RESEARCH REPORT

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Policies to Improve Transportation Sustainability, Accessibility, and Housing Affordability in the State of California

Daniel G. Chatman, Associate Professor
Department of City & Regional Planning, UC Berkeley
Michael K. Manville, Associate Professor
Department of Urban Planning, UCLA
Carolina Reid, Assistant Professor
Department of City & Regional Planning, UC Berkeley
Elisa Barbour, Post-Doctoral Researcher, Institute of Transportation Studies, University of California, Davis
Tamara Kerzhner, Ph.D. Candidate, Department of City and Regional Planning, University of California, Berkeley

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7. Author(s) Daniel G. Chatman, Ph.D. https://orcid.org/0000-0001-5475-8544; Elisa Barbour, Ph.D. https://orcid.org/0000-0002-4685-4517; Tamara Kerzhner, Ph.D. Candidate https://orcid.org/0000-0003-3850-1380; Michael Manville, Ph.D. https://orcid.org/0000-0002-4218-6427; Carolina Reid, Ph.D. https://orcid.org/0000-0002-1315-6413		**8. Performing Organization Report No.** N/A
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16. Abstract This report presents analytical review of empirical research on the interactions between housing availability and production, and travel behavior, accessibility, land use policies, and transportation policies. It identifies lessons from this review for California state legislative efforts to improve housing and transportation linkages, and to increase both transportation sustainability and housing affordability. Relevant California state efforts include legislation to influence parking standards; to require up-zoning near transit stations; to influence regional housing and transportation planning goals; and to change environmental review to focus on reducing vehicle miles traveled instead of accommodating road traffic.		
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Executive Summary

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The largest metropolitan areas in the state of California are marked by an undersupply of housing, severe lack of affordable housing, and a heavy reliance on the automobile. There is a strong need to produce more housing, particularly in locations that permit households to meet their travel needs by more sustainable transport modes such as carpooling, walking, cycling, and public transportation. What role can the state play in encouraging the development of housing, including affordable housing, in locations that reduce auto use *without* constraining mobility and access to opportunity? At the same time, how can state policies encourage investments in transportation infrastructure and services, and the adoption and implementation of transportation regulations, that promote reductions in auto use, decrease greenhouse gas emissions, and make environmentally sustainable travel more likely?

We conducted an analytical review of empirical research on the interactions between housing availability and production, and travel behavior, accessibility, land use policies, and transportation policies in California, the United States and internationally. We then considered lessons from this review for California state legislative efforts to improve housing and transportation linkages, and to increase both transportation sustainability and housing affordability. Relevant California state efforts include legislation to influence parking standards; to require up-zoning near transit stations; to influence regional housing and transportation planning goals; and to change environmental review to focus on reducing vehicle miles traveled instead of accommodating road traffic.

Housing and transport are inextricably linked and between them do much to define the overall pattern of daily life for households and individuals. Decisions about where to work, go to school, shop, eat, socialize and spend time throughout the city are all shaped by the relative costs of transport (in time and money) and the subsequent travel and location choices made by individuals, firms and households. Housing—the location of home—is ultimately the center of gravity for travel decisions, and research increasingly stresses that no effort to reform transportation alone will succeed without attention to the location of housing. But the converse is equally true—no land use policy, if unmatched by complementary transportation interventions, should be expected to meaningfully reduce driving and the accompanying air pollution.

Our analysis of current research shows that city and regional scale are important, but policies often focus only on smaller scale areas such as neighborhoods or even individual parcels. Research tends to over-emphasize developing housing near rail stations, which accounts for only a small portion of developable land in the state and cannot suffice to address the scale of the problems the state is trying to address compared to focusing on areas dominated by single-family zoning. There is also an over-focus on development regulations and not enough attention paid to the state government's potential role in allowing and encouraging road pricing and parking pricing, which can significantly improve the effectiveness of land use and multi-modal transport strategies for reducing driving.

We strongly recommend policies focused more generally across urban areas in infill locations and inner ring suburbs, not just near rail stations; and we strongly recommend transportation investments focused on buses, carpooling infrastructure, and pedestrian improvements, not just rail transit. At the same time, we note the value local planners place on combining de-regulatory approaches, particularly upzoning, mixed use zoning, and parking de-regulation, with the development of neighborhood plans that incorporate resident input, and which facilitate streamlining development approvals.

We recommend the state consider policies likely to both decrease VMT and increase housing affordability while improving accessibility. We also encourage the state to support metropolitan planning organizations and municipalities in advancing housing production to increase affordability, reduce transportation greenhouse gases (GHGs) and improve accessibility. Those policies should focus on providing larger amounts of market rate housing built in smaller multifamily developments in infill locations and inner suburbs rather than producing small amounts of affordable housing in larger multifamily developments near rail.

1. Price roads and parking

Pricing enables more efficient use of resources, reducing transportation related GHGs while disincentivizing peripheral location decisions. The incidence of price burdens tends to fall on more affluent households, who own and drive autos at a higher rate. Pricing also generates revenues that can be used to address equity concerns, for example, by replacing regressive forms of revenue generation like transportation sales taxes.

A. Allow and encourage congestion tolls and other forms of road pricing

The state can play an important role in facilitating the adoption of road pricing by enacting enabling legislation. One option is VMT pricing, in which fees are levied based on vehicle miles traveled within a metropolitan area or state. The state could even tie some transportation assistance to a willingness to carry out road pricing.

B. Meter on-street parking

On-street parking pricing helps create a more efficient market in parking, reducing GHGs associated with cruising, and critically, providing better support for reforming off-street parking requirements. California cities are currently allowed to meter on-street parking but tend to leave most spaces unpriced. The state could require that on-street parking permits be auctioned.

2. Lift regulatory dampers on housing development

It is not clear that transit-oriented development policies are particularly good at reducing driving as the influence of transit proximity upon auto use, by itself, is modest. Other factors, including lower parking requirements and higher transit accessibility (including bus service), appear to be more important as is allowing more infill development near existing employment clusters. Reinforcing existing bus services with dedicated lanes also holds promise.

A. Reform single-family zoning

Reforming single-family zoning makes widespread sense particularly in wealthier suburban locations. There are stronger equity benefits to be gained from allowing housing supply to respond to demand to drive down housing prices for poorer households, than from funneling new housing development to neighborhoods near rail stations. At the same time, there is higher demand for housing in most infill urban locations than in suburban lower density locations. Limiting single family zoning would also likely have large effects on racial and income integration, since it is the most prevalent form of exclusionary zoning. Concerns about gentrification leading to displacement appear overblown: there is no reliable evidence that rents or prices of multifamily units increase on average when new housing is developed nearby.

B. Abolish minimum off-street parking requirements

Minimum off-street parking requirements decrease housing affordability and increase driving. Reducing parking minimums would lower the cost of development but could also allow developers to develop and market their housing for a different demographic at a lower price point. Providing fewer parking units could also result in a greater reduction in auto ownership and use than other built environment factors such as proximity to rail. The state should consider banning minimum parking requirements, while encouraging the use of on-street parking management in ways that protect existing homeowners and renters and make the elimination of off-street parking requirements politically palatable.

3. Adopt state incentives for housing and transport development

The state should also consider providing incentives to regional and local governments to engage in development and planning practices that promote housing affordability, decrease auto use and increase accessibility. The state could play a stronger role in pre-empting local zoning to meet housing goals.

A. Expand the use of state transport funds beyond rail and transit

The state has a potential role to play in encouraging the use of alternative modes like transit and walking, as well as in reducing the duration and distance of driving trips. A relatively small share of households will be helped by transit improvements, and a much larger share by facilitating shorter driving trips, carpooling and walking.

B. Support the taxation of land value rather than property value

Affordable housing could be encouraged through aggressively taxing land value, not development. A tax on land value incentivizes the production of more housing to cover carrying costs, reducing speculation. A progressive tax on real estate transactions (which could be rebated if the parcel purchased was redeveloped into more units within five years) would be another efficient and equitable way to raise money for affordable housing. An even more preferable policy route would be to roll back Proposition 13 and replace the property tax with a land value tax.

C. Incentivize “gentle” but widespread density improvements

Smaller but more widespread increases in housing and population density over time are likely to have a less disruptive effect on housing markets, and raise fewer political concerns about displacement, while reducing housing prices overall as supply increases. Gentle density is much cheaper, and much less susceptible to market swings and corrections than larger scale multifamily developments. Building 4- to 10-unit wood-framed buildings has significant private and social cost advantages over concentrating multifamily development in steel-framed towers in a small fraction of urban neighborhoods.

D. Reward localities that meet state performance goals for housing production

The state should consider how to reward localities that increase housing production, through provision of planning funds and other means to facilitate neighborhood planning that combines public input with development permit streamlining.

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1. Introduction

The largest metropolitan areas in the state of California are marked by an undersupply of housing, severe lack of affordable housing, and a heavy reliance on the automobile. There is a strong need to produce more housing, particularly in locations that permit households to meet their travel needs by more sustainable transport modes such as carpooling, walking, cycling, and public transportation. What role can the state play in encouraging the development of housing, including affordable housing, in locations that reduce auto use *without* constraining mobility and access to opportunity? At the same time, how can state policies encourage investments in transportation infrastructure and services, and the adoption and implementation of transportation regulations, that promote reductions in auto use, decrease greenhouse gas emissions, and make environmentally sustainable travel more likely?

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Section 2 of the report provides background on the research questions in the California policy context.

Section 3, the main part of the report, is a review of empirical studies on how land use policies, housing policies, and transportation policies influence housing availability and travel patterns. It is organized into three themes: (1) the impacts of housing policies on housing affordability and travel patterns; (2) the impacts of transport policy on housing, travel patterns and accessibility; and (3) barriers and issues in the implementation of such policies, focusing on transit-oriented development (TOD).

In **section 4** we address California state legislative efforts to influence local and regional land use planning with the intention of affecting transportation outcomes. These legislative efforts include Senate Bill 743, Senate Bill 375, and others.

We end in **section 5** by recommending state policies and interventions that are likely to meet the three interrelated goals of reducing auto use and carbon emissions, increasing housing supply and affordability, and increasing accessibility.

2. Background and Policy Context

2.1 The California Policy Landscape

California faces two major policy challenges: how to address the accelerating effects of climate change, and how to increase housing affordability. Increasingly, policymakers have recognized and addressed the interconnections between these policy concerns.

Los Angeles, the San Francisco Bay Area, and San Diego have seen unprecedented increases in both housing cost burdens and homelessness. Researchers have argued that in California the housing affordability crisis is largely the product of an undersupply of housing (Jackson, 2016; Kahn et al., 2010; Kok et al., 2014; Quigley and Raphael, 2005). Some have also argued that housing has not been built in the places where it is most needed to improve affordability or reduce driving (Jackson, 2016). When combined with growing demand for housing in regions with strong economies, the undersupply has contributed to both increasing housing prices and longer commute times.

Meanwhile, the state of California has adopted policies that are intended to reduce greenhouse gases (GHGs) to levels recommended by international climate scientists. California achieved the statewide GHG reduction targets it set for 2020, but the more stringent reduction targets it adopted for 2040 are much more challenging to achieve. Recent trends in GHG emissions from transportation are moving in the wrong direction. Since 2013, vehicle miles traveled and associated GHGs from cars and light-duty trucks have reversed their previous downward trend (CARB, 2023). This is highly problematic, as the transportation sector accounts for 41 percent of GHG emissions statewide.

In response to these twin challenges, legislators in Sacramento have passed bills that are intended to address the interlinkages between housing and transportation. Policy makers are continuing to explore further strategies to mitigate the housing crisis, increase public and active transport options, and reduce GHGs. California policy approaches include the following:

- **Integration of transportation and land use planning**. Several legislative approaches are intended to integrate transportation and land use planning. Senate Bill 375 requires the development of regional transportation plans that work to reduce GHGs, in conjunction with local plans for housing development. Senate Bill 743 re-orients environmental review standards for new housing developments to support reducing driving instead of reducing traffic congestion.
- **Incentives for dense and transit-proximate housing production.** A parallel set of state policies has been adopted or proposed to make it easier for private-sector developers to build higher, denser and more affordable housing than they might otherwise. Legislative proposals and adopted policies have included more permissive upzoning and mixed-use zoning near transit, easier permitting for affordable and transit-proximate housing units, reduced or no minimum off-street parking requirements, and streamlined environmental regulation. Adopted policies include California's Density Bonus Program, as

well as SB 35 and SB 540, which ease development approvals for housing projects that meet affordable housing and sustainability criteria. At the federal level, the 2015 Affirmatively Furthering Fair Housing Program requires HUD grant recipients to reduce segregation and increase accessibility in their plans.

- **Public funding and financing mechanisms for development.** Another set of policies increases funding and financing options for developments that may improve housing and transport linkages, depending on the context and details. Until being eliminated in California in 2012, state-authorized redevelopment authorities provided the principal means by which localities financed downtown redevelopment as well as affordable housing, through tax increment financing (TIF). A more limited version of local TIF authority was subsequently restored through SB 628 (2016), which established Enhanced Infrastructure Financing Districts (EIFDs) for funding housing and transit priority projects, and AB 2 (2015), which established Community Revitalization and Investment Authorities (CRIAs) as a local tool for funding economic revitalization programs, including low- and moderate-income housing, in distressed areas. Another source of funding for affordable housing and transit improvements was made available starting in 2014, when 20 percent of funds were allocated on an ongoing basis from California's GHG Cap-and-Trade Program to the Affordable Housing and Sustainable Communities (AHSC) Program, to fund affordable housing projects combined with transit and/or active transport facilities upgrades. Regional Early Action Planning (REAP) grants by the California Department of Housing and Community Development support local governments and councils of governments (COGs) in developing and implementing plans for infill housing and reducing vehicle miles of travel (VMT).

2.2 Contextualizing California's Policy Challenges

Urban development theory and research has long recognized the inherent connection between land development and travel patterns, with the main focus on accessibility. Starting with Von Thunen's model of land values in 1863 and continuing to the analysis of urban land prices by Alonso, Muth and others in the 1950s, location and development decisions have been theorized as a tradeoff between accessibility and land prices. Early theories explained the phenomenon of 20th century cities developing around a central business district, with the most accessible central locations priced the highest. According to this theory, accessibility to a given destination and the price of land fall in tandem, as one moves away from the city center. The density and cost of housing thus decline towards the edge of the city, as the cost of transportation increases. According to this theory, households make tradeoffs between housing and transportation decisions, to maximize their utility given their available income.

While simple and idealized, these models and their successors have held up over time to help explain the influence of market forces on city structure (Brueckner and Fansler, 1983; Spivey, 2008). Later scholars adapted the basic model by relaxing some assumptions, for example, considering differing incomes, differing housing types, physical geography, polycentricity with urban sub-centers and secondary employment centers, and heterogeneity of households' preferences (Spivey, 2008).

A related body of research has underscored the role of public regulations and investment in constraining or facilitating the location of houses or firms and influencing housing supply (Saiz, 2010). Housing and transportation infrastructure are complex and long-lasting bundles of goods. They have long been subjected to extensive public regulation. Their bundled nature, their durability over time, and the extent to which they have been regulated means that real-world development and travel patterns are not just the outcome of free market forces in the classic sense.

Common land use policies that directly affect patterns of urban development, and in turn, the set of housing and transportation choices households face include limits on density, intensity and location; design and performance standards for lots and buildings; the withdrawal of land from developable supply; and direct and indirect controls on growth (Deakin, 1989). Another common land use policy is the requirement for new development (or redevelopment) to provide a minimum number of off-street auto parking spaces (Shoup, 2005). Such land use regulations often result in increased housing prices and reduced construction of new units (Glaeser and Ward, 2006; Quigley and Rosenthal, 2005; Jackson, 2016).

