulation



Minimum parking requirements thus either reduce aggregate density or substantially increase the costs of achieving the same level of density by necessitating underground or structured parking podiums and

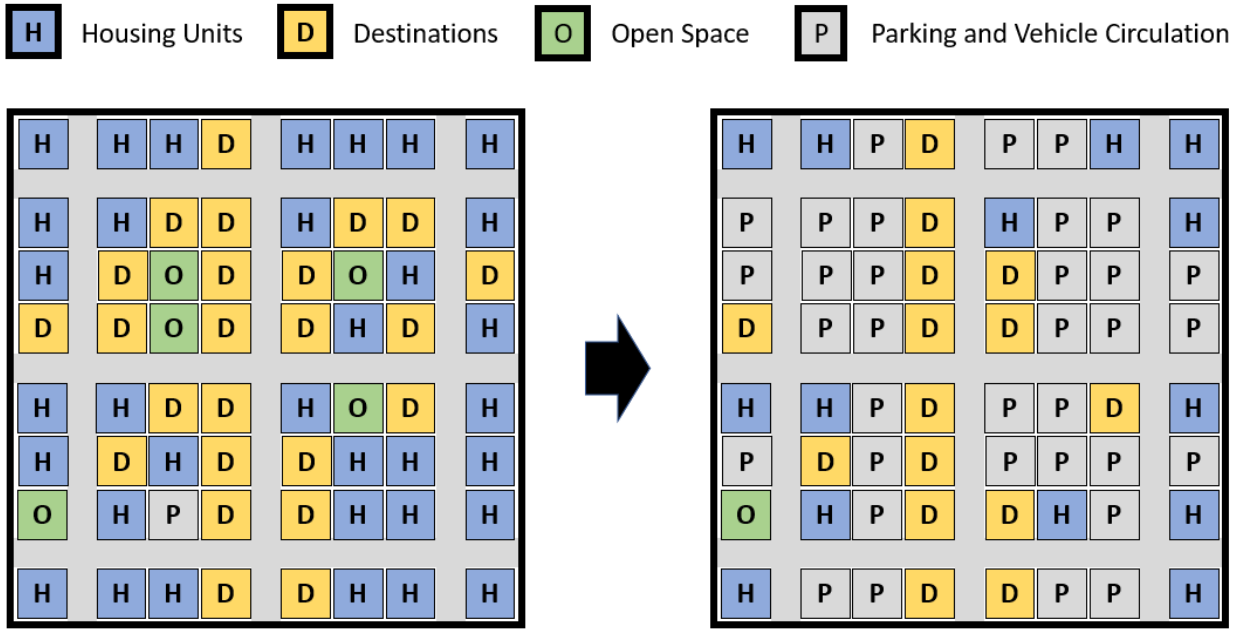
higher building construction heights. Figure 34 shows examples of parking podiums and structured parking, which can have square footage that is comparable with the size of the building that they serve.

Figure 34: Podium and Structured Parking Examples

Source: Google Earth Pro

To the extent parking requirements also push origins and destinations further apart, they necessitate additional travel distances and transportation infrastructure to serve the same amount of housing and number of destinations, as illustrated in Figure 35.

Figure 35: The Effect of Minimum Parking Requirements on Destination Proximity to Housing



Minimum parking requirements also affect the spatial distribution of growth within metropolitan areas. On average, approximately 20 percent of land within city centers is devoted to parking in the hundred most populous urban areas (Rowlands & Loh, 2023). This ranges from 0.4 percent in New York City, NY to 49.0 percent in San Bernardino, CA (Parking Reform Network, 2024). A study on the removal of minimum parking requirements in Buffalo, NY concluded that the reform allowed increased density of mixed-use development in areas where alternatives to driving already exists because access to non-automobile

transportation reduces the risk of underproviding parking spaces, demonstrating how such requirements can lead to additional sprawl by disincentivizing infill development (Hess & Rehler, 2021).

Even in cases where parking is provided, unbundling the cost of parking from the rent or sale of housing units or other types of real estate uses can reduce cost burdens for car-free households. This method also allows individuals and households to decide for themselves whether owning or renting one or more parking spaces are worthwhile.

Use Controls

One of the hallmarks of land use regulations both in the United States and abroad is a restriction on certain uses of property for certain land parcels. Oftentimes, these codes requires that certain land parcels are set aside for residential, commercial, or industrial uses, though modern codes generally regulate even further by types of housing, particular business activities, and types of industries allowed in various sub-classifications.[22] Even under form-based zoning codes, which regulate building characteristics such as height and setbacks, use controls still usually exist but often in a more flexible form that allows more than one land use on a given parcel, subject to other regulations.

Reforming use controls to allow the co-location of commercial and residential activities on the same parcel can help put residents closer to goods, services, jobs, education, recreation, and other amenities. Similarly, at the neighborhood scale, allowing compatible uses to intermingle within a single neighborhood can lower required travel distances by providing additional local options. For example, in a study on 31 metropolitan regions across the United States, researchers found that larger, denser, and more walkable mixed-use developments had a larger share of trips internally, compared with conventional suburban developments, and those with access to transit, employment, and destinations showed higher levels of walking, cycling, and transit shares for external trips, reducing the traffic impacts on the external roadway network (Tian, Park, Ewing, Watten, & Walters, 2020). Figure 36 includes examples of small residential structures containing ground floor retail or office space.

Figure 36: Neighborhood Retail Examples

Source: Wikimedia Commons

[22] Single-use zoning is often referred to as *Euclidean zoning*, named after the court case of *Village of Euclid, Ohio v. Ambler Realty Co.* (1926) which found zoning to be a valid exercise of a State's police power under the Federal Constitution.

Relaxing use controls within neighborhoods can also allow for providers of goods and services to locate on smaller, slower side streets, rather than just on major arterials. This can improve the generalized cost of walking trips, given that pedestrians show a preference for travel on streets with lower car volumes and travel speeds (Broach & Dill, 2015). In addition to increased comfort, this can provide additional safety benefits for pedestrians as travel along and across major arterials, a location where commercial uses are commonly allowed, can be reduced.

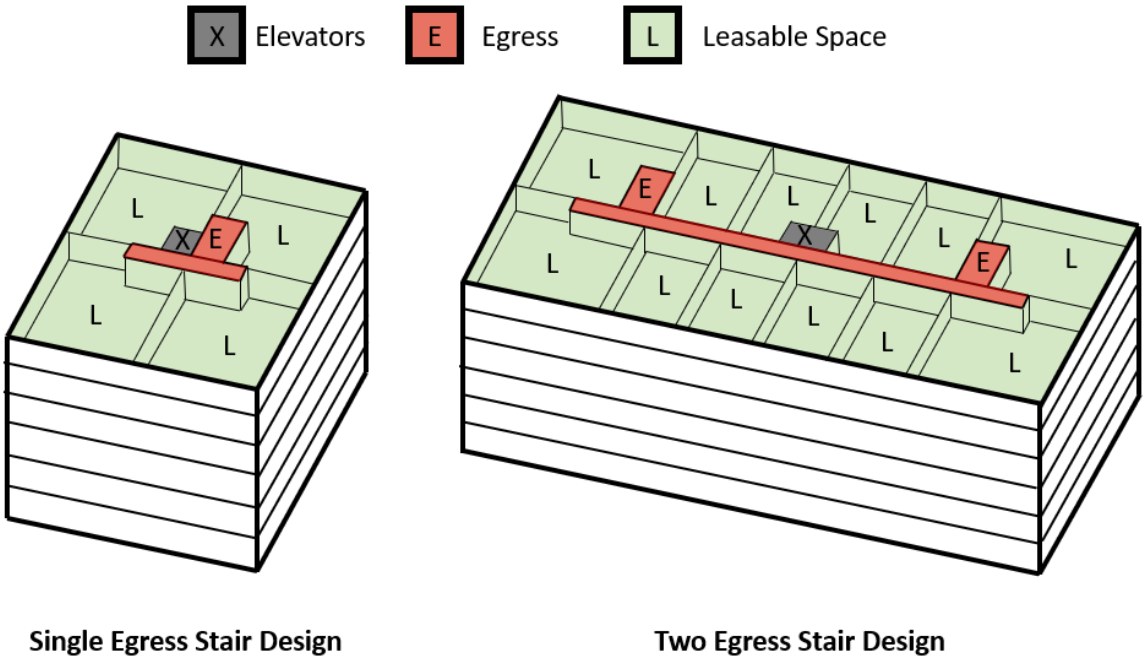
Building and Fire Codes

Building codes are the set of rules that specify the standards for construction, with the main purpose of protecting the public health, safety, and general welfare as they relate to the construction and occupancy of buildings. Fire codes are a specific subset of these building codes, and represent rules to both reduce the risk of a structure fire occurring, and reduce the damages, injuries, or fatalities that occur in the event of a fire, such as ensuring safe building egress routes.

Building codes, like all safety regulations, reflect the inherent tradeoffs between added costs and safety. Additionally, there can be higher order tradeoffs as well, such as improved safety aspects in one direct respect but reduced safety via indirect, and sometimes unintended, effects. Policymakers must thus carefully weigh both the costs and benefits of particular items in building codes, inclusive of indirect effects.

One building and fire code element that has gained attention in recent years are known as single-staircase (or single-egress) buildings. In most jurisdictions in the United States, buildings higher than three or four floors are required to have at least two staircases for redundancy of egress, usually connected via an internal hallway, as shown in Figure 37.

Figure 37: Single Egress Stair Structure Versus Two Egress Stair Structure



These requirements may result in infill development on smaller lots being rendered either financially or physically infeasible, making a significant share of parcels unsuitable for additional density without substantial lot assembly. Single-staircase structures are common in many other countries, including in countries such as France, Germany, and Austria, all of which have lower rates of fire deaths than the United States (Federal Emergency Management Agency, 2011). A 2024 report by the provincial government of British Columbia, Canada summarized findings from international practice, finding that countries allowing single-egress structures often used other methods to achieve fire safety, such as requirements that buildings be sprinkled, increased fire compartmentalization, or increased exit stair width (Heikkila, 2024). Additionally, such buildings are allowed in New York City and Seattle, but both New York State and Washington State have lower rates of fire deaths per capita than the national average (Ahrens, 2021).

Such structures have the potential to deliver more housing supply on small lots, provide for additional family-sized units given the more open floorplates, and provide additional windows and cross ventilation for more apartment units given the lack of a need for a long internal corridor. In recent years, several state and local governments have either passed or are considering legislation to allow single-staircase buildings (Center for Building in North America, Inc., 2024).

When housing typologies offered by single-staircase buildings or other lower cost construction techniques are made more expensive or even impossible to construct, housing supply is further constrained given fewer units are built in the places they are demanded. Given the association between supply constraints and the rate of homelessness in a community, and the higher likelihood of mortality for persons experiencing homelessness, it is conceivable that such restrictions could reduce risks associated with fires but increase risks associated with higher homelessness rates (Logani, Meyer, & Wyse, 2023). Additionally, even if the units are constructed, but at locations further away from destinations than single-staircase buildings would have allowed for, individuals occupying those units may be at a higher risk of transportation-related injuries and fatalities given increased travel distances.

None of this is to definitively imply that such tradeoffs are not worth the costs of reducing additional fire-related damages, injuries, or fatalities, simply that higher order tradeoffs must be appropriately analyzed and weighed to ensure that the reduction in one type of harm is not offset, or more than offset, by a different type of harm.