According to the traditional theory, housing affordability is intimately connected to transportation costs. Households' attempts to trade off lower cost and better-quality housing through longer commutes are becoming more onerous in places such as coastal California where housing supply is constrained. One study using the Panel Study of Income Dynamics (PSID) found that higher housing costs in more accessible areas ate up any transportation cost savings there (Smart and Klein, 2018). A more recent study of the same question using finer spatial data from the PSID concluded that while for some income groups transportation cost savings were not completely offset by higher housing costs, it is increasingly difficult to find housing in locations that balance these tradeoffs. More importantly, this study concluded that any transportation cost savings for the lowest-income group of households living in urban areas are not significant enough to overcome higher housing costs (Makarewicz et al., 2020).

Meanwhile, transport policies and investments influence land use patterns by affecting the relative accessibility and price of different locations and modes of travel. Depending on conditions, investments in new transport facilities may serve mainly to advantage certain locations within an urban area, relative to others, without increasing overall economic productivity (Chatman and Noland, 2014). If an incremental addition is made to an already built-up transportation network (such as through the addition of a new rail station), effects on development may be small. However, especially over time and across an urban area, investment in alternatives to driving, such as transit and active transport facilities, have the potential to affect the density of new development and to reduce energy use (Gallivan et al., 2015). Significant transit investments may increase productivity by increasing population density and size, leading to greater agglomeration economies (Chatman and Noland, 2014).

It is also clear historically that some kinds of transit investment have the potential to *decrease* urban density, particularly when serving outlying parts of a metropolitan area and stimulating development there. For example, regional commuter heavy rail—like BART in the San Francisco Bay Area—encourages housing in peripheral locations, and while it may move a specific segment of commutes from private car to transit, it can

also create auto-reliant residential patterns. Only a small fraction of household travel consists of commuting to work, and only a fraction of commutes are served by such radial, suburb-to-CBD transport. Moreover, these investments are more likely to benefit higher income and white commuters (Golub and Martens, 2014).

Policies to price road and parking use have the potential to influence firm and household location decisions by increasing transportation costs and affecting the relative price (in time as well as money) of the choice between different transportation modes. The attractiveness of driving is significantly influenced by changes to the price of gasoline and parking provision, for example (Alberini, 2021; Goetzke and Vance, 2021; Manville and Shoup, 2005). Pricing policies can affect land development based on the classic urban models because of the inherent tradeoff between transportation cost and proximity; congestion charges can be expected to increase market demand for infill locations because, in a pricing regime, road user costs will be lower for locations closer to travel destinations (Brueckner, 2000).

Just as transportation and land use are inextricably linked in explaining the economic behavior of households and firms, transportation and land use policies have inter-connected impacts. Because of this, many scholars have argued the need for multi-level, complementary policies for transportation and land use (Docherty et al., 2018; McLeod et al., 2017; Thomas and Bertolini, 2020; Fischel, 2005; Lens, 2022). In addition, it has been long observed that integrating transportation and land use policy is made challenging by institutional fragmentation of decision-making authority. For example, transportation investment and environmental regulation are largely managed at the federal and state government levels, while general land use authority is almost universally under the control of municipal governments in the U.S.

Different levels of government may be more suited to enact policies at different scales. For example, some pricing policies, such as gas taxation or enactment of cap-and-trade programs for GHG emissions, are generally imposed by higher levels of government to create a more level playing field among economic actors within regions. Other policies, such as zoning to allow higher density development, tend to be applied locally. Some have argued this is appropriate since zoning rules could be more optimally applied where they can benefit from more fine-grained attention to varying circumstances. Other scholars have decried the hyper-local and parochial decision making embodied in the adoption of local zoning (see, e.g., Fischel, 2005).

We now turn to considering in more detail the findings from empirical research on these and related topics.

3. Review of Empirical Studies

3.1 Theme 1: Housing Policy Impacts on Housing Affordability and Travel Patterns

The first key theme in the literature is the relationship of state housing and development policies to housing supply and affordability, and consequent travel patterns due to the built environment. While there is a well-established relationship between some land use regulations and reduced housing supply, recently questions have emerged about the impact of upzoning and other de-regulatory zoning policy shifts on local supply and affordability. We review this literature in detail to consider benefits and costs of land use interventions including transit-oriented development programs and local zoning ordinances affecting parking requirements, height limitations, and setback rules, as a basis for considering state efforts to influence such regulations. We also consider the impacts of the built environment on travel, focusing on recent evidence that emphasizes the importance of parking as a causal factor in automobile use.

3.1.1 Land Use Planning/Policy Impacts on Housing Production and Price

Various public policies influence development, including regulatory policies for land use (such as zoning), affordable housing requirements, institutional planning and coordinating arrangements, and finance and funding provisions. Some policies, such as single-family zoning, are generally considered to be market constraining. Other policies, such as restrictions on off-street parking provision for development near rail stations, are considered by some to be market supportive. And sometimes policies are not constraining simply because there is little demand; for example, in the case where the market produces no development in a given area, even though it has permissive zoning.

A large body of research in urban economics has demonstrated that restrictive land use regulations are associated with higher prices for land, homes, and rents, with some studies finding these effects specifically in California (Jackson, 2016; Kahn et al., 2010; Kok et al., 2014; Levine, 1999; Quigley and Raphael, 2005). Planners and economists attempt to track regulation in numerous ways, all of which, when used in controlled statistical models, have pointed to regulation playing a role in suppressing housing production and increasing the price of housing (Monkkonen et al., 2020). An acknowledged weakness in this field of research is that regulatory stringency is hard to measure. Much of this research has measured it in terms of the number of policies adopted by localities, often added up into an index measure, which is then compared across localities. This approach fails to consider the variable influence of different types of policies, considered individually or collectively, across jurisdictions.

Only a few studies have aimed to unpack the impact of the black box of local land use plans and regulations, with even fewer conducted in California. Monkkonen, Lens, and Manville (2020) attempted to disentangle the impacts of two dimensions of land use regulation—prohibitions and process—on housing production across California cities, employing survey data from the Terner California Residential Land Use Survey Data Set,

conducted in 2017-18, and zoning capacity estimates taken from the housing elements of cities' general plans. The authors developed two indices of local regulation, one to measure regulatory prohibitions against higher density development, and the other to measure whether a city imposes an arduous approval process for development projects under consideration. The "process" index was comprised of a set of policies including parking requirements, the number of public hearings that developers must attend, and the magnitude of required impact fees.

The authors found that permitted housing by jurisdiction from 2013 to 2017 was negatively associated with low-density zoning, but uncorrelated with the index of process. Zoning restrictions had a greater impact on production in more expensive places, with the interaction between available zoned capacity and housing costs both significant and consequential. Development was found to be most common in higher-income and higher-rent parts of metropolitan areas—usually near but not actually in the most affluent neighborhoods—reflecting their desirability. Because developers want to build where returns are highest, regulatory constraints restrict production much more in high-rent cities than in low-rent cities. Another research study by MacDonald, (2016), conducted for the Terner Center for Housing Innovation at UC Berkeley, aimed to understand which local planning policies exert the most significant impacts on housing production, both positively and negatively, testing the impact of these policies in four San Francisco Bay Area jurisdictions in conjunction with market feasibility analyses. This study is valuable in trying to evaluate the impact of individual local policies in conjunction with market factors, but its results are derived from only a small number of jurisdictions, making them hard to generalize.

MacDonald (2016) found that reducing ground floor retail requirements, reducing parking requirements, eliminating conditional use requirements, and implementing specific plans were the most beneficial policies for cities to take to improve development potential. It is interesting to note that he did not find zoning restrictions to be the most influential factor in predicting development outcomes, perhaps reflecting the small sample of cities he studied, as well as his consideration of other policies. MacDonald also found that market forces such as investor and developer target return and perceived risk, and local sales prices, rents, and construction costs, generally had a larger effect than the policy changes he evaluated.

This section now discusses in more detail some land use policies used by California localities that affect housing production, and how the policies interact with market forces.

Planning policies intended to encourage dense, transit-oriented or infill development can have the intended effects, but only when the conditions are right. The interplay of policy and market forces can be very complex and hard to predict, given that many local government policies affect development and local market conditions vary widely, even when comparing geographically proximate neighborhoods where similar public policies apply. Market factors help explain why even carefully developed TOD plans can sometimes fail to materialize, leaving public planners disappointed and sometimes baffled about why new development failed to occur (Carlton, 2019)

Estimating the impacts of upzoning on development can be tricky. MacDonald (2016) found that relaxing density restrictions did not necessarily result in increased housing production, even in areas with high market

interest, because of complications such as building height limitations. Building higher than six stories requires more costly construction materials and labor, and depending on the lot size, certain building heights may not be economically feasible. Increasing permitted density was most effective in inducing development areas with high economic feasibility, and where a project was able to pay a significant premium above market land values, due to high rents, low costs, or a combination of the two.

Transit investments or zoning reforms are insufficient to induce dense infill or transit-oriented development in the absence of local market strength. Schuetz et al. (2015) estimated longitudinal changes in employment and housing outcomes for 28 Los Angeles Metro stations over a 20-year period, comparing station areas to matched control neighborhoods. The study found no evidence that station openings led to immediate changes in employment or housing markets, although a few stations saw employment growth within five to ten years after opening. A second, supplemental case study analysis by the same authors aimed to isolate the role of site-specific zoning from economic conditions and institutional factors in accounting for development outcomes in five Metro station areas, each of which opened between 1993 and 2003 (Schuetz et al., 2018). The study found considerable variation in redevelopment and land use change near the stations, with even station areas located close to one another, with similar TOD-compatible zoning, experiencing very different outcomes.

The authors concluded that new rail stations in densely built neighborhoods may experience significant redevelopment only where land values are high and redevelopment is possible, both in terms of zoning and in terms of market factors, at substantially higher density than current buildings. The form and timing of redevelopment reflects compatible zoning and other forms of public support, land values, the degree of active engagement by local government agencies, and political support from neighborhood residents. Furthermore, redevelopment may take many years to emerge.

A 2019 study for the Urban Displacement Project and Terner Center for Housing Innovation further depicts how market factors interact with policy and land constraints in influencing development potential near transit (Nolan, 2019). The study, conducted to investigate the potential impact of SB 50—proposed legislation that would have upzoned areas near transit—examined four case study neighborhoods representative of areas with development potential: two in the Bay Area and two in Los Angeles. Most parcels in the transit station areas were sized for detached single-family homes (around 5,000 square feet or less), which could support multi-family building construction up to 12 units, but not much denser. In addition to parcel geometry, the amount of vacant or underutilized land was found to vary widely, affecting opportunities for development.

To examine financial feasibility, the study compared whether, under SB 50 upzoning, a stylized 12-unit, four-story building would be financially sustainable for a developer in two of the neighborhoods studied —on a lot in Menlo Park versus one in the Fruitvale neighborhood in Oakland. Two parcels with similar characteristics in terms of size and zoning code were identified, and construction, operating, and “soft” costs (e.g., for permitting review and impact fees) were assumed to be the same in each case. Land prices in Menlo Park were four times higher than in Fruitvale, adding to developer costs but also meaning that developers could demand higher rents. Despite the higher land values, the project in the Menlo Park location penciled out by a wide margin, while the Fruitvale project was determined to be barely financially feasible. While SB 50 could have increased

housing supply in certain areas, in others up-zoning alone would not necessarily have resulted in substantial housing supply increases.

Mandatory inclusionary zoning policies can sometimes increase building-level integration by income, and sometimes increase neighborhood-level integration. About half of California cities have adopted inclusionary housing ordinances which require housing developers to include a share of affordable units, often 10 to 15 percent (Hickey, 2014; Mawhorter et al., 2018). Even more municipalities have adopted voluntary density bonus programs, providing developers who choose to do so with increased allowable densities and other incentives, in exchange for providing stipulated shares of affordable units in their development projects. Indeed, the state's Density Bonus Law, first passed in 1979, mandates that developers who elect to provide a portion of units at affordable levels can receive a density bonus up to 35 percent beyond local zoning standards (to be raised to 50 percent starting in 2021, through passage of AB 2345), and also gain eligibility to receive reduced parking requirements and other concessions including deviations on design standards, fee waivers, and expedited permit processing (Mawhorter et al., 2018).

Some research has concluded that mandatory inclusionary zoning policies have resulted in more affordable units being produced than voluntary incentive zoning (Sturtevant, 2016). However, mandatory policies also reduce project profitability, which can sometimes jeopardize a project's financial feasibility. For this reason, most California cities with inclusionary housing ordinances also offer cost offsets to developers, in the form of density bonuses, fast-track permitting, design flexibility, fee waivers or reductions, project subsidies, and other methods to help increase developers' rate of return.

Possibly reflecting the provision of such offset measures, some research indicates that inclusionary housing ordinances adopted by California localities do not result in lower production levels or higher prices for market-rate homes (Mukhija et al., 2010; Schuetz et al., 2011; Sturtevant, 2016). Two studies of inclusionary programs in California found that the number of affordable units produced in communities increased with the use of a density bonus (Garde, 2016; Schuetz et al., 2011). Nevertheless, at the time these studies were conducted, the total number of affordable units produced through inclusionary requirements was relatively modest compared to more direct subsidy programs such as the Low Income Housing Tax Credit and Housing Voucher programs. These latter programs, moreover, are financed by society overall, while inclusionary housing places the onus of affordability on developers and landowners who choose to create much-needed housing supply.

One point of consensus is that the design of such programs is critical for determining whether they will induce new housing production. If mandatory inclusionary requirements are too stiff, then projects may not "pencil out," resulting in fewer units built overall, including affordable units, than might have been built if requirements were relaxed (Ramakrishnan et al., 2019). Similarly, even voluntary density bonus programs need to be designed to offer adequate profitability levels to developers to induce their use. Take-up rates of density bonus provisions available in Los Angeles prior to 2017, which were based on state law, were much lower than the take-up rate starting in 2017 under the city's newly established Transit Oriented Communities program, which increased the available density bonus as well as the associated affordability requirements, demonstrating the importance of program design in determining whether inclusionary programs succeed in

producing new housing through market mechanisms (Barbour et al., 2021). While more research is needed, it is clear that both program design and market context will influence the effectiveness of inclusionary zoning programs (Schuetz et al., 2011).

Impact fees may reduce housing production in supply-constrained housing markets. Impact fees are charges per unit or per square foot for new construction, used by cities to fund affordable housing, transport improvements, or other public facilities and benefits, with fees set proportionate to the need for new public facilities/benefits created by the development. Many research studies have linked impact fees to the cost of housing (discussed in Burge and Ihlanfeldt, 2006a, 2006b). Impact fees can be high in California, costing above $20,000 for a single-family home in nearly 40 percent of localities, and above $20,000 for multi-family units in 34 percent of localities (Mawhorter et al., 2018). A case study of seven California localities found that impact fees added from six to 18 percent to the median house prices (ibid).

The costs of impact fees may or may not be capitalized into higher prices for housing, depending on the state of the market and the value accorded by homebuyers to the benefits provided (Burge and Ihlanfeldt, 2006a, 2006b). The latter question is critical for considering the effect of the fees on housing production. If impact fees reflect the cost of providing valued facilities needed to serve new development, and if they offset other taxes that would otherwise be levied, the fees can represent savings. In that case, a higher observed home price could reflect value for home buyers, which can induce more, not less production. Adoption of impact fees may also facilitate project approval by local governments, making permitting approval more predictable which reduces developer costs.