Minimum Street Widths

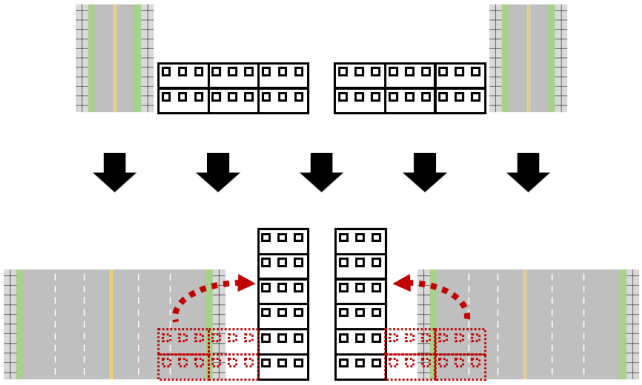
The local land use and transportation planning process generally prescribes the roadway capacity that new developments and neighborhoods are required to provide to gain approvals, partially determining the size of neighborhood roadways facilities.[23] Secondly, locally and statewide adopted roadway design standards for lane width and other aspects further delineate the physical size of provided transportation facilities, often with consideration for crash risk, truck movements, and emergency service movements.

However, land set aside for transportation circulation comes at an opportunity cost of using the land for other uses (Guerra, Duranton, & Ma, 2024). As shown in Figure 38, as more land use set aside for transportation capacity, higher building heights are required to achieve the same effective neighborhood

[23] This can also include requirements for land to be set aside for future roadway capacity expansion.

density, but adding additional floors to structures raises per square foot costs of construction, leading to an implicit restriction on density.

Figure 38: Tradeoff Between Land Set Aside for Transportation Capacity and Building Height Required to Maintain Similar Density



Larger street widths can thus both explicitly and implicitly push origins and destinations further apart, making active transportation modes such as walking, cycling, or accessing transit by foot or bike more difficult. Additionally, to the extent streets with wider or more lanes encourage faster travel speeds, they can increase crash risks between roadway vehicles, as well as between roadway vehicles and cyclists or pedestrians (Fitzpatrick, Carlson, Brewer, & Wooldridge, 2001; Hamidi & Ewing, 2023). Faster speeds and higher volumes accommodated by larger roadway facilities and wider lanes also can increase the noise exposure to cyclists and pedestrians, further increasing the generalized cost of using those modes.

Lastly, just as in the example of building and fire codes, roadway capacity and lane width policy decisions that are based on emergency service response times must weigh secondary effects. For example, additional road capacity or higher speeds may improve emergency service response times, yet also could increase vehicles miles traveled and crash risk in a way that ultimately generate more situations requiring emergency response.

Other Implicit Restrictions

There are many other restrictions beyond those that explicitly or implicitly have to do with the physical layout or density of a structure, and this list is far from exhaustive. Other mechanisms that can implicitly act as restrictions include long approval and permitting processes, other fees and exactions, environmental review, design standards, and occupancy rules among many others (Bronin, 2023). Requirements or processes that impose additional costs, uncertainty, or add development time indeed can raise housing costs and, where they stymie infill development, increase sprawl and the associated transportation and environmental costs. This is not meant to suggest that such reviews, requirements, or exactions are necessarily unwarranted or unjustified in all, or even in many, cases. However, they impose costs that policymakers should account for when weighing tradeoffs.

Extent

When considering all the different mechanisms by which land use outcomes are controlled, it is important to consider the *extent* to which restrictions are placed or relaxed as a perhaps underappreciated lever.

For example, a regulatory framework that technically allows for dense and mixed-use buildings is unlikely to achieve significant reductions in regional housing and transportation cost burdens if that permission is only applied to a very small portion of metropolitan land. A reduction in parking minimums that effectively only applies to few parcels will produce far more modest results than one that applies to a significant portion of land across a city or region. The *magnitude* of allowances, and the *proportion* of metropolitan land they apply to, are paramount considerations if changes to land use policies are to be effective at bringing about desired changes to land use over the medium and long term.

Approval and Planning Processes

The local planning and development processes can also be altered to ensure that regional needs, such as adequate housing supply, as well as the interests of traditionally underrepresented groups, such as renters or persons with lower incomes, are protected. At the state level, additional oversight mechanisms can be created to ensure regional land use plans created by regional governments or MPOs are implemented via the local comprehensive planning process. Local land use plans can be required to be *not inconsistent* with adopted regional plans, for example. Efforts to ensure that overall planning leads to more than sufficient zoned capacity can lead to increased competition in land markets, which can reduce costs for delivering housing and other types of development.

Even in cases where there is regional support across a metropolitan area for sufficient housing supply, attainable and affordable housing, and parity in access to public services, many of the burdens of new housing development (and real estate development generally) are highly localized. Thus, some level of resistance to housing at the neighborhood level when an actual development project is proposed is all but guaranteed. Given this common dynamic, states and local governments can consider adjustments to the local planning and development process that put more weight on adopted city-wide or regional comprehensive plans, while applying considerably less discretion on *project-by-project* approvals, if projects are consistent with adopted city-wide or regional plans. This strategy could be described as a "set it and forget it" approach to planning, where, once regional or citywide consensus is reached on a comprehensive plan, local development plans consistent with the regional vision cannot be arbitrarily rejected without another citywide or regional consensus-driven process. States, regions, or localities can also enact policies to require more development capacity is preserved as "by-right," leading to fewer delays and less ambiguity in the overall development process.

Additionally, the comprehensive planning process, whether done at the city or the regional level, may face challenges representing the population as a whole. The benefits of abundant regional housing supply accrue most heavily to renters and first-time homebuyers, yet these groups, and renters in particular, often have incomes that are lower that the regional average. Those with lower incomes may have more difficulty attending public meetings, either due to transportation constraints or job requirements, and can be underrepresented in more traditional public meeting processes. Researchers at Boston University found, for example, that individuals who are older, longtime residents, and homeowners, groups far more likely to oppose new housing construction than the general public, were significantly more likely to participate in the public meeting process surrounding land use decisions (Einstein, Palmer, & Glick, 2018). Additionally, those who may most benefit from new housing, future residents, may not yet even live in the city or region to participate in any sort of public process surrounding housing and land use policy.