While many studies have analyzed the effects of impact fees on housing prices, the empirical literature on the effect of impact fees on housing construction is thin. Burge and Ihlanfeldt (2006a) found no discernible effect of impact fees on the number of single-family home completions in Florida from 1993 to 2003. Especially in inner-ring suburbs, where most population growth was occurring and housing affordability issues were most pressing, the positive effects of non–water/sewer impact fees (in terms of financing the necessary infrastructure) evidently outweighed their direct cost, leading to higher rates of construction. However, these fees had no significant effect on construction rates for housing in central-city, outer suburban, or rural areas. Florida is not a supply-constrained, expensive region, in comparison to many U.S. coastal cities. In high-demand areas, housing impact fees could fall on developers, and reduce the price they were able to bid for land. In this case impact fees could be expected to reduce the supply of new housing. A price effect on housing in this case would not result from a developer "passing on" the costs of impact fees but from a lower supply of housing for a given level of demand. This price response, importantly, would be observed in *all* housing, not just new construction (Been, 2005).

Parking is oversupplied. Parking requirements, included in zoning codes, significantly increase housing costs and reduce the amount of new construction. Despite reforms in some cities, most jurisdictions in the United States continue to require a minimum number of off-street parking spots to be built with new housing or nonresidential development. Donald Shoup and others have argued that these requirements are set too high, forcing developers to build an expensive amenity for which there is less demand than regulations assume

(Shoup, 1999). A typical requirement for single family homes in the Bay Area is two parking spaces per unit, although for locations in central cities in the Bay Area, requirements are often set lower, from no parking to one space per unit (MacDonald, 2016).

Parking spots are often provided exactly at the minimum, suggesting that removing the constraint would shift the curve of parking supply to lower levels (Levine, 2010; Shoup, 1999). A study of a small sample of developments in Los Angeles found that developers, on average, manage to build *less* parking than is required as a minimum by local zoning (Gabbe, 2018). This is explained by the fact that developers can take advantage of density bonuses and allowances for affordable housing which enable them to supply substantially less parking than the zoning mandates. Several empirical studies find that cities that have removed their parking minimums have seen a sharp drop in the number of parking spots provided. London, after eliminating most of its parking minimums, and switching to a maximum-parking code instead, saw a 40 percent reduction in the construction of parking spots, almost entirely attributable to removing the minimum requirement (Guo and Ren, 2013).

Gabbe et al. (2020) analyzed the effects of Seattle's 2012 parking reforms, which included the elimination of parking minimums for core urban areas and "secondary urban centers" with good transit access. The study used data from over 60,000 housing units distributed among 868 projects submitted for approval between 2012 and 2016. Where parking minimums were lowered to zero, 30 percent of new developments provided no parking at all, and 88 percent of projects had less than one parking spot per unit. Based on comparing a counterfactual estimate in which the reforms would not have been put into place, the authors calculated the policy reform led to a cumulative savings of $500 million in parking construction costs (ibid.).

Parking requirements limit development. Parking minimums both directly add to the costs of construction, and indirectly add to opportunity costs in the developments. Parking can be quite expensive, requiring not only the space needed for a car but also extra space to back out and leave the garage. Depending on the type of construction and technology used, structured off-street parking can range from $30,000 to $75,000 per space, representing from 3 to 17 percent of development costs (MacDonald, 2016). Parking requirements are particularly onerous in dense areas where digging is needed for subterranean parking.

Parking requirements carry design and scale stipulations which can make development or redevelopment technically or financially infeasible, such as when parking must be added to historic buildings or when it is required on small lots (Manville, 2013). Such requirements particularly affect infill and city center development and re-development, where land costs are high, and parcels are small and fragmented. Because of this, neighborhoods where existing lots or buildings do not facilitate new off-street parking will not be able to add new housing or convert existing buildings to housing.

A study of Los Angeles' Adaptive Reuse Ordinance, which, since 1999, has allowed the conversion of historic office buildings to housing without requiring additional parking, found that while these apartment developments did not provide a substantially lower number of spots, their location has been highly variable. Developers provided fewer spots than would have been required otherwise, and on average only half of off-street parking was provided on-site. Condominium developers, meanwhile, provided drastically fewer parking

spaces than the zoning would have required. Relaxing the parking minimum allowed developers to "get creative," providing a variety of solutions to parking in and around the historic buildings, including no parking, less parking, unbundled parking and offsite parking. This allowed for developments that satisfied both financial viability and consumer demand, and channeled housing development into the downtown area (Manville, 2013).

The costs and complexities of providing required parking influences market rents. Small housing units, such as accessory dwelling units (ADUs) and micro-apartments, are expected to be "cheap by design," but parking requirements often make them untenable or unprofitable to build. For ADUs, adding both a housing space and parking spot to an already existing built up area is substantially more difficult and expensive than just adding housing. Required parking minimums also discourage the construction of smaller and lower-amenity new developments.

The requirement to include parking means that finding a profit point for cheaper housing is extremely difficult. Thus bundled-parking units tend to be larger and with greater amenities, raising housing prices (Lehe, 2018). A study of Los Angeles argued in the same vein that the removal of parking minimums from housing in historic refurbished office buildings may not only have contributed to the development of more housing, but also incentivized the development of smaller, cheaper units (Manville, 2013).

Ground floor retail requirements can inhibit development. Ground floor retail typically requires ceilings of 15 to 17 feet, much higher than the typical 9 to 10-foot requirement for residential housing, along with glass fronting, incurring higher construction and labor costs (MacDonald, 2016). This study suggests ground floor retail requirements may significantly affect project feasibility in areas where retail rents are below residential rents, and foot or vehicle traffic is not present.

Discretionary approval procedures can add significantly to the costs of development. Permitting procedures consist of all ministerial actions conducted by local governments that are necessary for project approval, including design review, environmental review, plan check, and building permit application approvals. These procedures have been shown to contribute significantly to the cost and project approval time in California. Coastal communities in California take about 2.5 months longer, on average, to issue a building permit than California inland communities or the typical U.S. metro area community, seven months compared to four and a half months (Legislative Analyst's Office, 2015). Typical approval time is over a year in San Francisco, and over eight months in Los Angeles (ibid). Permitting time significantly affects costs for developers, and as costs of delay compound over time, can make a project infeasible. The cost of uncertainty can be equally or more significant to developers, further causing some projects to become infeasible.

Conditional use permits (CUPs) and planned unit developments (PUDs) are one form of conditional approval, requiring a developer to get approvals from the local planning commission and possibly city council to be permitted. Traditionally, CUPs and PUDs are used to address unforeseen issues that a new use of a property may cause. Without the CUP or PUD process, a city might not have the power to compel developers to make changes (MacDonald, 2016). However, eliminating CUPs and PUDs can have positive effects, as development approval processes sometimes result in protracted negotiations and draw opposition from surrounding neighbors seeking to prevent development. In such cases, eliminating discretion and providing for "by-right"

development, so long as a project meets basic stipulated standards, could facilitate lower-cost and even possibly more equitable housing development (ibid). Over 70 percent of California jurisdictions allow by-right development in some cases, but mainly for single-family homes and small multi-family projects—not the sort of projects that could enhance density significantly (Mawhorter et al., 2018).

Permitting time is also indirectly regulated by cities through the number of staff allocated to completing plan checks, doing design review, working with developers through the approval process, providing access to the Planning Commission, and permit processing (MacDonald, 2016). The more staff that a city allocates to the process, the cheaper development becomes for the developer. Some cities provide expedited processes for a fee. Some developers hire consultants to achieve faster approval.

Another significant contributor to the time needed for development approval is environmental review required under the California Environmental Quality Act (CEQA). CEQA requires that all development projects and plans be analyzed, and, if feasible, mitigated for negative environmental impacts. Various streamlining mechanisms are available under CEQA that can make review less onerous for certain types of projects, but unless development is permitted "by right," CEQA still introduces an element of uncertainty. A city or its residents may use the CEQA process to slow or impede unwanted redevelopment. If a project is challenged under CEQA, additional delays and other costs (e.g., litigation) are incurred. Thus, streamlining CEQA review and making the process more predictable has the potential to increase housing supply.

Typical approval time for a project in California reflects these contingencies. Projects consistent with a city's general plan and zoning regulations generally are approved in under six months; projects that require a conditional use permit or variance take slightly longer; projects that require a general plan or zoning amendment take six months or more, and projects that require full environmental review take double the typical time (Mawhorter et al., 2018). Based on interviews with Bay Area developers, MacDonald (2016) found that completing a full-blown Environmental Impact Report (EIR) can take 12 to 24 months and cost $300,000 to $1 million, depending on the size of the project. Another study of CEQA review in the state's ten largest cities between 2004 and 2013 showed that projects requiring an EIR required, on average, about 2.5 years to approve (Legislative Analyst's Office, 2015).

Specific Plans, although they can be costly and time-consuming for localities to prepare and adopt, can speed permits for housing development. Specific Plans are developed for specific neighborhoods to stipulate standards such as density, mix of uses, parking requirements, and urban design. Specific Plans are usually expensive and time-consuming for a city to develop, requiring the completion of an Environmental Impact Report as well as often involving extensive community input. The benefits can also be substantial, however. As part of completing a Specific Plan, a city must complete an EIR, and CUPs and PUDs are often eliminated. The adoption of a plan subsequently enables developers requiring discretionary project approval to avoid having to complete the full environmental review process within the Specific Plan area, as long as they comply with the mitigations set forth in the plan. This streamlining process can reduce development costs substantially, while the plan development process can also provide community residents and stakeholders with an opportunity to

participate in envisioning and protecting the community's values and development priorities (MacDonald, 2016).

Corridor-based or regional planning coordination helps support successful development outcomes. Various scholars argue for the importance of planning processes and coordination, in addition to regulatory mechanisms, in yielding hoped-for development outcomes, though this literature often focuses specifically on transit-oriented development. Suzuki, Cervero, and Iuchi (2013) and Carlton and Fleissig (2009), for example, argue for the importance of planning at the corridor and regional scales, and not just the single station area scale. Carlton and Fleissig argue that ideal TOD policies, when applied only at the station level, can sometimes kill project feasibility. Similarly, Suzuki and co-authors found that TOD planning has been more likely to result in actual construction when undertaken through a corridor-based and regional, rather than individual station-based, approach. However, integrated planning is made more difficult by fragmentation among different agencies responsible for development policy, even within a single local jurisdiction.

3.1.2 Housing Supply Impacts on Housing Location and Affordability

As housing affordability concerns in California have coincided with policy interest in supporting sustainable transportation, state policymakers have considered how to support more housing production near transit, to help ease housing supply pressures while also increasing transit use. For example, a controversial proposed legislative bill, Senate Bill (SB) 50, would have systematically upzoned areas near high-quality transit stations statewide, while also requiring provision of affordable units for new construction. SB 50 met with negative reaction and concern about the loss of local control over land use choices, and the belief that housing production would cause gentrification and lead to displacement of low-income residents.

Other strategies for minimizing displacement could include introducing upzoning in places where renters are less likely to be currently living, such as single-family areas with high homeownership rates, and through implementing strong renter protections and measures such as a progressive tax on real estate transfers (Manville et al., 2020).

Research shows that new housing developments neither increase nearby housing costs nor lead to gentrification. A body of fine-grained research tracking the production of market rate housing and its effects on rents and displacement demonstrates that new development reduces regional and local housing costs (Phillips et al., 2021). That said, the cost of new housing in an area with as deep an affordability crisis as in California will almost inevitably be high. New housing must be sold or rented at a price which will cover its development costs, unlike older housing. And housing prices everywhere in the state have been pushed up thanks to decades of downzoning to single-family housing. This zoning practice, rooted in over a century of explicitly racist and classist exclusionary practices and tactics to preserve single family home values (Fischel, 2005; Lens, 2022; Mohorčich, 2023), has left large swathes of the state without reasonable housing options for poorer households.

Understanding the effects of increases in the housing supply in this setting of deliberate scarcity, meant to maintain home values for existing wealthy and white homeowners while marginalizing and limiting residential

options for lower income residents, requires untangling three issues which have different impacts on housing prices:

1. Added supply of housing *reduces the cost of existing metro-level housing* stock
2. Newly produced housing *itself is expensive,* compounded by a setting of artificial scarcity created by privileged groups, meaning *all* housing prices have continuously soared for decades
3. New housing may have a *local amenity effect*, leading to the opening of new businesses or other changes in non-residential aspects of a neighborhood, such as increased commerce or more green space, which some argue raises overall housing costs as the location becomes more "attractive."

These three potential effects can be expected to influence housing costs in different directions and by different magnitudes depending on location and have historically been difficult to measure. One widely prevailing assertion, sometimes deployed by privileged groups in order to justify exclusionary practices (Been et al., 2019; Manville, 2021a), is that market rate housing does not help low- and middle-income groups, and that new housing production causes local gentrification (Mohorčich, 2023). Such a claim is predicated on the assumption that the amenity effect of a new housing development (which could increase the price of housing in the neighborhood) outweighs the supply effects of that development (decreasing the price of neighborhood housing). A robust and growing body of evidence shows that the amenity affect assumption is empirically incorrect (Phillips et al., 2021). Amenity effects have limited or no impact on housing costs or displacement, according to the available evidence. (Note also that the deconstruction of such claims to reveal their embedded racial and class politics, and the use of progressive language by interests dedicated to neighborhood exclusion, is quickly developing its own literature [see Manville, 2021b; Mohorčich, 2023; Nall et al., 2022].)

Evidence increasingly shows that the market shortage of housing raises housing costs for all residents and leads to the replacement of low-income with higher-income residents, across most of the state. These higher-income buyers out-compete low-income residents for the limited, static supply of old housing stock, regardless of the age or quality of the units or of local amenities. Below, we discuss these studies and research findings on the production and pricing of housing at city-wide or regional scales, and then focus particularly on questions of displacement and gentrification locally. That is, we look at the research on the spatial questions of where and how housing-permissive policies should be adopted, and how to maintain and increase housing affordability both near transit and elsewhere.

At the city and regional scales, the research is clear: more housing supply, even at higher price points, reduces overall housing costs. The development of more housing within a city or region reduces housing costs regionally, even if new housing units are high-priced (Phillips et al., 2021; Zuk and Chapple, 2016). The evidence for this is extremely strong, based on a large body of research and multiple meta-analyses (Been et al., 2019; Gyourko and Molloy, 2015). Just a sample of studies from California, the U.S. and globally can be discussed here.

The process by which this occurs is usually termed "filtering"—expensive housing becoming cheaper housing over the course of decades, producing "naturally occurring" affordable housing. This process is often slow,

though Rosenthal (2014) finds that the rate is approximately three percent per year of rented housing and 0.5 percent per year of owner-occupied homes. About 19 percent of units affordable to low-income renters in the U.S. in 2013 were unaffordable as few as eight years previously (Rosenthal, 2014). When the supply of housing is limited and only small amounts of new housing are being produced, there is a higher likelihood that all locations and types of housing may rise in value regardless of their age or quality. In addition, owners of rental units have more incentive to upgrade and raise prices even on old units when supply is limited and rents are high (Been et al., 2019; Zuk and Chapple, 2016). A study from Victoria, Australia found that housing filtered *up*, with buyers out-earning sellers in locations with a constrained supply of housing, and filtered *down*, to lower-income buyers, when supply constraints were removed (Hansena and Rambaldib, 2022).

A faster and more important process than filtering is also at work: the production of new housing removes pressures on low-priced units by high-income groups (Been et al., 2019; Mohorčich, 2023). Submarkets for housing exist in all locations to different degrees, but as affordability crises deepen, these sub-markets increasingly dissolve into one another. As fewer new housing units are built while population growth continues, groups initially in the market for high-end and particularly mid-range housing will be priced out and turn to competing with lower-income groups for (initially) lower-priced homes. These lower-income renters, and eventually homeowners, can be displaced first from high-demand locations, which are often those well positioned with regard to jobs, services, and other destinations, and then from the region entirely (Been et al., 2019).

Such effects may take hold in months, rather than years. Looking at rental costs across Germany, Mense (2020) employed a quasi-experimental method which examined weather-induced delays in the construction of new rental housing to identify random variations in the monthly amount rental housing coming on line. He found new market-rate rental housing reduces rents across the spectrum of the rental market, with every one percent increase in the total stock of rental housing reducing rents 0.4-0.7 percent both at the district level and in the specific municipality, with the effects strongest in the month new units are opened.

Bratu et al. (2021) studied new market-rate housing in downtown Helsinki, Finland, examining demographic information for each household which undertook a move (Bratu et al., 2021). They found that the occupation of high-end new units leads to direct “moving chains,” which reach middle- and low-income neighborhoods within 1-2 years. Critically, Bratu et al. compare the chains of moves set off by the construction of market rate housing with those set off by rent-controlled units developed in the same central location. They found that 100 units of new market rate housing opens 60 vacancies for households in the bottom 50 percent of households within just two years, as compared to 75 vacancies opened by 100 units of social housing. This effect is quicker and reaches more low-income groups than corresponding processes in U.S. cities, as found by Mast (2019) (discussed further in the next section). The Finnish authors conclude this difference is due at least in part to greater income inequality and segregation in the U.S. (Bratu et al., 2021).

The deeper the gap between need and supply in a given market, the weaker the effect of moving chains and looser markets will be, as the total deficit of new housing needed is greater. The high cost of new housing would appear to play a role, but in fact it is only that *all* housing prices continue to rise regardless of sub-

market. Lower-priced units often see more extreme price inflation, as these units now move up the price ladder, even as they age (Manville, 2021a; Zuk and Chapple, 2016). Zuk and Chapple (2016) show, for example, that neither subsidized nor market-rate housing production had as strong an effect in stopping displacement in San Francisco as it did in the wider region, where the housing market is not as tight.

In contrast to San Francisco, a study of the effect of new market-rate, multi-family construction in Minneapolis (Damiano and Frenier, 2020), found that new units lowered the rents for expensive and mid-priced units immediately adjacent (i.e., ones comparable to the new units opened) but had a limited effect on less expensive housing units. This may show a more effective disaggregation between submarkets in Minneapolis, implying the construction of subsidized housing to complement market-rate units would be useful in stemming displacement and providing for housing needs.

New housing construction and neighborhood change do not necessarily lead to displacement. Only recently have scholars begun specifically to investigate the effects of developing housing on the cost of existing stock immediately within a neighborhood, and on displacement of households living there. The previous section discusses regional, overall effects of housing shortages. Does new, market-rate housing in a given location raise adjacent housing costs and displace lower income residents? A set of detailed recent studies find that new market-rate housing does not lead to higher local rents, and often leads to lower rents, with supply effects overwhelming any amenity effect (Phillips et al., 2021).

New housing is usually priced higher than existing housing units in the same neighborhoods. It is possible that in some cases an influx of new residents may change the perceived desirability of the neighborhood to other higher income people, causing the market prices of existing housing to increase. Wherever the market value of land is suppressed by zoning constraints, upzoning allows the market value to be expressed, if the land can be more intensely developed in concordance with the higher allowable density. Some scholars have argued that the resulting redevelopment can price out lower-income renters; alternatively, by increasing supply, and applying inclusionary policies like density bonuses for affordable housing, upzoning assists low-income renters in the long run (Pough, 2018).

A few studies specifically on California are available. One study showed that between 2000 and 2013, low-income San Francisco Bay Area census tracts where more market-rate housing was built experienced considerably less displacement than other tracts, regardless of a community's inclusionary housing policies (Legislative Analyst's Office, 2015). Another study by Chapple and Zuk (2020) used multiple measures to identify gentrification and displacement in Bay Area census tracts in 1990, 2000, and 2013. The study found that about 10 percent of the tracts gentrified between 1990 and 2000 and about the same share between 2000 and 2013. About half the tracts that gentrified were in TOD zones, areas located within one-half mile of a fixed-rail transit station. But local change did not always equate to displacement. After accounting for demographic and socio-economic characteristics of the neighborhoods, as well as for core city location (in the region's three major central cities), and tenure, individuals in poverty made up a higher rate of those moving into core city TODs, although not into non-core city TODs. Outside of the three major cities, TODs were more likely to lose low-income households from 2000 to 2013, but TOD neighborhoods in the three major cities

were more likely to gain low-income households, which the authors determined might reflect growth in subsidized housing in those neighborhoods. Neighborhoods with a high proportion of renters were more likely to lose low-income households, whereas minority neighborhoods were more likely to gain.

A problem in disentangling the effect of additional housing construction at a local level is that more housing is likely to be developed in locations where housing prices are already on the rise. A recent study of San Francisco therefore considered only locations where new housing was built essentially at random, by restricting the analysis to lots redeveloped after fires (Pennington, 2021). These locations saw a decreased likelihood of displacement following the addition of more housing. There was a 17 percent reduction in the risk of displacement of residents to lower-income census tracts within 100 meters of new construction, and rents adjacent to these market-rate developments were two percent lower compared to the city-wide trend over the same time. This occurred despite increases in commercial turnover and new business openings—that is, neighborhoods *did* change, spurred by new construction, but this *did not* lead to displacement of existing residents (Pennington, 2021).

Asquith et al., in a 2019 study of multifamily housing developments of over 50 units in low-income areas across eleven major U.S. metro areas, found an average reduction in nearby rents of five to seven percent. This was seen both on immediately adjacent blocks and in the larger neighborhood, reducing area rents and drawing more movers from low-income, rather than high-income neighborhoods (Asquith et al., 2019). Li (2019) analyzing new housing developments in New York, similarly found that that for every 10 percent increase in the housing stock, rents within a 500-foot buffer decreased one percent and sales prices decreased. This effect, as in San Francisco, occurred despite an increase in amenities, such as new restaurants, indicating that any potential local increases in price caused by these new amenities was outweighed by the price-lowering effects of increased supply.

A study by Mast (2019) investigated the impact of new market-rate construction on the market for lower-cost housing across multiple cities. This study traced the impacts of new construction, finding that it reduced demand and loosened the housing market in low- and middle-income areas. Specifically, the study found that building 100 new market-rate units led to between 45-70 people moving out of below-median income tracts and 17-39 leaving bottom-quintile income tracts, creating 70.2 equivalent units in below-median income tracts, almost all within a five-year period. This finding suggests a significant amount of local downward pressure on prices from adjacent, newly constructed units; promoting new construction may lead directly to reduced demand for existing housing in low-income areas.

3.1.3 Zoning Impacts on Affordability, Equity, and Climate

Single family zoning is predominant, reducing affordability and density. The extraordinarily high prevalence of single-family housing zoning in the United States means that housing is undersupplied, the effects of which are discussed above (Levine, 2010). Studies find that single family zoning limits housing supply and raises prices, with California cities in particular producing inadequate housing to meet demand (Glaeser and Gyourko, 2002; Quigley and Raphael, 2005; Saiz, 2010; Jackson, 2016). Single-family zoning has direct and widely attested racist and classist origins, meant to preserve segregation and simply price out anyone not able to afford, or

interested in residing, in a single-family home (Lens, 2022). It constitutes, even compared to other forms of constraining residential regulation, what Pendall describes as "a scorched-earth effect on access by low-income people to privileged communities" (Pendall, 2021).

This exclusionary strategy was built on, and then compounded over decades, by the inherently low density and limited amount of housing that can be produced under this zoning, driving up prices and reinforcing the exclusionary spiral. As studies of the history of race and property in the USA show, this helped create and maintain the white spaces which are seen by some scholars as one of the key mechanisms of the production of white supremacy and hierarchical racial identity; a confluence of property ownership, wealth and orderliness that partly constitutes white identity (Goetz, 2021; Harris, 1993).

As explicitly racial housing practices enacting segregation were stuck down over the course of the 20th century, structural or institutional racism, rather than overt racism, came to dominate the housing landscape. Bullock and Rodgers (1976) characterized the mechanisms of structural racism as "freezing" and "mapping," creating racially neutral spaces which were impossible for new entrants to breach. The argument is that white homeowners, supported by the judicial system, transmuted overt segregation into a status quo where preserving private (white) home values rationalized overriding neighboring property rights such as what could be built or who could move in (Dickerson, 2020; Williams et al., 2023).

Empirically, low density (single-family) zoning is correlated to higher racial segregation into the present, even when controlling for other zoning and regional characteristics (Rothwell and Massey, 2009), and, in an experimental study, low vacancy rates contributed to anti-Black discrimination in housing applications (Hanson and Hawley, 2014).

Single-family zoning is extremely prevalent even in high-cost coastal California. About two-thirds of land in California local jurisdictions is zoned for single-family housing, and less than one quarter for multifamily housing, even in central cities (Mawhorter et al., 2018). Even in San Francisco, with some of the world's most valuable and productive land, the share of residential land zoned for single-family development is about 38 percent. In Los Angeles, the share is 70 percent, and in San Jose it is nearly 90 percent (Manville et al., 2020). In prosperous suburban areas, single-family zoning is nearly ubiquitous. Considering even relatively dense locations like SoHo in New York City, Mohorčich (2023) identifies resistance to change and exclusion of new residents from a high-opportunity, well-located area. Considering this landscape in starkly material terms, he posits such politics reinforce that "rent is power" and that "new housing…is one of the longest levers for shifting power from those who own stuff to those who rent stuff."

Single-family zoning regulations suppress the regional market for higher density and less auto-dependent housing development by limiting the amount of land available for such development (Levine, 2006). Furthermore, multi-family construction is often subjected to zoning standards similar to those applied to single-family, with regard to such standards as height limits, minimum lot dimensions, and setbacks, which makes developing multifamily housing much more difficult (Mawhorter et al., 2018). Multifamily housing construction was historically prevalent in California early in the 20th century but began to decline with the widespread adoption of single-family zoning by mid-century (Elmendorf, 2019).

Market interest in multifamily housing has grown in California in recent years. After comprising generally below one-quarter of all housing permits issued annually in the state during the 1990s, the multifamily share of permits began growing in the 2000s and has exceeded half of annual permits in most years since 2010 (calculated from U.S. Census Housing Permits Survey). An indication of the potential new development that might be induced near transit through upzoning can be gleaned by reviewing recent research conducted to estimate the potential impacts of SB 50, the proposed legislation discussed earlier. One study found that SB 50 would have increased market-feasible housing development capacity in the Bay Area nearly fourfold, from 730,000 to 3 million units (Baron et al., 2018). Another study found that while 40 percent of current housing capacity in areas that would have been affected by SB 50 was in neighborhoods at risk of or already experiencing gentrification and displacement. Under SB 50, the share would have dropped to 34 percent, because an estimated 85 percent net new capacity would have been added into moderate- and high-resource areas, improving housing integration by income (Cash et al., 2019).

Removing single family exclusionary zoning does not by itself solve these problems, because it may also be accompanied by stricter development requirements such as minimum heights, maximum density, affordability requirements, or parking maximums (Einstein, 2021; Goetz, 2021). Stricter new regulation can be weaponized as a means of exclusion: by creating onerous and expensive requirements for any new units of housing, exclusionary cities can ensure dense housing cannot be feasibly built, while paying lip service to inclusion (Manville, 2021a).

Over the last century, the proliferation of single-family zoning means that locations where new construction can be undertaken are limited, so that current residents, primarily homeowners, hold significant power to pick and choose what gets built, even in the small areas where the locality nominally permits higher densities. Even when developers are able to meet development requirements, existing landowners are able to leverage scarcity of upzoned land and potential sites of development into a windfall, further raising the cost of the new housing for the few eventual residents (Phillips, 2022).

Using data on participation in public meetings across Massachusetts that allows identification of commentators' demographic characteristics and residences, Einstein states that "there was not a single community in which [existing] land-use institutions empowered the socioeconomically disadvantaged or underrepresented minorities." Participants were substantially more likely to be homeowners, older, white and male, and they overwhelmingly opposed all new development (Einstein, 2021). In a recent study of Californian's support or opposition to housing construction, Manville (2021b) likewise finds that homeowners were more likely to resist more housing, including affordable housing, even if they otherwise held liberal positions.

Similarly, Wynes and Matthews (2023) find significantly lower support for higher density and additional housing among local homeowners in Canada, even as these residents voice higher support for climate action and low-carbon transport policies. This adds support to the "homevoter hypothesis" (Fischel, 2005), which posits that local policy preferences are often dictated by homeowners who believe they need to preserve the growing value of their homes. The incursion of lower-income residents or people of color which allows the

possibility of neighborhood change, in this instance, is understood by homeowners as potentially lowering the value of their homes.

This phenomenon has been observed across both suburban and dense urban settings. Gabbe (2019), analyzing San Jose, Sunnyvale and Santa Clara—some of the most expensive cities for homeowners or renters in the country—finds that San Jose upzoned only 0.6 percent of its land over a decade (2006-2016), and smaller towns even less. Furthermore, San Jose downzoned almost as much land, 0.5 percent, over the same period. Los Angeles upzoned just 1.1 percent of its land in 2002-2014, and upzonings were especially unlikely in locations with high homeownership and good schools (Gabbe, 2018). Been et al. (2014) show that in 2002-2009, even New York City was likelier to downzone than to upzone parcels, and downzoning was likelier in locations where home ownership was higher, and which were predominantly white. Unsurprisingly, as this limited upzoning was concentrated in less-white locations, a separate study found the upzoned areas were likelier to gain more white residents, especially if they were close to existing concentrations of other whites (Davis, 2021).

A study of the Boston area, considering zoning differences between jurisdictions, finds that more units were produced under more permissive zoning regimes, and that this lowers both rents and home prices (Chiumenti et al., 2022). The strongest effects were in both allowing multi-family buildings and in loosening height and FAR (floor-area ratio) restrictions, reducing rents up to 12 percent and monthly home-owner payments up to nine percent on either side of a jurisdictional border, while inclusive housing ordinances were shown to have much more limited effect. As with Einstein's findings (above), the study found that towns with representative, town-meeting style governments were the most restrictive. Similarly, in New Zealand, a study found that upzoning large parts of Auckland reduced housing prices in upzoned parcels which were intensively developed (i.e., with a higher density of houses) and that housing prices on non-upzoned parcels and those that remained underdeveloped increased (Greenaway-McGrevy et al., 2021).

Single family zoning does not allow the development of multifamily units even as property values increase, and as properties are expanded and renovated, change hands, and accrue profits (Manville, 2021a). Often, no affordable housing can be built at all in areas zoned only for single-family housing as single-family zones also usually ban cheaper construction options like prefabricated homes or ADUs (Kaul et al., 2021).

Summarizing liberal Californian's ambivalent positions on local housing and affordability, Manville concludes, "almost all subsidized housing is multifamily, so dramatically expanding it in expensive coastal areas might well require the same zoning reforms—and trigger the same opposition—as expanding the housing stock more broadly" (Manville, 2021b).

Another way to analyze single family zoning is in terms of the "zoning buffer"—the gap between the existing amount of housing, and the number of units if every permissible unit was built. In 1960, for example, Los Angeles had 2.5 million residents and zoning that could, if it were all built out, accommodate 10 million residents: a four-fold, or 300 percent, zoning buffer. Following decades of downzoning, the population of Los Angeles is just over 4 million, while its building potential has been reduced to 4.3 million (a zoning buffer of 13%). With a bigger zoning buffer, each upzoned parcel is less valuable, and development can take place both widely and relatively cheaply. When the zoning buffer is thin, and concentrated in just a few locations, those

controlling and benefiting from ownership of the land can leverage it for profit, increased home values or continued exclusion, by passing on those high costs to new residents (Phillips, 2022).