Given these limitations of the standard public involvement process, states, regions, and cities can take actions to reach as many communities as possible when crafting local and regional comprehensive plans,

including targeted outreach to underrepresented communities and local and regional advocacy groups that represent populations who may be less likely to be able to attend in-person meetings. Outreach can also include modes of public engagement that are more easily accessible than in-person testimony. Care can also be taken to document what populations are participating in the processes that is occurring, to better-understand how representative of the population as a whole received public feedback and testimony actually is.

Processes at the nexus of development and transportation system performance can also be adjusted to ensure that they do not unintentionally hinder more location-efficient development patterns that reduce household transportation costs. For example, some state and local governments have moved away from performance metrics such as level-of-service for automobiles, and towards alternative metrics that better assess the transportation impacts of different land use and development alternatives.[24]

State and Local Examples

Many state and local governments are taking actions to begin to address chronic housing supply shortages, with some tailoring these actions in ways the accommodate growth in a mixed-use, walkable format near transit stations. This review is not meant to be exhaustive, as countless changes to land use policy, both large and small, occur nearly each day through the planning processes at every level of government. The review does, however, attempt to highlight reforms where significant changes to land use outcomes have been realized or where the wide-ranging nature of the reform suggests that significant changes to land use outcomes could be realized over time. Many of the major reforms, especially those at the state level, have been relatively recent, and thus research on their effectiveness is not yet complete. Additionally, many of these enacted policies share similar goals, but address the problem in different or unique ways. Thus, the intent of this section is to provide a kind of repository of examples that policymakers can learn from and build upon.

State Examples

Arizona

HB 2721 (2024): This law requires that by January 1st, 2026, municipalities with a population of 75,000 or more must authorize and incorporate "middle housing" (i.e., duplexes, triplexes, fourplexes, and townhomes) as a permitted use on all lots zoned for single-family residential use within one mile of the municipality's central business district, as well as being permitted on at least 20 percent of any new development of more than ten contiguous acres.

The law also prevents municipal governments from restricting housing types to less than two floors, restricting floor area ratios to less than 50 percent, setting restrictions for middle housing that are more restrictive than single-family dwellings in the same zone, requiring owner occupancy of any structures on the lot, requiring middle housing to comply with commercial building codes or to contain fire sprinklers, or requiring more than one off-street parking space per unit.

To incentivize expeditious compliance, the law also stipulates that in cases where a municipal government fails to implement the regulations by the target date, middle housing shall be allowed on all lots in the municipality zoned for single-family residential without any limitations.

[24] Level of Service Case Studies

Legislative Text

California

Regional Housing Needs Assessment Process (1969)/SB 375 (2008): Since 1969, the State of California has required local governments to adequately plan to meet regional housing needs. Under this process, the California Department of Finance, in consultation with the California Department of Housing and Community Development, projects housing needs for regional governments across the state. Regional governments then allocate the housing needs to local governments who must adopt housing elements in their general plans that show how the jurisdiction will meet local housing needs.

Researchers at UCLA have noted that process has historically faced challenges both correctly allocating housing targets to the local jurisdictions where more housing is most needed, such as those with the highest housing prices, as well as a lack of strong enforcement mechanisms that ensure local governments actually allow more housing de facto, rather than simply identifying locations where it could occur (Monkkonen, Manville, & Friedman, 2019). To rectify the latter issue, in recent years the State of California has begun using litigation and increasing fines to ensure compliance with the housing element law (California Office of the Governor, 2023; State of California Department of Justice, 2024).

In 2008, SB 375 created the Sustainable Communities Strategy, which further altered the planning process across California to achieve greenhouse gas reduction targets. The process focuses on incentivizing regional and local planning and building in ways that bring people and destinations closer together, with low-carbon, alternative and convenient ways to get around. The law requires metropolitan planning organizations to develop long-range plans, which align transportation, housing, and land use decisions toward achieving greenhouse gas emission reduction targets set by the California Air Resources Board. The law altered the Regional Housing Needs Assessment process so that housing allocations are allocated using a methodology consistent with the objectives of the Sustainable Communities Strategy.

SB 375 Legislative Text

AB 2923 (2018): This law requires cities and counties to rezone Bay Area Rapid Transit (BART)-owned parcels within 0.5-miles of the transit agency's stations in Alameda, Contra Costa, and San Francisco Counties to either baseline zoning standards set forth in the law or more intensive standards set by BART. Baseline zoning standards in the law lay out three levels of zoning, including (1) regional centers, (2) urban neighborhood/city center, and (3) neighborhood/town center. For all levels, minimum allowable residential densities were specified at 75 dwelling units per acre or higher, minimum parking requirements were prohibited, unbundled parking was allowed, and minimum bike parking requirements were set at one space per residential unit.

For station areas designated as regional centers, allowable heights were specified at 12 stories or higher, FAR was specified at 7.2 or higher, maximum residential vehicle parking was specified at 0.375 spaces per unit or lower, and maximum office vehicle parking was specified at zero per 1,000 square feet. For station areas designated as urban/neighborhood centers, allowable heights were specified at seven stories or higher, FAR was specified at 4.2 or higher, maximum residential vehicle parking was specified at 0.5 spaces per unit or lower, and maximum office vehicle parking was specified at 1.6 per 1,000 square feet. For station areas designated as neighborhood/town centers, allowable heights were specified at five stories or higher, FAR was specified at 3.0 or higher, maximum residential vehicle parking was specified at 1.0 spaces per unit or lower, and maximum office vehicle parking was specified at 2.5 per 1,000 square feet.

BART took no action to rezone parcels impacted by the law to more intensive standards than that laid out in the baseline standards by the July 1st, 2020 deadline. Cities and counties had until July 1st, 2022 to rezone non-conforming parcels to align with the adopted standards. Lastly, the law includes streamlining provisions for development projects on the relevant parcels for projects with certain characteristics.