Single family zoning is also a major contributor to climate change. Single family zoning, by definition, produces high land consumption, high residential power use, greater energy costs in the provision of infrastructure and services, and more intensive waste production and runoff (Pendall, 2021). Single-family zoning also means greater GHGs in transportation, both in terms of higher reliance on personal vehicles, and in terms of the GHG impacts of more sustainable transport options, which is explored more thoroughly in the following sections of this report. These high costs are intrinsically not borne by the residents of single-family zoning. Instead, they are externalized and borne by areas which have not been powerful enough to build the protective walls of single-family zoning—locally, nationally, and globally (Berberian et al., 2022; Islam and Winkel, 2017; Kaufman and Hajat, 2021; Pendall, 2021; Pulido, 2000).

Densifying neighborhoods only around high-frequency transit focuses controversy and opposition to densification, and also to gentrification and displacement, along those transit corridors. In Los Angeles, an anti-growth resident group sued the city over its Transit-Oriented Communities (TOC) program, claiming that it illegally rezones parts of the city. Concerns have also been raised that the TOC program, as well as the controversial state legislative bill SB 50, would lead to the displacement of low-income, communities of color.

Inclusionary zoning or incentive zoning policies are increasingly being used in concert with upzoning to attempt to increase production of affordable units near transit. Land values and rents near rail stations tend to be higher, making affordable housing more difficult to develop in the first place. Higher market-rate rents mean the opportunity costs to developers of providing affordable leases are higher and affordable housing requires a higher subsidy. A study in Los Angeles (Boarnet et al., 2017) found that landlords soon preferred to opt out of initial affordability covenants, absent a regulatory requirement to maintain the affordable housing, but that affordable housing developed near rail stations did reduce low-income households' auto use and appeared to slow the pace of gentrification.

Los Angeles' TOC program is one example of a program that includes inclusionary housing policies. The program was established as the result of the passage of Measure JJJ in November 2016, which established inclusionary housing requirements citywide, and called for the planning department to develop an incentive program for affordable housing near transit. Development projects of ten units or more seeking a density increase above 35 percent are required to provide affordable units, or pay an in-lieu fee, and meet labor and wage standards (Stein, 2019). By contrast, the voluntary, incentive-based TOC density bonus program operates like an augmented version of the state-mandated density bonus law, which does not trigger the mandatory inclusionary requirements, because it operates upon existing zoned density limits.

The Los Angeles TOC program tailors incentives and affordability requirements according to four tiers, based on distance from and quality of the adjacent transit. The highest affordability requirements, along with the deepest incentives, which include density increases up to 80 percent, are offered to projects closest to transit. Parking requirements are reduced to 0.5 spaces per bedroom for more distant projects, and no residential parking is required for housing projects closest to high quality transit. For projects only seeking a density

bonus, a FAR bonus, or a parking reduction, by-right approval is provided, meaning no approval vote is needed by the planning commission or city council, and no CEQA review.

The adoption of the two JJJ inclusionary programs—the mandatory portion triggered when projects of 10+ units seek a zoning change or General Plan amendment, and the voluntary, incentive-based TOC component that operates only for projects near transit—has provided a sort of natural experiment for evaluating how program design affects housing project applications, both for market-rate and affordable units. The upshot is that the TOC program has been very effective in inducing new applications, including both market-rate and affordable units, compared to either the state density bonus law (previously in effect in Los Angeles) or to the mandatory component of the JJJ inclusionary requirements.

Prior to the enactment of Measure JJJ, projects later made eligible for JJJ provisions accounted for a significant portion of Los Angeles' new housing production—between 2016 and 2017 they accounted for more than 19,000 proposed residential units (Sharp, 2019). However, by largely eliminating the ability to make zone changes and general plan amendments, Measure JJJ contributed to a notable reduction in applications for new homes where its provisions applied, with developers citing the mandated prevailing wage requirement included in the JJJ provisions as the primary culprit (LAplus & Real Estate Development & Design Program, UC Berkeley, 2018).

From 2017 to 2019, permits for both market-rate and affordable units were up in Los Angeles, and the TOC program appeared to have played a role, with more than 27,000 new housing units permitted under the program since its inception (Linton, 2020). About one quarter (24%) of the discretionary units approved were affordable (deed restricted). In 2019 alone, more than 14,500 new units—42 percent of all proposed housing in the city—had been proposed through the TOC Program.

The TOC program shows that a carefully designed density bonus program can include inclusionary requirements. But the program also begs the question how much more housing might be produced in Los Angeles if zoning were systematically de-regulated citywide, rather than only in transit-proximate areas, and if parking requirements were also systematically de-regulated, rather than only offered as an inducement for building affordable units.

3.1.4 The Built Environment and Household Travel

One of the key goals of California state policies in recent years has been to encourage better integration of land use and transportation planning, to improve housing affordability and supply while also reducing reliance on the car. Hundreds of empirical studies have studied how the built environment influences travel, particularly the extent to which households choose sustainable transport modes like carpooling, walking, cycling and public transportation over the single-occupant personal vehicle.

However, studies find that most built environment characteristics have modest effects on travel compared to other factors, such as socioeconomic characteristics. A number of meta-studies (Aston et al., 2020; Ewing and Cervero, 2010; Stevens, 2017) summarizing the findings of over 100 studies from around the world conclude that the built environment factors most commonly studied—including density, mixed land uses, walkability,

distance to transit, jobs-housing balance, and transport accessibility—affect VMT and transit use only to a limited extent, especially when the factors are evaluated separately and at the local scale.

Other research underscores the importance of considering physical effects in combination and at a larger spatial scale beyond the neighborhood (Bento et al., 2005; Boarnet and Wang, 2019; Chatman, 2008; Ewing et al., 2015; Gallivan et al., 2015; Guerra et al., 2012; Kim and Brownstone, 2013; Suzuki et al., 2013). But almost all studies have failed to consider some of the most important factors in influencing travel, such as road supply and the availability of parking (Chatman, 2013). The key elements of the built environment found to influence travel behavior include density (of population or employment or both), mixed land uses, proximity to transit, street design (often measured as intersection density), accessibility (often measured as distance to a central business district (CBD), or number of jobs or other attractions reachable within a given travel time or distance, sometimes using a gravity measure to weight for distance), and perhaps most importantly, parking availability.

Two meta-analyses identified and compared the effect of built environment characteristics on travel behavior (Ewing and Cervero, 2010; Stevens, 2017). Both studies concluded that the relationships between travel and the built environment examined were modest, although parking availability was not included. In these meta-studies, the variable most strongly associated with auto use was large-scale accessibility. In the Ewing and Cervero meta-analysis, the correlation of "job accessibility by auto" with VMT was found to be nearly as large as that of population density, mixed uses, and street network characteristics combined. Equally strongly related to VMT was another measure of accessibility, the distance to downtown. Proximity to transit had a relatively weak average relationship with VMT.

This is all the more notable for the fact that none of the studies included in the Ewing and Cervero meta-study had controls for parking availability. A later study that did control for parking availability as well as transit service density found that proximity to transit had no statistically significant relationship with auto ownership or auto trips when parking availability was controlled (Chatman, 2013). Stevens (2017) also found that the variables with the largest influence on auto use (as measured by vehicle distance traveled) were the distance to downtown and job accessibility by auto, though the estimates did vary.

A further complication is how to control for the fact that households with a pre-existing preference for particular travel modes (e.g., public transit) may choose to live in neighborhoods with characteristics (e.g., rail station access) that facilitate use of those modes, an effect called "self-selection." Analysis of built environment influences on travel behavior that fails to correct for self-selection is potentially biased, for example if higher walking propensity is attributed to the pedestrian-oriented environment itself, rather than individuals who prefer walking choosing to live in such a neighborhood. Studies that have corrected for self-selection indicate that this phenomenon does attenuate built environment effects on travel outcomes, but research findings also demonstrate "resounding" evidence of statistically significant associations between the built environment and travel behavior, independent of self-selection influences (Cao et al., 2009).

Other basic challenges in conducting and interpreting research findings relate to how built environment measures are defined. For example, evaluating the relationship between development density and travel is made problematic by shifting and inconsistent definitions of density across different studies (Chatman, 2008).

Interpreting findings is further complicated by confusion in hypothesizing potential causes and effects. For example, density could have different hypothesized effects on travel, as shorter distance to destinations might reduce VMT, but might also encourage making more trips. Indeed, Stevens' 2017 meta-study finding that once self-selection was accounted for driving in mixed-use areas actually increased supports this possible interpretation (Stevens, 2017).

This problem is further complicated by the fact that many studies fail to account for interactions and synergies between built environment variable effects. Treating built environment variables as independent creates the risk of either overestimating or underestimating their influence. If two or more built environment factors are closely correlated, then omitting one from the analysis could lead to overestimating the independent influence of the modeled factor (a proxy effect). Alternately, omitting built environment factors and failing to account for their interactions could also lead to underestimating synergistic effects—when factors together may produce a total effect greater than the sum of each independent effect.

The disparate findings of Ewing and Cervero (2010) and Stevens (2017) reflect these concerns and deficiencies. The studies that were evaluated for their meta-analyses differ substantially in terms of which built environment variables were tested and how many, and whether they controlled for self-selection, among other methodological distinctions. Of the 37 studies included in Stevens' meta-regression, only twelve included at least three built environment variables in the analysis; only one of the twelve also controlled for self-selection. Fourteen studies only tested a single built environment variable. Furthermore, few of the studies explicitly investigated overlaps (proxy effects) or synergies (positive interaction effects) among built environment variables.

Thus, although it may be common practice to do so, analysts should not simply interpret elasticities calculated for separate built environment variables as representing independent effects, after controlling in a consistent way for the others. This caution is confirmed by examining reported elasticities for VMT in respect to density for the studies included in Ewing and Cervero's meta-analysis (facilitated by their reporting of elasticities for each built environment variable in each study investigated). The reported elasticities for density can be seen to be generally notably higher (stronger) in the studies that failed to control for other built environment variables than in the studies that did so. Two studies included in Stevens' sample that were conducted in North America corroborate this conclusion, by employing explicit methods to examine overlap relationships (Boarnet et al., 2003; Heres-Del-Valle and Niemeier, 2011). These studies entered built environment variables in stages, while also controlling for sociodemographic characteristics of travelers, allowing for examination of proxy effects. Both studies showed that adding other built environment variables in addition to density cut the elasticity of density significantly, in one study by more than half.

Few of these research studies have attempted to account for such interaction effects and synergies. One study included in Stevens' meta-analysis that does so, while also including multiple built environment variables measured at different geographic scales, and controlling for self-selection, was conducted by Chatman (2008). Chatman decomposed density into three component parts: "built form density" of structures on developed land; "activity density" of the number of local desirable non-work activities; and "network load density,"

measuring the number of potential local transportation system users per unit of transportation network capacity. Using data from an original household travel survey conducted in 2003-4 in two California metropolitan areas, Chatman found that network load density and activity density were highly negatively correlated with vehicle mileage, in a specification that did not include distance-to-CBD. Upon introducing that variable (and an indicator for San Francisco as the nearest CBD), built form density at the quarter-mile radius was found to be strongly negatively associated with mileage, but the coefficients for the other density measures became insignificant. Across Chatman's models for VMT and trip frequency by mode, activity density only gained an independent statistically significant relationship when interaction variables among the three density variables were introduced. Chatman's findings point to the importance of considering interaction effects among built environment variables at the local level, and to the importance of taking regional accessibility (measured in his study as distance-to-CBD) into account.

Some other research that corroborates the value of considering interactions and synergies among built environment variables has utilized a different methodological approach than the commonly employed "D-variable" strategy (employed in Chatman's study just described). This approach, which can be called "neighborhood-type analysis," categorizes local areas according to shared built environment characteristics, and then observes travel patterns for different types. The focus in this approach is shifted from a deductive process aimed at disentangling the separate effects of different built environment factors across multiple study zones to a more inductive one aimed at observing how those factors vary systematically in their relationships on-the-ground, and then considering how travel outcomes vary based on the observed patterns. Neighborhood-type research can capture effects of unobserved built environment variables and synergies operating among such variables even when they are not tested explicitly, and it can thereby account for complexities of locational attributes not fully captured in conventional regression analysis.

Two research studies that attempted to determine whether neighborhood-type indicators could impart information not captured when using only built environment-factor variables measured independently found that they could, even after controlling for more conventional built environment variables, as well as regional compactness and socio-economic characteristics (Ralph and Delbosc, 2017; Voulgaris et al., 2017).

A third neighborhood-type study that corroborates this finding bears more detailed description here, as it comes from California and relies on very extensive data collection. This study by Deborah Salon used travel data for more than 80,000 households obtained from six household travel surveys conducted in California between 2000 and 2013 (Salon, 2015). These were matched to variables representing transport system and built environment characteristics at the census tract level for all tracts in the state. Using cluster analysis for twelve measured built environment variables, Salon categorized census tracts into four types considered most representative on-the-ground, corresponding to Central City, Urban, Suburb, and Rural neighborhood types. Salon jointly estimated models of neighborhood choice (to control for self-selection) and travel distance, for both commute and non-work travel, estimating the models separately by place type to allow for variation between them.

Controlling for socioeconomic status, self-selection, and economic conditions, Salon found that elasticities of built environment variables varied substantially across the neighborhood types with respect to VMT impacts, indicating that not just the level of built environment variables varied across the different place types, but that their estimated effects also varied by place type. This was especially the case for commute VMT, for which elasticities even changed sign (direction) for some built environment factors across different neighborhood types (Salon, 2015). Regarding job access, Salon further found that local job access had a strong negative relationship with both non-work and commute VMT—people drove fewer miles when there were more local jobs. This relationship was not uniform across space or trip types, however, as the marginal effects of job density increases in rural neighborhoods showed a much stronger relationship with VMT than for other neighborhood types, and as the effect of job density approximately doubled in size for commute VMT as compared with non-work VMT.

Salon's findings underscore the importance of considering place attributes in a holistic way, so as to distinguish how different place types function within the urban landscape, rather than assuming that separate built environment attributes operate consistently across multiple locations. Other research has further corroborated the existence of non-linear and "threshold" effects of such variables upon travel behavior across different local areas. Boarnet and co-authors (2011) tested for threshold effects and interaction between local and regional accessibility measures, comparing a measure of local accessibility (local residential density within one-quarter mile of the place of residence) to a measure of regional job accessibility (distance to jobs measured using a gravity variable) to evaluate whether and how they influence VMT, after controlling for a wide set of other built environment and socioeconomic status variables. The authors explicitly tested for non-linear effects of the two variables in question, and interaction between them, noting that, "Almost everything that we know about land use and travel behavior is derived from regional averages, typically from studies that analyze travel diary data for a metropolitan area or larger geographies…the question of nonlinearities, or thresholds, in the land use–VMT relationship has rarely been examined" (p.152).

After dividing detailed travel diary data for the six-county greater Los Angeles metropolitan area into quintiles on two specific built environment variables, Boarnet and co-authors estimated a Tobit regression separately for households in each quintile of two accessibility variables—employment accessibility an population density—and found that employment accessibility was a much stronger determinant of VMT than population density across quintiles, with little evidence of interaction between the two variables. Access to regional employment showed a markedly nonlinear effect on VMT, with elasticities ranging from statistically insignificant to greater than one in absolute value across quintiles of this variable. The impact of employment accessibility on VMT was largest for households in the third and fourth quintiles of the variable, approximately three to four times larger than common elasticities found in the literature and in the full-sample average elasticity from the authors' basic regression. Based on these findings, the authors concluded that "the influence of land use can vary in ways largely overlooked by previous research" (p. 152), and that high employment accessibility locations appear to be fruitful places to direct policy attention.