The law has a sunset date of January 1st, 2029.

Legislative Text

SB 9 (2021)/SB 450 (2024): The first law, S.B. 9, requires that proposed housing developments containing up to two residential units within a single-family residential zone would be considered ministerially, without a discretionary review or hearing, if the proposed housing development meets certain conditions.[25] Second, the law requires local agencies to ministerially approve a parcel map for an urban lot split that meets certain standards. These two provisions combined effectively allow for up to four units on what is currently a single-family parcel, barring other limitations laid out in the law.

The law also sets forth what a local agency can and cannot require in approving construction of two residential units, allowing for certain objective standards unless those standards would have the effect of physically precluding the construction of two units or precluding either of the units from being at least 800 square feet.

The law exempts from eligibility certain parcels with existing income-restrictions, as well as those in historic districts or properties listed as a landmark or historic property. It also exempts parcels with certain conditions, such as those with high fire hazard, floodplains, and other contexts.

An update to the law, S.B. 450, further clarified the intent and purpose of the law, while creating new restrictions on methods used by local governments to circumvent the legislative intent of S.B. 9, including required approval windows, additional state oversight and enforcement authority, among other restrictions on attempts to deny lot split applications.

S.B 9 Legislative Text

S.B. 450 Legislative Text

AB 3177 (2024): This law prohibits local agencies from imposing land dedication requirements on housing development to widen roadways for the purposes of mitigating vehicular traffic impacts, achieving adopted traffic level of service related to vehicular traffic, or achieving a desired roadway width. The prohibition only applies to housing development in transit priority areas or with other particular characteristics as laid out in the law.

Legislative Text

Colorado

HB 24-1313 (2024): This law requires local governments to set housing density goals near transit-rich areas and demonstrate that they are reaching those targets with housing development. It applies to 31 municipalities located within five metropolitan planning organizations. These local governments are

[25] Ministerial approval describes government decisions that involve little to no personal judgement and are based on a project's compliance with established standards.

required to change their current zoning laws to allow for higher-density residential development in these areas, with at least 40 units per acre within a quarter mile of bus stops and a half mile of rail stations.

A community is assumed to fall under this provision if it is either entirely or partially within a metropolitan planning organization, has a population of 4,000 or more, and contains at least 75 acres of certain transit-related areas. Alternatively, a county government falls under this provision if it either contains a transit station area that is both in an unincorporated part of the county and within one-half mile of a station that services a commuter rail service or light rail service or if it is a transit corridor area that is both an unincorporated part of the county and is fully encompassed by one or more municipalities.

The law also requires submittal of various reports of impacted local communities to the Colorado Department of Local Affairs, and upon approval of a transit-oriented community's housing opportunity goal report on or before December 31, 2027, will designate the transit-oriented community as a certified transit-oriented community. This certification makes the entity eligible for a transit-oriented community infrastructure fund grant program created within the Colorado Department of Local Affairs. This $35.0 million grant program will assist transit-oriented communities in upgrading infrastructure within the designated transit centers and neighborhood centers.

Additionally, the law requires the Colorado Department of Local Affairs to conduct a study that identifies policy barriers and opportunities within the Colorado Department of Transportation including state access code, roadway design standards, and the treatment of pedestrian and bicycle crossings as well as portions of state highway that pass through locally-identified transit centers and neighborhood centers that are appropriate for context-sensitive, complete streets.

Legislative Text

HB 24-1152 (2024): This law permits accessory dwelling units within cities with a population more than 1,000 that are within metropolitan planning organization boundaries as well as portions of counties within a census designated place with population more than 40,000 that are within metropolitan planning organization boundaries. Approval is subject to a local administrative approval process, and requires allowance of accessory dwelling units in any part of the subject jurisdiction where the same jurisdiction allows single-unit detached dwellings.

The law also creates $8.0 million in state grant and loan programs to help finance the construction and conversion of accessory dwelling units for eligible low-to-moderate income borrowers, nonprofits, and public housing authorities.

The law is scheduled to take effect on June 30th, 2025.

Legislative Text

HB 24-1304 (2024): This law prohibits a municipality that is within a metropolitan planning organization or a county that has unincorporated areas within a metropolitan planning organization from enacting or enforcing minimum parking requirements that apply to certain land use approvals for a multi-family development, adaptive re-use for residential purposes, or adaptive re-use mixed-use purposes which include at least 50 percent of the use for residential purposes. The law applies to the unincorporated area of the county of the municipality, within a metropolitan planning organization, and at least partially within

an applicable transit service area, which is defined by a map published by the Colorado Department of Local Affairs.

The law does not apply to parking requirements related to those provided for persons with disabilities, and allows a local government to enact or enforce parking maximums, enforce parking minimums as part of prior agreements to provide affordable housing in exchange for reduced parking requirements, parking minimums that are stipulated in a grant award for affordable housing, enact or enforce a minimum parking requirement for bicycles, or imposing certain requirements on parking spaces that are voluntarily provided in connections with a development project.

This law is scheduled to take effect on June 30th, 2025.

Legislative Text

Florida

CS/SB 102 (2023): This law, sometimes referred to as the Live Local Act, requires municipalities to authorize multifamily and mixed-use residential as allowable uses in any area zoned for commercial, industrial, or mixed-use if at least 40 percent of the residential units in a proposed multifamily rental have a 30-year affordability requirement. The law prohibits municipalities from restricting the density of such developments to below the highest allowed density on any land in the municipality where residential development is allowed, and prohibits height restrictions on such developments to the highest currently allowed height for commercial or residential development located in its jurisdiction within one mile of the proposed development or three stories, whichever is taller. The law requires administrative approval for such developments, so long as they meet other local regulations provided for in the law.

Later revisions to the law in 2024 add height constraints for projects near single-family dwelling units, prohibits floor area ratio requirements from being more restrictive than 150 percent of the maximum floor area ratio permitted within the jurisdiction, and further prohibits or reduces minimum parking requirements for developments depending on their location relative to transportation facilities and the current presence of parking.

Legislative Text

Maine

LD 2003 (2022): This law requires that the State of Maine establish statewide and regional housing production goals and set forth ways in which local governments can coordinate with that goal. It requires that municipalities allow certain affordable housing developments to have a dwelling unit density of 2.5 times that base density that is otherwise allowed at that location and bars requiring such development to have more than two off-street parking spaces for every three units.

Additionally, the law requires that municipalities allow structures up to at least two dwelling units per lot if the lot does not already contain an existing dwelling unit, and up to at least four dwelling units per lot if the lot does not already contain an existing dwelling unit and the lot is also in a designated growth area or if the lot is served by sewer and water utilities. For lots that already have a dwelling unit present, the law requires that municipalities allow at least two additional dwelling units, with one either attached to or within the existing structure and a second detached dwelling unit, or one of each type. The law prohibits municipalities from imposing dimensional or setback requirements for the additional units that are

greater than those for a single-family housing unit, except lot areas per housing unit, so long as the lot area does not vary by incremental unit.

Lastly, the law requires that municipalities allow accessory dwelling units on the same lot as a single-family dwelling unit in any area in which housing is permitted, so long as an accessory dwelling unit doesn't already exist on the lot. These accessory dwelling units may be within, attached to, or detached from the existing dwelling unit. It requires that these accessory dwelling units cannot be restricted by any density requirements or area restrictions, cannot have setback and dimensional restrictions that are more restrictive than that of the single-family housing unit, and prohibits additional parking requirements for any accessory dwelling unit beyond those of the single-family housing unit.

The law took effect on July 1st, 2023.

Legislative Text

Massachusetts

Section 3A of MGL c. 40A (2021): This law requires that select communities with service from the Massachusetts Bay Transportation Authority to allow through zoning ordinance or bylaw at least one district of reasonable size in which multi-family housing is permitted as of right. It also prohibits localities from imposing age-restrictions, bedroom number per dwelling unit restrictions, size of bedroom restrictions, or number of occupants per dwelling unit in multi-family housing within this district. The district is required to have a minimum gross density of 15 units per acre and be located not more than 0.5 miles from a commuter rail station, subway station, ferry terminal, or bus station, as applicable.

The Massachusetts Executive Office of Housing and Livable Communities promulgates guidelines to determine if a community is in compliance with the section. Compliance application deadlines for communities varies by categories and is effective on a rolling basis from 2023 to 2025. The law provides further that a failure to comply with the requirements will render any of the communities in question ineligible for funding from a variety of state funding sources, and may also be taken into consideration from state agencies when evaluating applications for discretionary grant programs or other discretionary funding decisions.

The law took effect January 14th, 2021.

Legislative Text

H.4138 (2024): This law requires, among many housing-related provisions, that no municipality shall prohibit, unreasonably restrict, or require a special permit or other discretionary zoning approval for the use of land or structures for an accessory dwelling unit, or the rental thereof, in a single-family residential zoning district. Accessory dwelling units must be allowed if they are not larger in gross floor area than half the gross floor area of the principle dwelling or 900 square feet, whichever is smaller. The law also requires that not more than one parking space shall be required for the accessory dwelling unit, except in the case that the unit is within 0.5 miles from a commuter rail station, subway station, ferry terminal, or bus station, in which case no parking space shall be required.

Legislative Text

Montana

SB 323 (2023): This law requires that cities with a population of at least 5,000 residents must allow duplex housing as a permitted use on any lot where a single-family residence is a permitted use, and that zoning regulations that apply to the development or use of the duplex may not be more restrictive than zoning regulations that are applicable to single-family residences.

The law took effect on January 1st, 2024.

Legislative Text

SB 528 (2023): This law requires that all cities adopt regulations that allow a minimum of one accessory dwelling unit by right on a lot or parcel that contains a single-family dwelling. It stipulates that the accessory dwelling unit may be attached, detached, or internal to the single-family dwelling on a lot or parcel, and that it may not be more than 75 percent of the gross floor area of the single-family dwelling or 1,000 square feet, whichever is less.

The law prohibits cities from requiring additional parking to accommodate the accessory dwelling unit, requiring that the unit match the exterior design, roof pitch, or finishing materials of the single-family dwelling, requiring that the single-family dwelling or accessory dwelling unit be occupied by the owner, requiring any other relationship status between occupants of the single-family dwelling and accessory dwelling unit, assessing impact fees on the construction of the accessory dwelling unit, or making permitting of the unit contingent on public street improvements beyond construction-related damage repair. Additionally, the law prohibits maximum building heights, minimum setback requirements, minimum lot sizes, maximum lot coverages, or minimum building frontages for the accessory dwelling unit that are more restrictive than those for the single-family dwelling on the lot.

For municipalities that did not adopt or amend regulations pursuant the law by the effective date, the law required that they review and permit accessory dwelling units in accordance with the law until regulations are adopted or amended.

This law took effect on January 1st, 2024.

Legislative Text

SB 245 (2023): This law requires that cities with a population of at least 5,000 residents allow as a permitted use multiple-unit dwellings and mixed-use developments that include multiple-unit dwellings on a parcel or lot that is located in a commercial zone and is serviceable to local water and sewer infrastructure. Additionally, cities are prohibited from requiring more than one off-street parking space for each unit and those accessible parking spaces as required under the Americans with Disabilities Act of 1990, or the equivalent provided under a shared parking agreement.

Legislative Text

Oregon

HB 2001 (2019): This law requires cities to allow duplexes on each lot or parcel zoned for residential use in cities with more than 10,000 in population and requires duplexes, triplexes, fourplexes, attached townhomes, and cottage courts on certain lots in cities of more than 25,000 in population and within the Portland Metro area. The law prohibits cities from adding owner-occupancy and parking requirements to

accessory dwelling units. It also made changes to eviction procedures in Oregon, including extended notice periods, updated disclosure requirements, and other items.