Another factor to consider is that built environment effects do not just occur in relation to local "place" characteristics that may affect travel behavior, but also relate to wider-than-local accessibility characteristics of

an area. Traditional built environment-travel analysis often does attempt to account for wider-than-local impacts by using measures of accessibility to desirable destinations (especially jobs and shopping opportunities) by car and other modes, particularly transit. However, many of the studies have used local accessibility measures such as counts of jobs or shops within a given (short) distance. In seminal work on this subject, Handy argued that accessibility should be measured both close to home *and* at wider scales to link local and regional spatial structure in analysis of travel patterns (Handy, 1992).

Many subsequent studies have only examined counts of the number of jobs or shops within a given distance from home, failing to distinguish between localized and regional access (Handy et al., 2013). Some work has revealed significantly different effects for accessibility measured close to home and farther away (Boarnet and Wang, 2019; Chatman, 2008; Handy, 1992; Salon, 2015). Handy (1992) and Salon (2015) found that while local and regional accessibility were negatively correlated with non-work VMT when included alone, the relationships sometimes worked in opposing directions (indicating possible substitution effects) when both were tested jointly.

Some have argued that the oft-observed pattern of low estimated impact levels for built environment characteristics on travel behavior reflects the common tendency of researchers to measure effects only at a fine-grained, localized scale, while failing to adequately account for the influence of such factors at a wider, regional scale (Lee, 2015). An oft-cited study that supports this contention was conducted by Bento and co-authors (2005), who analyzed travel diary data from the 1990 Nationwide Personal Transportation Survey (NPTS) in conjunction with urban form measures for 114 U.S. metropolitan areas. The authors employed measures to describe the urban-area transport network, including measures for urban-area road and transit network density, along with a measure of population centrality. A jobs-housing balance measure at the zip code level was also employed. The authors then estimated a two-part model to explain, first, the number of cars owned and second, the demand for VMT conditional on number of vehicles, controlling for socioeconomic status.

The Bento study found that the effects of individual built environment measures tested were significant but small. However, the combined effect of measures of urban form and transit supply was substantial when they changed simultaneously across a metropolitan area. The authors showed this combined impact by simulating the vehicle choices and VMT for all households in the multi-city sample, with measured levels of urban form and transit availability identical to those in each of the six cities. For example, the simulated effect of moving all households from a city with Atlanta's urban form to a city with Boston's urban form was a VMT reduction of 25 percent.

Metro-scale built environment characteristics reflect not just wider-than-local impacts but also long-run impacts that may accumulate over time. For example, improvements in transit service could produce accessibility benefits which induce new ridership through mode-shifting from automobiles (the so-called direct, or ridership, effect of transit), but then lead to development impacts over the long run, if developers are motivated to build new homes or commercial buildings near transit facilities (Gallivan et al., 2015). The new development could lead to further reductions in driving through mode-shifting to transit, but in addition, by

also reducing the need to drive even among non-transit users who live or work near transit stops, facilitated through lower automobile ownership, more biking and walking, and shorter trip lengths and frequencies (ibid).

Gallivan and co-authors (2015) employed structural equation and multi-level modeling of data on travel and land use patterns for more than 300 U.S. urbanized areas in 2010. According to their model, without transit systems to support compact development, gross population densities in U.S. urban areas would be 27 percent lower; and the compactness associated with transit service resulted in an aggregate eight percent reduction in VMT, transportation fuel use, and transport-related GHG emissions, compared to a hypothetical "non-transit" condition. Similar evidence about the importance of transit in the density and compactness of urban areas is presented in a study of agglomeration as a function of transit across all U.S. metropolitan areas (Chatman and Noland, 2014).

Other research has investigated accessibility measured at a wider-than-local but not metro-area scale. A number of studies have attempted to measure what can be called contextual accessibility—considering access not just within a constant, possibly arbitrary distance (radius) from home, but based on patterns of access observed in contiguous territory surrounding a given location. An example of this approach employed by Boarnet and Wang (2019) used data from the 2012 California Household Travel Survey to estimate VMT impacts of accessibility to jobs measured at a distance of both less than and more than five miles from home, and to jobs located both inside and outside of 46 employment sub-centers identified for the Los Angeles region (while also controlling for number of vehicles, income, and size of household, as well as residential density at the census tract level). The authors found that access to non-centered jobs had a larger impact on VMT than access to jobs in employment sub-centers, and that the effect was primarily due to short-distance accessibility (within five miles of home).

Kim and Brownstone (2013) used data from the 2001 National Household Travel Survey to examine the influence on VMT of residential density measured both locally and within the four square-mile area surrounding each census block group. Using a simultaneous equations model to account for residential self-selection, they estimated the impact of residential density on household vehicle usage and fuel consumption. Residential density had a statistically significant but modest influence on vehicle usage, similar to the effect found in previous studies, but the joint effect of local and wider density was much larger.

3.1.5 Review of Key Findings

The preceding discussion underscores the complexity of transportation-land use interactions, which renders research on the subject challenging to undertake and to apply to policy decisions aimed at reducing VMT through linking transportation and land use. However, below, we highlight areas of general consensus in the existing research, as well as areas of disagreement, with implications for policymaking.

The availability of off- and on-street parking substantially increases vehicle ownership and driving. Providing "bundled" (included in rent) parking in residential buildings significantly affects vehicle use. One study found that otherwise identical households without bundled parking were two to three times more likely, depending on the city, to own no cars compared to those living in housing with bundled parking, and bundled parking led

to a 33 percent increase in the household's number of cars (Manville, 2017). A further study found that bundled parking not only increased the likelihood of owning personal vehicles, but also increased driving significantly (Manville and Pinski, 2020). Even when accounting for vehicle ownership, transit use was 56 percent lower for those with bundled parking.

Other studies further corroborate the importance of on- and off-street parking in travel choices. A study of TNC passengers in Denver found that 20 percent chose app-based ride-hailing because of a lack of parking at the destination, also suggesting that ease of, or access to, parking can be a motivation for choosing whether to drive, though in this case the alternative is not transit (Henao and Marshall, 2019). A study of households that won a housing lottery in San Francisco found that the effects of bundled parking raised driving frequency and reduced transit use and walking, regardless of proximity and availability of transit or the neighborhood's walkability (Millard-Ball et al., 2020). Bundled parking, in fact, was the strongest built environment measure in the study in its effects on travel patterns, consistent with Chatman (2013). Furthermore, the study found that a lack of bundled parking had no effect on the probability of employment or on mobility between jobs.

The literature generally supports the theory that denser, mixed land use encourages walking, biking, and public transit. Medium and high-density areas which mix residential and commercial functions, connected by tightly-woven street grids and with provisions for safe and comfortable pedestrian and cyclist mobility, allow residents to make a large proportion of their trips without cars, without reducing their overall access to jobs or amenities. A recent meta-study of land use impacts on transit use found the most significant factors, after controlling for job accessibility and self-selection, to be land use mix, jobs-housing balance, pedestrian connectivity, and commercial density (Aston et al., 2021). This contrasts with low-density, single family housing neighborhoods where commercial areas and services are located at a significant distance from housing. Lower density, use-segregated development makes walking untenable due to distance, which can be further exacerbated by winding, widely distributed street grids with little connectivity as well as a lack of sidewalks and other pedestrian infrastructure.

The literature on the impact on VMT of locating housing near transit is mixed, partly because access to transit on its own provides no guarantee of transit use. Empirical studies paint a complex picture regarding whether, and to what extent and under what circumstances, a neighborhood's built environment interacts with transit access to influence households' travel decisions and VMT. Early research underscored that transit use was associated with higher density development (Pushkarev and Zupan, 1977). The literature on public transit costs and efficiencies often notes that "mass transit needs mass," describing the large role that density can play in the cost-effectiveness of transit (Guerra et al., 2012). Research on Bus Rapid Transit (BRT) stops found that stations with TOD-like features generally had higher ridership than those with limited TOD attributes (Vergel-Tovar and Rodriguez, 2018). Nasri and Zhang (2019), in a study of transit and car trips in the Washington D.C. metro area, found that a trip with a TOD origin or destination had a higher likelihood of being undertaken by transit rather than by car, especially if the destination was located in a TOD area (Nasri and Zhang, 2019).

Some studies of mode choice have further distinguished the impact of local TOD attributes, separate from transit service levels and regional accessibility factors. For example, a study of travel behavior in 15 U.S.

regions found that the likelihood and number of transit trips depends on the diversity and street design of the environment around a household, the share of regional jobs accessible by transit within 30 minutes, the density of bus stops within one-quarter mile of home, and the compactness of the region (after controlling for socioeconomic status) (Ewing et al., 2015).

Renne et al. (2016) similarly looked beyond how transit service levels affected how often people living near transit used it, to consider the impact on their mode choice of built environment characteristics, and regional transit accessibility, measured by distance to the CBD and the share of population and jobs within a given region located near transit (a measure that the authors call the "network accessibility effect"). Considering all housing within one-half mile of fixed-guideway transit stations across the United States (in 4,400 station area locations within 39 metropolitan areas, accounting for five percent of U.S. housing supply and 48 percent of jobs), the authors determined that local area characteristics most strongly associated with transit commuting were land use mix, measured as local jobs-housing balance, walkability, and transit service frequency. However, transit mode share was even more strongly associated with "network accessibility;" a doubling in this network effect yielded a 39 percent increase in the mode share of transit commuting in station areas. In related work, the same authors distinguished between those station area neighborhoods with high density and walkability, which might be considered as exhibiting the full complement of TOD attributes, from other areas merely located within half a mile of a station, which they called "Transit-Adjacent Development" (TAD) (Renne et al., 2016). The authors found that only 33 percent of all station areas nationally had a density of eight units per acre, considered a threshold for supporting transit use, combined with a high walkability score.

Research findings on how transit proximity influences VMT are complicated to discern, even though on a simple descriptive basis, the relationship seems straightforward. For example, households living within a half-mile of a Los Angeles rail transit station drive, on average, 16 miles less per day, take 0.19 more daily rail transit trips, and 0.4 more bus transit trips than households living beyond a half-mile (Boarnet et al., 2017). One before-and-after study from 2017 in Los Angeles, tracking the opening of a new light rail line in stages, found that households who had long lived in locations where rail stations were newly opened (under 1 km away) changed their travel habits and reduced VMT, while those who lived at further distance (1-5km) did not (Boarnet et al., 2017).

A major limitation of the these studies is their failure to include measures of parking availability. In one study comparing households nearer and further to rail stations in New Jersey, Chatman (2013) found that it was attributes *coinciding* with rail proximity, in particular the relative unavailability of parking, the size and age of housing, and local density of amenities, rather than proximity to rail in and of itself, that explained almost all the reduction in driving and car ownership seen near rail stations. Limited parking, smaller units, smaller household size, and density of bus service all had significant effects while proximity to a rail station had no statistically significant effect on its own, only in combination with other factors. In this study, parking availability was by far the factor most highly correlated with VMT.

Development near rail stations tends to command a price premium. The preponderance of research on the relationship between rail access and the price of housing indicates that housing near transit commands a price

premium, in most cases reflecting a demand for the accessibility offered by transit, but in some cases, possibly reflecting planning efforts and infrastructure investments concentrated in those areas. Most of the literature on this subject describes a positive increase in home values in areas close to transit improvements, with the largest premium, approaching 10 percent, near rail. A lower, but still positive, premium also exists for homes within a larger radius (e.g., 1-1.5 miles of transit) (Giuliano & Agrawal 2017); and in some studies, a reduction in value in the radius between two and five miles away (Chatman et al., 2012). Other studies report higher home values in municipalities with rail stations and a decline in property value as distance to transit investment decreases (e.g., 1.5% decrease in property values with every additional minute of drive time to a station) (Armstrong and Rodriguez, 2006; Rodríguez and Mojica, 2009). While few of these studies use the higher-quality repeat-sales method, one study doing so found that price impacts of a new rail line were limited to lower-income neighborhoods and smaller houses occupied by people more likely to use transit (Chatman et al., 2012).

Regional connectivity and built form are likely more important than neighborhood connectivity and built form in affecting VMT. The mixed effects of local built environments on reducing VMT may be explained by the simple fact that very few households are able to remain entirely within their immediate neighborhoods for most of their needs. Even if a neighborhood is walkable and some amenities are found locally, many more destinations, and in particular, sites of employment, will continue to be located at distances requiring motorized travel (Nasri and Zhang, 2015; Srinivasan and Ferreira, 2002).

The influence of the built environment and transit access in reducing VMT is greater for higher income households. A study of TODs in the Los Angeles region found that middle and upper middle-income households ($50-100,000 USD per year) had lower VMT vis-à-vis non-TOD residents in the same income classes, compared to low-income households in and outside of the same TOD areas (Boarnet et al., 2017). The greater relative TOD/non-TOD VMT impact of wealthier households is because wealthier households tend to have greater VMT to start with. Locating new affordable housing near transit thus may not reduce VMT more dramatically in the short-term, compared to locating market-rate housing near transit. However, the authors argued that locating new affordable housing near transit might provide equity benefits and provide better support for the long-term viability of efficiently operating transit systems.

Another California study using data from the California Household Travel Survey and the Nationwide Household Travel Survey takes issue with these conclusions (Chatman et al., 2019). The authors showed that VMT reductions were associated with rail proximity regardless of whether new residents were low or high income, but that higher income households had a larger reduction in VMT than low-income households when located in TODs near rail. In examining population changes between 1990 and 2013, census tracts located near rail transit in California did not lose low-income residents overall, even when gaining high-income ones. Adding housing units and drawing additional residents, especially without displacing existing residents, therefore should be expected to reduce vehicle use. The authors argue that restricting new housing near transit to affordable development would likely reduce overall housing supply, and thus increase VMT, compared to a broader effort to increase housing supply in TODs.

Households make trips for multiple reasons and focusing solely on commuting misses opportunities for VMT reductions. Research increasingly points to the complexity of household travel decisions, underscoring that policy efforts focused on influencing mobility patterns through the availability of transport modes or the design of the built environment will fail unless they also consider the intrinsic nature of work, childcare, shopping, and other household functions that drive the need for mobility (Jarvis, 2003). For example, a study of 2,000 individuals in Cologne, Germany found that multiple factors influenced travel behavior (Scheiner, 2010), and the built environment had little impact on work trips which were determined mainly by the household's demographic and socio-economic characteristics. In contrast, shopping trips were more strongly influenced by living in dense, mixed-use areas where residents made shorter but more frequent trips for shopping than those in suburban areas. Leisure trips were strongly affected by 'lifestyle' preferences, but work trips were not.

In addition, household travel decisions are far more complex than suggested merely by a single home and a single job. An increasingly small share of trips in U.S. cities are work trips—even during the peak AM commute hours, home-to-work trips are a minority of all traffic. According to the 2017 National Household Travel Survey, only 15 percent of all trips are work commutes, smaller than the shares of trips for personal and family visits, recreation, schooling, and shopping. As the NHTS points out, "In the United States in 1969, there were as many vehicles as workers. By 1990 and continuing to the present, there are as many vehicles as drivers" (NHTS, 2018). Even when accounting for work travel only, the pattern of U.S. commutes is highly scattered, with many trips going suburb-to-suburb and notably failing to follow simple logic related to transit proximity or jobs-housing balance (Angel and Blei, 2016; NHTS, 2018).

3.2 Theme 2: Transportation Policy Impacts

The second important theme present in the literature is how transport policies and plans are likely to influence housing development and travel patterns, particularly with respect to impacts on low-income households and gentrification. This section considers these interrelated aspects of transportation investment and pricing, in relation to land use and travel impacts.

3.2.1 Transportation Infrastructure Effects on Housing and Travel Patterns

Transport infrastructure—transit, rail, highways, and bike and pedestrian infrastructure—is historically one of the most important elements in the creation of the built environment of the city, and at the same time often has a more subtle and interdependent effect than might be expected (Giuliano, 2017). This is primarily due to the sheer scale of metropolitan regions and the slow pace of change. Even a major new highway will have only a limited impact over a major metropolis or region, as it adds only a marginal amount of connectivity to the total road grid.

Buildings, meanwhile, are slow to be built and slower to be knocked down. Regardless of new infrastructure investments or changes in policy, much of the physical stock of most areas already exists and will persist for many decades. Relocating households or businesses is also often relatively expensive, difficult, and slow. These

factors mean that transportation investment may have only marginal impacts on land use, at least in the short term, and quick-and-easy fixes are rarely possible.

In aggregate and over time, however, transport investments profoundly shape almost every aspect of the physical environment (Hanson and Giuliano, 2004). It is critical to recognize the ongoing, chicken-and-egg relationship of transport and land development. As discussed in this report, the characteristics of transit-proximate neighborhoods influence travel patterns and in a synergistic fashion, transport investments can influence travel. This is not just directly, by affecting mode choice such as when a newly opened transit station attracts riders, but also by facilitating land use changes with spillover consequences for travel on different modes such as when transit facilities induce pedestrian- and bike-friendly development. These "indirect" effects of transport investment, through land development, have been found, in the case of transit, to exceed direct effects on transit use (Gallivan et al., 2015).

Furthermore, transport pricing policy can influence development patterns, by altering the relative costs of using different modes to access different places. This includes key policies such as parking production, pricing regulation, congestion pricing, and transit cost and quality. Transportation pricing policies can work synergistically with transit provision and land use policies in inducing sustainable travel choices, underscoring the importance of policy coordination at multiple levels of government.

No simple assumption should be made that transit investment automatically supports more compact urban development. Indeed, at the metropolitan scale, the development of commuter rail can have a "hollowing out" effect, increasing the population in peripheral areas served by commuter rail, compared to the core of the city. This effect is also pronounced, though not universal, with new highway development (Kasraian et al., 2016). Flows of people and goods are shaped by the built environment, but if transportation infrastructure does not provide the right connectivity and accessibility, it may not stimulate land use changes (Hanson and Giuliano, 2004), including densification and the construction of less car-dependent places.

Studies attempting to establish the causality between land use changes and transport network development show varied results—in some historic cases, transport networks followed existing population concentrations, while in others they contributed to their formation. An international meta-study of the long-term impacts of transport networks found that while the historical development of rail networks had some effect on regional population growth, density and urbanization, the effect weakened over time, as rail networks grew denser (Kasraian et al., 2016). A study of the greater Toronto region found that improving accessibility through the development of transport links played a smaller role in urbanizing peripheral land than in places nearer to existing dense, urbanized areas within the region. This pattern, moreover, was more evident in urban areas, where transport infrastructure had little effect, than for rural areas, where it had a moderate effect (Kasraian et al., 2020).

Empirical studies on land use impacts by mode show mixed effects. Road—but not rail—infrastructure generally attracts employment, but with exceptions and significant caveats reflecting conditions such as pre-existing economic and population growth, zoning, land ownership patterns, and local market attractiveness (Hanson and Giuliano, 2017; Kasraian et al., 2016). A study of zoning changes around a wave of new highway

construction across Spain in 2003-2007 found that while local governments rezoned land from rural to urban in response to new highways, this outcome was highly variable. Municipalities located in more highly populated regions, those where residents favored conversion, and those where developers had substantial political influence, saw higher levels of newly zoned urban land, as well as more actual development and land use change. Additionally, towns with large shares of commuters saw much lower levels of change than those with few commuters (Garcia-López et al., 2015). Where conditions are not already favorable for land use changes, highways are unlikely to stimulate economic growth and, in regions in decline, will likely have no effect, or merely redistribute activity or population from one part of the region to another, or even contribute to a loss of population and employment (Hanson and Giuliano, 2017; Kasraian et al., 2016).

Public transit investments can raise the price of housing, reflecting demand for TOD, given ubiquitous constraints on housing development. As discussed above, a large number of studies describe a positive increase in home values in areas close to transit improvements. Additionally, there may be network effects across transit systems; the addition of, say, a new BRT line may increase home values near other (older) transit stops, as the expansion results in greater accessibility and reduced transportation costs (Rodríguez and Mojica, 2009; Stokenberga, 2014). Price premiums for transit have been shown to vary based on regional compactness as well as levels of transit accessibility (Hamidi et al., 2016). This finding is not surprising; transit is an amenity, and amenities make neighborhoods more attractive. Similar price premia have been identified when parks open, existing buildings are renovated, and when pollution or crime fall.

Public transit investments may induce new housing and commercial development, leading to cumulative, indirect effects on travel behavior. According to some studies improving transit service can increase accessibility which induces residents to switch from automobiles; and that over the long run, grater accessibility can also encourage developers to build denser, less car-dependent developments near transit. That new development, in turn, can lead to further reductions in driving even among non-transit users who live or work near higher density transit stops, more biking and walking, shorter trip lengths and frequencies, and even lower rates of auto ownership (Gallivan et al., 2015).

One study that attempted to measure this “indirect effect” of transit investment employed structural equation and multi-level modeling of data for 2010 on travel and land use patterns at a macro scale for more than 300 federal-aid urbanized areas (Gallivan et al., 2015). The study’s modeled estimate of the land use effect of transit varied substantially across the urban areas studied, but overall resulted in an average ratio of land use benefits to ridership benefits (a.k.a. a “multiplier”) of 4:1. The finding of a ratio greater than one for indirect land use benefits compared to direct ridership benefits of transit provision has been corroborated in other research (King and Fischer, 2016).

Gallivan and co-authors found that increasing transit route densities by one percent in a region was associated with an increase in population density of 0.2 percent, with a corresponding land use benefit of a 0.05 percent reduction in VMT. Increasing transit service frequencies by one percent in a region had nearly the same effect. The authors also employed a neighborhood-level model incorporating data from nine metro areas on population and employment densities, land use mixing, pedestrian environment, and job accessibility, while

controlling for socioeconomic status. The study found that adding a rail station to a neighborhood that previously had no rail access was typically associated with a nine percent increase in activity density (combined population and employment density) within a one-mile radius of the rail station, with a corresponding land use benefit for VMT reduction for households within that radius estimated to be a two percent reduction. Improving employment accessibility also had potent land use effects, reflecting how access to jobs and services influences residential location choice. The authors' best-fit neighborhood model found that every one percent increase in the share of regional jobs accessible by transit in a given neighborhood (measured as jobs accessible by transit within 30 minutes from a transit stop within a 1⁄2 mile of a household) was associated with a 0.5 percent increase in neighborhood activity density, with a corresponding land use benefit of a 0.1 percent reduction in VMT.

Transit investment, regardless of quality and mode of service provided, is rarely sufficient to induce development on its own. A study of 21 light rail, BRT, and streetcar corridors in 13 cities across the U.S. and Canada attempted to assess the effects of transit investments on adjacent development, measured in terms of investment dollars spent. Each corridor was rated on three factors: transit level of service, land development potential, and public policy support, using a combination of quantitative and qualitative measures (Hook et al., 2013). The authors argued that government support was the strongest predictor of new development. Even in strong land markets, they argued, government support was necessary to encourage development. The second most important factor was the development potential of the land through which each corridor passed. Controlling for government support, most of the observed variance in development outcomes between the corridors could be explained by the corridor-specific real estate market value of the land. Because downtowns tend to have strong land markets, transit investments in downtown areas led to more development. Meanwhile, even high-quality service could not induce development if the transit line passed through undevelopable land. The study concluded that focusing policy support for TOD upon "emerging" market areas could be a useful strategy, because development in areas with limited market activity is generally difficult to catalyze, while conversely, development in areas with strong market activity may require relatively modest public involvement.

Public transit investments can be popular politically as a congestion relief measure, but in practice, may not reduce congestion. Los Angeles County's Measure M was passed by voters in 2016, permanently raising the sales tax by ½ cent, to generate $860 million annually, and more than $120 billion over 40 years, with 65 percent of funding targeted for transit. While LA had no heavy or light rail in1980, by 2016 it had over 110 miles of rail, with more under construction. But this rail expansion has been accompanied by falling ridership and rising roadway congestion. By 2016, LA Metro's per capita ridership was 20 percent lower than its 1980 level.

Measure M was promoted as a means to relieve traffic congestion, a campaign strategy that worked with voters (Manville, 2018). Most voters who approved Measure M favored it for its promise to relieve congestion, but most also did not favor additional measures that could support transit use, including denser development, paid parking, highway tolls, and narrower streets for bus and bike lanes. Some city projects now underway using Measure M funds have met with strong resistance, including road diets and bike lanes. Environmental

review documents for the city's long-range transportation plan, adopted after passage of Measure M, showed that vehicle congestion was not projected to decline as a result of new investments and policies (City of Los Angeles, 2016). One slow-growth citizen group sued the city over the plan (Linton, 2019). Although transit is popular politically for its potential to reduce traffic congestion, most voters may favor it to improve their own driving conditions rather than because they plan to use transit themselves (Manville, 2018).

Pricing strategies for transport can work synergistically with transit access, and combining these approaches may facilitate "push-pull" effects that reduce driving. The attractiveness of driving is significantly influenced by the price of gasoline and parking provision (Alberini, 2021; Goetzke and Vance, 2021; Manville and Shoup, 2005). Pricing policies can also indirectly affect land development by influencing cost differentials for access to transport modes, which vary across locations.

Pricing policies indirectly affect land development by influencing cost differentials for access to transport modes, which vary across locations (Brueckner, 2000). Various research studies argue that pricing acts synergistically with compact development and alternative transport provision. The impact of gasoline prices on transit ridership was found to be greater in U.S. urban areas with higher densities and regional containment policies (Lee and Lee, 2013). Congestion pricing was found to have a larger impact on VMT reduction in urban areas than in suburban neighborhoods in Portland, Oregon, attributable to more mode options available in dense and mixed-use urban settings (Guo et al., 2011). Research has also found synergistic effects between built environment conditions and parking pricing and transit/vanpooling subsidies, indicating that land use policies could be more effective where supportive transportation policies are in place (Ding et al., 2018).

Two recent extensive travel demand modeling efforts conducted in California, including one by Caltrans (the California Department of Transportation), underscored the value of adopting a synergistic policy package combining roadway pricing, support for multimodal transport options, and support for more compact development (Brown et al., 2021; Caltrans, 2021). These studies both aimed to determine the best policy mix for the state to achieve its climate policy goals. They both found that pricing policies, including VMT fees and parking pricing, when considered on their own, could reduce GHGs more effectively than modeled infill development or improvements to transit and active transport (AT) facilities and service, also considered on their own. The studies also argued that a mix of policies is needed to achieve state goals, and that combining these strategies would achieve more than the sum of the individual strategies on their own.

Combining the provision of improved transit infrastructure and services with pricing policies may make the latter more politically acceptable, thereby improving the chance for adoption. Schaller (2010) investigated why cordon pricing was adopted in Stockholm and London in the mid-2000s, but a similar scheme failed in New York City (though it later succeeded in 2019). Important factors he pointed to included London's and Stockholm's more unitary governance structures, compared to New York; London and Stockholm control transit as well as roadways, unlike New York. Public votes on cordon pricing in London and Stockholm were timed to come after improvements to transit service, and the pricing schemes were marketed to voters as a means to reduce congestion and also provide equity benefits by strengthening transit. Meanwhile, New York's

effort to pass a cordon pricing scheme coincided with cuts to transit service, and voters distrusted promises that toll revenue would be used for transit expansion.

3.2.2 Congestion and Road-Use Pricing and Social Equity

Charging drivers for road use is often politically unpopular and raises equity concerns. Currently, road use in the U.S. is almost always free, and the costs of roads are paid for primarily indirectly, such as through the gas tax, and are also subsidized. But road pricing policies have been found to be some of the most effective approaches for reducing vehicle miles traveled and greenhouse emissions. There are a variety of approaches, including high-occupancy toll lanes (HOTs), congestion cordons, and pay-per-mile proposals which rely on GPS tracking.

The equity argument, however, is a genuine concern particularly in the U.S. Unlike in Europe, where urban congestion pricing is more prevalent, low-income households in the U.S. are almost as likely as high-income ones to rely on private cars for the majority of their mobility needs. In the U.S. context, introducing additional costs to the mobility of low-income but car dependent households may place an undue burden particularly on the lowest income group, while wealthier drivers can simply absorb the cost and continue driving. However, this argument simplifies the equity and environmental justice outcomes of the current situation, which are not favorable to lower income households. Clearly there is a need to introduce policies in tandem with congestion pricing which ameliorate equity effects.

Research finds that cordons and HOT lanes can be progressive, regressive, or neutral depending on their implementation and boundaries (Ecola and Light, 2010; Jalota et al., 2021; Santos and Rojey, 2004). For example, Stockholm's congestion pricing scheme is considered mainly progressive, impacting the travel of largely wealthy, male, city-center residents; and with the revenues used to improve public transport, benefiting women and low-income residents (Eliasson and Mattsson, 2006). This is also the case for an analysis of a hypothetical downtown cordon pricing proposal for Toronto, with wealthier residents affected more than low-income ones (Abulibdeh et al., 2015).

An analysis of the unequal burdens of introducing congestion pricing in California's six largest metro areas estimated approximately 13 percent of the population would experience reduced mobility or be unable to afford the new costs (Manville et al., 2022). This is approximately the same percentage of Californians who experience other forms of insecurity, such as the 14 percent of Californians eligible for food assistance (in 2019).

Policies to mitigate transport inequality with congestion pricing are highly practicable. Like other priced public services, such as electricity, water, and gas, subsidizing road use fees for vulnerable users could be part of congestion pricing policies. In fact, road use in many ways is easier to subsidize than many public utilities. Unlike water, power, or food, accommodating more road consumption does not require producing more roads, so that the cost of providing subsidies is not constrained by the cost of increasing the supply or the total budget available from the fees paid by non-subsidized users. Moreover, unlike many municipal services, most

travel that would be subject to congestion pricing is metropolitan and regional in scale, rather than being confined to a single municipality.

Unlike many towns and cities, which struggle to meet the needs of their residents in terms of utility subsidies, congestion pricing could be instituted over an entire region, with costs shared by rich and poor cities alike (Ecola and Light, 2010; Manville et al., 2022). Cordon and pricing mechanisms could be geographically designed to target primarily higher-income drivers, leading to a progressive outcome especially once improved public transport is taken into account, and a higher impact on reducing vehicle miles travelled and air pollution (Santos and Rojey, 2004).

3.2.3 Transportation Policy Impacts on Accessibility and Travel Patterns

Transportation infrastructure investments influence travel patterns and location choices by changing accessibility. The influence of accessibility is lower than one might expect because so many other factors also play a role in determining household travel and location choices. Nevertheless, accessibility is of critical importance particularly to lower-income households.