The law gives the Oregon Department of Land Conservation and Development the responsibility of issuing minimum standards for compliance as well as a model zoning code. In cases where cities do not meet the state's deadline for compliance, the state's model code will automatically apply. The law gives cities the option to seek an extension for areas a municipality deems as having insufficient infrastructure, though the extension request must include the plan to quickly remedy the infrastructure deficiency, with the Oregon Department of Land Conservation and Development determining where or not that plan is adequate. Lastly, the law prohibits cities, individuals, or homeowner associations from passing new regulations or rules that would prohibit the additional housing typologies.

Legislative Text

HB 3395 (2023): This law requires the Building Codes Structures Board to update the State of Oregon building code to allow single-exit residential buildings.

The actions to adopt the updated state building code is required by October 1st, 2025.

Legislative Text

Vermont

S. 100 (2023): This law requires that in any district that allows year-round residential development, duplexes shall be an allowed use with the same dimensional standards as a single-unit dwelling. It further allowed that in any district that is served by municipal sewer and water infrastructure that allows residential development, multiunit dwellings with four or fewer units shall be a permitted use, unless that district specifically requires multiunit structures to have more than four dwelling units.

The law also caps parking minimums to not exceed one space per dwelling unit in any district served by municipal sewer and water infrastructure that allows residential use. Otherwise, for areas without sewer and water services and more than one-quarter mile away from public parking, parking minimums must not exceed 1.5 spaces per dwelling unit. The law provides that density standards for multiunit dwellings shall not be more restrictive than those required for single-family dwellings. For projects with certain income-restricted units, the law allows developments to exceed density limitations for residential developments by an additional 40 percent, as well as exceeding maximum height limitations by one floor, subject to other requirements and building codes.

Legislative Text

Virginia

SB 296 (2024): This law requires, among several provisions, that certain submitted development requests be either approved or disapproved within a certain period after submittal and that the planning body provide specific reasons for disapproval. Additionally, it lays out further restrictions on future disapproval justifications that were not raised initially in the first disapproval. A failure by the local planning commission or other agent to meet the deadlines require that the application be deemed automatically approved. The law provides additional certainty for development on approval timelines and processes.

Legislative Text

Washington

HB 1110 (2023): This law requires legalization of four homes per residential lot in cities with 75,000 in population or more, rising to six homes per lot if located within 0.25-miles of a major transit stop or if two homes are affordable. The law requires legalization of two homes per residential lot in cities between 25,000 and 75,000 in population, and four homes per lot if located within 0.25-miles of a major transit stop or if one of the homes is affordable. Lastly it requires legalization of two homes per residential lot in cities under 25,000 in population but located within the state's largest metropolitan areas.

Legislative Text

SB 5491 (2023): This law amends the state building codes to allow residential buildings of up to six stories above grade to be served by a single exit, subject to certain conditions relating to water supply, fire department characteristics, other provisions.

The actions to adopt the updated state building code is required by July 1st, 2026.

Legislative Text

Local Examples

Buffalo, NY

Unified Development Ordinance (2017): In 2017 the City of Buffalo, NY adopted a new Unified Development Ordinance, also known as the "Green Code," which, among many policy changes, removed minimum parking requirements across the entire city. A study from the University of Buffalo found that these changes led to 47 percent of major developments to include fewer parking spaces than would have been legally permissible under the previous code, with mixed-use developments providing 53 percent fewer parking spaces, highlighting that the minimum parking requirements had likely been a binding constraint (Hess & Rehler, 2021).

The researchers also concluded that minimum parking requirements constrain development in dense, centrally located neighborhoods with frequent transit service, as these locations experienced the greatest drop in provided parking following the reforms. While single-use developments in suburban areas may face lower costs to comply with parking requirements given lower cost land and larger parcels, urban infill development often faces higher land costs and physical site constraints that make complying with minimum parking requirements far more costly, particularly if structured or underground parking is required.

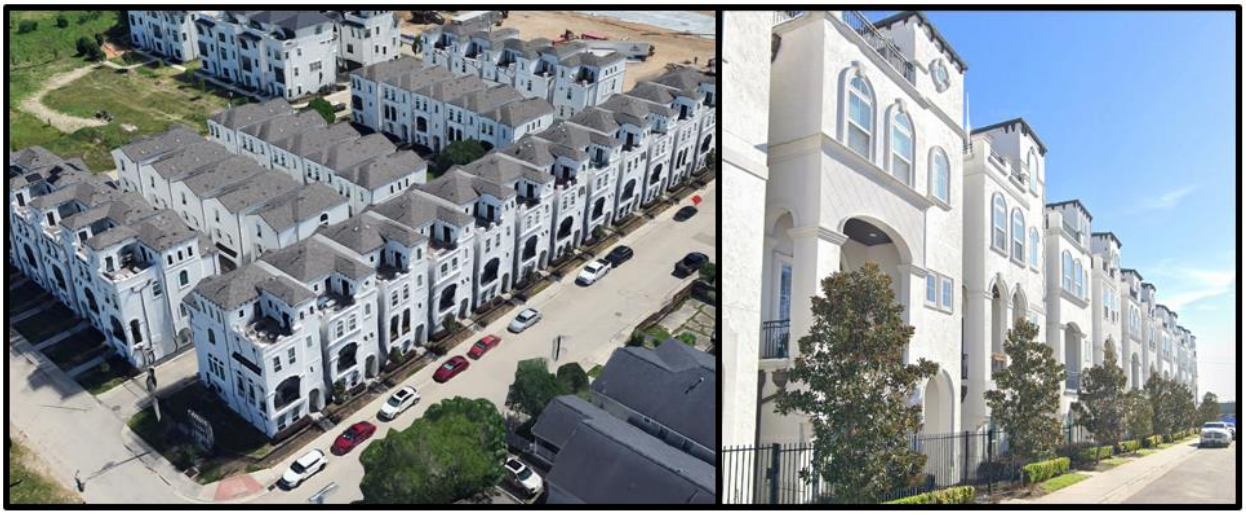
Unified Development Ordinance

Houston, TX

Minimum Lot Size Reforms (1998/2013): Though Houston does not have a formal zoning code, it does enforce many of the same land use regulations common in other American cities, including regulations on minimum lot size (Lewyn, How Overregulation Creates Sprawl (Even in a City Without Zoning), 2005). In 1998 Houston policymakers reduced the by-right minimum-lot size requirements by about two-thirds, from 5,000 square feet to 3,500 square feet, within the I-610 loop, and permitting even smaller subdivisions of 1,400 square feet for lots meeting certain criteria. In 2013, this reform was extended to cover all land in the municipality with wastewater collection services.

Estimates of delivered townhomes vary by timeframe, but one study found from 2005 to 2018, over 39,000 town houses were developed, with post-1998 townhouses now accounting for four percent of all housing units citywide, eight percent inside the I-680 loop, and no less than 43 percent of net housing units added across the City of Houston since 1990 (Wegmann, Baqai, & Conrad, 2023). Another study on the welfare effects of the reforms estimated an average gain per household from the reform of $18,000, with lower income and smaller households benefitting more (Mei, 2022).

Figure 39: Example of Missing Middle Housing in Houston, TX



Source: Google Earth Pro

Los Angeles, CA

Adaptive Reuse Ordinance (1999): In response to challenges in the commercial office market in older sections of Downtown Los Angeles, the City of Los Angeles drafted an Adaptive Reuse Ordinance that waived a series of usual regulatory requirements to encourage the conversion of economically distressed or historically significant buildings to apartments, live/work units, or visitor-serving facilities (City of Los Angeles, 2001). Additionally, the ordinance was intended to allow more workers to locate closer to jobs and transit in the city center, reducing vehicles miles traveled and improving air quality. To facilitate these conversions, the incentives included flexibility in the construction of mezzanine space, as well as exemptions from density restrictions, off-street parking requirements, certain commercial space regulations, site plan review, and new loading space requirements. Projects meeting the requirements in the ordinance were approved by-right, without special city review of environmental review.

While there is difficulty in establishing direct causality, by one researcher's estimate, between 1999 and 2008 the adaptive reuse ordinance resulted in at least 6,900 new units in the city center, compared to 9,200 units added overall in the city center between 2000 and 2010, suggesting the ordinance likely accounted for over 75 percent of that decade's housing construction (Manville, 2013). A 2021 white paper estimated that in the 20 years after passage, over 12,000 new housing units were created through adaptive reuse, accounting for more than 30 percent of the 37,000 housing units added in the city center over the same period (Central City Association, 2021). The reforms are credited with accelerating development in the city center while reversing prior trends of neighborhood decline (Riggs & Chamberlain, 2018).

Adaptive Reuse Ordinance

Conclusions

Land use policy changes represent a significant opportunity to address escalating housing and transportation costs in the United States, while simultaneously reducing environmental harm. By adjusting land use policies to allow for increased housing supply, especially in a mixed-use format near transit facilities, both housing and transportation cost burdens can be reduced simultaneously. Ensuring that the land use regulatory framework allows for both sufficient housing supply and transportation-efficient development patterns is also an inherently equitable strategy, given that low-income households bear the most significant burden of escalating housing prices. Allowing origins and destinations to locate closer in proximity to one another, and near transit stations, unlocks more affordable transportation options for households while also improving access to goods, services, and jobs for households with and without access to an automobile.

Transportation agencies can also benefit from changes to land use policies by other government entities, as allowing for more transportation-efficient land use patterns can reduce overall infrastructure outlays per capita. Providing capacity for modes of transportation such as walking and cycling require less infrastructure than less space-efficient modes such as automobiles, meaning that land use policies that allow for a higher proportion of trips to utilize these modes can result in infrastructure cost savings for local, state, and the Federal government. Employment and residential density within the walkshed of transit facilities is also highly correlated with transit trip generation, and thus land use policies that allow for more households and jobs to locate near transit stations represents a key opportunity to increase fiscal stability for transit agencies.

In recent decades, in response to escalating housing costs, state and local governments have begun to take significant legislative actions to address land use policy reform. Such actions include both the relaxation of explicit land use controls, such as height and density restrictions, as well as changes to implicit land use controls such as parking minimums or minimum lot sizes. Other actions involve changes to the approval processes for new developments to reduce both uncertainty and approval timelines. The evidence suggests that older land use reforms in Downtown Los Angeles and Houston largely succeeded in their policy goals, while many of the more recent land use reforms are still too new to properly evaluate their impacts, though early results are promising.

While land use policies generally set the stage for land use changes, development patterns and projects are affected by many different factors. Thus, such policies must be seen as a *necessary*, but not always a *sufficient* condition for achieving changes to land use outcomes. Furthermore, evidence from statewide reforms suggest that effectively implementing changes to land use policies often requires an iterative approach, one that learns from both the shortcomings of previous reform attempts and adapts to new hurdles that can be enacted in response to previous attempts. Creating more affordable, fiscally responsible, environmentally sustainable, and convenient communities for the American people should be seen as a process rather than a single policy change, and a journey rather than a destination.

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Relevant Federal Resources

Grant Programs

USDOT Pilot Program for Transit-Oriented Development Planning

USDOT Reconnecting Communities Pilot Grant Program

HUD Pathways to Removing Obstacles to Housing

Research and White Papers

USDOT Level of Service Case Studies

USDOT Climate Strategies that Work – Parking Reforms

USDOT Climate Strategies that Work – Transit-Oriented Development

USDOT Climate Strategies that Work – Zoning Reform