3.2.3.1 Spatial Mismatch and Accessibility

A main current of academic thinking about the connections between transport and housing locations has been through the prism of access to jobs, summarized as the spatial mismatch hypothesis, first articulated by Kain (1968). He argued that low employment among African Americans was caused by the relocation of jobs from city centers to suburbs, locations which African Americans were barred from living in by racial discrimination and had limited ability to access by available transport modes. This work has since been expanded and refined, to address other marginalized populations, such as immigrants and low-income women, and other forms of inaccessibility, such as modal mismatch, designating whether jobs are accessible only by car, and skills mismatch, where jobs may be geographically reachable, but require the wrong skillset for the workers in question (Fan, 2012; Houston, 2005).

Support for the spatial mismatch hypothesis and its power to explain spatially concentrated unemployment among vulnerable populations has waxed and waned. However, numerous studies support the idea that the locations of jobs, homes, and transportation between them play a role in the employment outcomes of low-skilled and/or minority workers, while offering only a partial explanation (Ihlanfeldt and Sjoquist, 1998). Andersson et al. (2018) find empirical support for the spatial mismatch hypothesis in analyzing low-income workers in the Great Lakes region, who lost jobs due to mass layoffs. These jobseekers are presumably unemployed due to an exogenous cause, which is helpful in establishing why they were or were not able to find reemployment. Using residential locations, travel times, and regional availability of appropriate jobs, the study found a correlation between shorter job search time and access to jobs. This was particularly important for non-Hispanic Black workers, women, and older workers. Likewise, a study of Chicago found that access to low-skilled or entry-level jobs had a significant correlation with lower unemployment in African American and low-income census tracts (Jin and Paulsen, 2018).

A more nuanced picture emerges from a study considering the effects of public transport for spatial mismatch for youth, who generally have less access to cars and are less likely to have made a residential location choice based on employment (Brandtner et al., 2019). This study found that better public transit availability contributed to reduced youth unemployment, but this effect was only significant in cities with higher levels of households not owning personal vehicles. The study concludes that improved public transportation at the neighborhood level can improve employment outcomes if there is sufficient citywide public transportation. For cities with greater car ownership, local improvements to transit did not have an effect on employment. Also, improved transit may do little to improve employment if services such as childcare are not available and usable within effective commute ranges, as their absence constrains parents' available travel times (Ihlanfeldt and Sjoquist, 1998). Meanwhile, a number of programs—government and non-profit—subsidize car ownership, and this can strongly improve employment outcomes, including the likelihood of being employed, hours worked, and higher wages (Fan, 2012).

The findings from this literature translate into three policy options: to improve mobility, by improving effective transportation links between homes and jobs; to move jobs nearer to homes, by creating or relocating appropriate jobs to areas of unemployment; or to move homes nearer to jobs, by creating stocks of affordable, un-segregated housing in job-rich areas (Fan, 2012; Ihlanfeldt and Sjoquist, 1998).

On average, low-income households have both less access to cars—primarily due to the cost—and at the same time more complex travel needs. Low-income individuals in the U.S. are more likely to work non-standard hours and to need to travel further for services or groceries (Blumenberg, 2016; Blumenberg and Agrawal, 2014). Studies show the effects of transit improvements on employment of low-income groups are mostly very limited, and much less substantial than the effects of car ownership. For example, a six-city study of TANF recipients found that their access to transit had no statistical significance on the likelihood of recipients finding employment (Sanchez et al., 2004). Longer commutes have been empirically and theoretically associated with higher wages, as wealthier households in the U.S. are more likely to choose higher quality housing at the urban periphery. Low-income workers, meanwhile, are on average less willing to undertake lengthy commutes for low pay.

However, these patterns may be changing, and moreover may hide substantial variation. Women's commutes are usually shorter than men's, as they are bound by household duties, but this does not hold for Black women (Johnston-Anumonwo, 2014). A recent New York area study likewise found nuances of spatial mismatch by gender and race, with white workers with a long commute being far more likely to commute to a high-wage jobs, and white women's commutes being consistently short, regardless of level of pay. Black workers face both long commutes and low wages, while Hispanic workers, who are also concentrated in low wage jobs, often have much shorter commutes, reflecting greater concentrations of employment opportunities in proximity to Hispanic neighborhoods than Black communities. Moreover, from 2000 to 2010, the wage/commuting patterns identified in the study grew more polarized, with relatively more workers in 2010—across most ethnic and gender categories—having either long commutes to low-paying jobs, or short commutes to high-paying jobs, and a smaller share having "tradeoff commutes" of any kind, either short trips to low wage jobs, or long trips to high-paying ones (McLafferty and Preston, 2019).

Others have argued that high unemployment is caused not just by lack of physical access to locations, but by lack of proximity to the networks through which jobs are advertised, such as local signs and word of mouth (Ihlanfeldt and Sjoquist, 1998).

Job re-location or creation strategies often involve policies to increase densities and reduce sprawl, in line with the original arguments that suburbanization reduces job opportunities for affected populations. Empirical findings are mixed on whether there is a correlation between sprawl and suburbanization and equality of employment opportunities. Some studies find that greater sprawl disproportionately affects Black and Latino workers, but others find that denser cities with tighter land use controls see no benefits in job access equality between population groups. Other forces, such as continued discrimination or job locations away from minority areas—regardless of density—may play a more substantial role. Furthermore, some policies intended to make cities more compact may also increase the price of housing, leading to reduced rather than improved access as low-income populations are pushed out (Fan, 2012; Stevens).

Sometimes policies have been adopted with the intention of inducing firms to locate in disadvantaged areas suffering from spatial mismatch. Policies such as Enterprise Zones and Redevelopment Communities have been tried across the U.S. since the 1990s, granting tax breaks and providing stimulus funds for both locating in designated areas and for hiring local residents. However, research finds such programs create few jobs, with even fewer going to local residents (Fan, 2012).

Programs that have focused on subsidizing housing for low-income populations have been found to have very little effect on employment outcomes. Both the creation of affordable housing and rental subsidies such as Section 8 vouchers and the Moving to Opportunity program, which should have allowed residents to relocate closer to jobs, have been widely studied, and only a few studies have found even very modest success. Fan (2012) offers some explanations for this finding: Households moving under affordable housing programs may not primarily be following jobs—for example, in many instances the primary motivation for moving is to leave unsafe areas.

3.2.3.2 Factors Shaping Household Decision-Making about Housing and Transportation

Models of urban form have long been used to explain households' choice of housing locations, job locations, and travel between them. Households choose between the convenience of shorter commute times and distances to jobs located primarily in the city center, and the cost of quality housing for their given income. Workers attempt to minimize the job-home distance to make it as short as possible, and longer commutes are a function, primarily, of a lack of affordable housing close to relevant employment locations, or a lack of jobs located close to residential areas (Giuliano, 1991). However, these models portray limited, idealized worlds, and straightforward assumptions about housing and travel choices often fail in the details (Giuliano, 1991; Jarvis, 2003).

One increasingly common finding in the literature is that individuals may not be strongly motivated to reduce their travel times. Despite vast improvements in the speed of transportation modes, the average duration of daily travel has remained substantially unchanged since the 19th century. Technological

innovations—horsecars, streetcars, omnibuses, private cars, commuter rail—helped cities grow outwards, lengthening distances instead of shortening travel times. The concept of "travel time budgets" (TTB) or "travel time tolerance" (TTT) was first studied in the 1960s and 1970s, and posits that individuals and households have a relatively set acceptable amount of time across the day, week, and even the year to dedicate to travel; between 50 minutes to 1.3 hours per day, according to different studies across several decades (Mokhtarian and Chen, 2004). There may also be a set travel cost budget, with households spending about 10 percent of income on travel if they own a car, and 3-5 percent if they are transit-reliant (Zahavi and Ryan, 1980). Travelers will attempt to optimize the destinations and trips they can make within that set amount of time and money, but they do not strive to lower it, nor, it is argued, are they willing to go much above it (Ryan and Zahavi, 1980).

Others have argued that some people may have an intrinsic preference for maintaining a certain block of time (and space) between home and work (Mokhtarian and Salomon, 2001). Many people use travel time to relax, or, increasingly thanks to mobile technologies, for activities such as listening to music, personal communications, or work (Bissell, 2018). Nevertheless, research continues to find that travel time is generally minimized with preference for nearer destinations, subject to personal and financial constraints (Small et al., 2007).

Housing supply constraints—as well as the availability of housing at different price points—influence household location and transportation choices. Increasingly unaffordable cities, where the type of jobs and the housing they can support are located far apart, stretch commutes. Merely having a similar number of jobs and housing units in a given region is not helpful if they're not "matched." Low-income workers seeking affordable housing may simply have to move far to find it and are increasingly limited in where they can live (Giuliano, 1991).

People may not prioritize job-home distance in comparison to other criteria such as neighborhood quality when choosing housing. Households may even prefer "more housing" over "less commuting," particularly in the context of the U.S. preference for single-family suburban living, meaning they will live further from work than is expected by the usual assumptions about minimizing travel distance within housing cost constraints. A study of households that utilized housing vouchers in Portland, Oregon, found that only a few were strongly influenced to move by commuting times or distances. Movers did not always move by choice and had limited choices both due to affordability (even with vouchers) and a limited ability to carry out an efficient search for housing. Housing voucher households who moved recently within the city of Portland on average moved to less accessible, less population- and job-dense locations and further from transit than housing voucher households who had not moved recently (Tremoulet et al., 2016).

Many households have two or more workers who are employed in different locations. Dual-earner households pose a challenge to standard models of housing and transportation choice based on a single worker per household, and thus a single set of location constraints in arriving at housing/job location decisions (Giuliano, 1991; Jarvis, 2003). Empirical evidence is mixed, with studies from Europe finding that dual-income households

do not have excessive commute times compared to single-income households, but U.S. studies lean towards dual-earner households having longer commutes (Sultana, 2006).

School locations are also important, and disproportionately affect women's travel, as the number of married women with school-aged children has increased even more quickly than married women's workforce participation overall (Sultana, 2006). One study of west-coast, dual-earner households found that housing location is often independent from school/childcare locations. Parents drive their children by car to private schools, and drive to their workplaces in separate single-occupant automobiles even when both jobs are in the same location due to the need for each spouse to have his/her own vehicle to manage other, chained trips (Jarvis, 2003).

The high cost of housing may reduce households' willingness to move for a new job, thus extending commutes. Households show high residential mobility *between cities* for jobs, but once they are established, households are less willing to move for job changes within cities (within-city moves are among the most common moves, but not usually carried out for work). Instead, households tend to extend their commutes to accommodate changes in jobs, social life or schooling over time. Housing decisions are long term, and often slow or sticky in relation to family lifecycles and assumptions about household needs. So while households are likely to select a larger home when children are born, for example, the reverse is not true and "empty nesters" may hold onto larger houses for decades. In California in particular, legislation like Proposition 13 disincentivizes moves because the property value on which property taxes are based is only reassessed at sale (Andersen, 2011; Giuliano, 1991; Jarvis, 2003). A move thus often triggers a dramatic tax increase.

Rising insecurity in housing and labor markets may make it more difficult for households to minimize commute durations. For lower-income, vulnerable groups, both housing locations and employment locations change frequently, and often not by choice. On the housing side, particularly for low income and vulnerable groups, evictions, breakups, dependence on friends or family who supply affordable housing, or loss of social housing mean that relocations are not planned in advance, and that locations of new housing are therefore very constrained (Mullen et al., 2020). On the employment side, work locations may change not only because of the loss of a job, but because jobs themselves either move, or require commuting to different, changing locations. One study found that opportunities at work or for new jobs are often not pursued by workers without cars, because new jobs involve an unreachable location, or because staying longer hours or taking on a different schedule clashes with limited commute options (Mullen et al., 2020).

Low-income households face significantly greater constraints in housing and labor market choices, yet, on average, travel shorter distances than higher-income households. Low-income neighborhoods in metropolitan areas tend to be closer to high-frequency transit stops, providing greater transit accessibility. However, research has documented that high transit costs, coupled with the disconnect between transit services and the needs of low-income families (e.g., high costs, 9-5 hours, and orientation towards the CBD rather than job-rich suburban locales), often discourage public transit use.

Research has consistently shown, however, that lower-income households drive less than higher-income households. On average, higher income households, those earning over $150,000/year, in California drive twice as much as those earning under $35,000 (Boarnet et al., 2017).

3.3 Theme 3: Motivations, Barriers, and Patterns in Policy Adoption and Implementation

The third major theme in this report is the state-level design, adoption, and implementation of housing and transportation policies to improve housing affordability, reduce auto use and increase accessibility, implemented primarily at the regional and local scale. State-level policies face significant barriers and constraints when the intent of the policy meets the reality of local politics, market dynamics, and conflicting regulatory guidance. Understanding the local barriers and issues that influence the implementation of state or regional housing and transportation plans and policies can point to ways to improve those interventions to ensure intended outcomes. For example, provisions in regional plans calling for directing housing growth to identified priority development areas (PDAs) have not always resulted in any increase in housing supply in those areas. Reasons are varied and context-specific, but include lengthy entitlement processes, opposition to new housing, high construction costs, and unsupportive market conditions.

In this section we focus specifically on the adoption and implementation of policies to encourage transit-oriented development in the state, while noting, importantly, that policymaking should address wider-scale concerns than the primary focus on transit-proximate areas. In California, the state and many local governments have adopted policies to support sustainable development, particularly focused on TODs. This section relies mainly on a 2019 survey of city planning directors in California's four largest metro areas which found a significant level of interest in TOD policymaking, with two-thirds of surveyed cities reporting they had adopted policies, programs, and/or plans to promote TOD, but with most also reporting a variety of perceived barriers (Barbour et al., 2021).

Localities report that they face various obstacles that make urban TOD planning more challenging than planning for development in "greenfield" locations at the edge of urbanized areas. Projects may face more complex planning, financing, and regulatory hurdles, and often entail higher land and development costs compared to greenfield development. Promoting infill or TOD development may require the simultaneous development or improvement of both transport infrastructure or services and of residential and commercial structures. These strategies often draw on different funding sources, bodies of regulation and expertise, and planning timelines. Sites for infill development or TOD are often legally complex, with irregularly shaped or small parcels which need to be assembled, and physically challenging, as such sites often require more complex and expensive infrastructure and ground preparation, with mid- and high-rise buildings more expensive to construct. On the other hand, while the immediate development costs may be high, long-term maintenance and service provision of infill sites may be lower than for development on the urban fringe (Barbour et al., 2021).

City leaders prioritize improving community livability, mobility and accessibility, and affordable housing, as motivations for adopting sustainable transportation and land use policies. More than 60 percent of respondents from cities that had adopted transit-oriented development policies indicated that these three motivations were "very important" to city leaders for doing so. The type of development preferred most by cities near transit was housing, especially market-rate, followed by retail and jobs.

A high share of respondents (63%) ranked mobility/accessibility as very important. This implies a strong awareness of the inter-connection between land use patterns and transportation behavior. Considering city characteristics, Democratic voter share was a significant positive predictor of mobility/accessibility and housing-related motivations among cities, after controlling for other city characteristics, including built environment factors (e.g., density and transit coverage), socio-economic factors (e.g., race/ethnicity, median income of residents), and political factors (voting tendency). Furthermore, the study found that higher overall motivation for TOD policymaking (measured across multiple TOD goals) was associated with lower perception of obstacles, and with liberal political leanings among city residents, reinforcing a discernible association between political ideology and TOD motivation (Barbour et al., 2021).

Among obstacles to achieving city TOD goals, resident opposition (associated with "NIMBYism") and lack of market interest were rated as less problematic than some factors more directly under the control of public decision-makers. The factor cited most frequently as a "major obstacle" to TOD was lack of vacant land, followed by difficulty in assembling land parcels, inadequate frequency of transit service, inadequate transit facilities, and then resident concerns or opposition. Lack of market interest was by and large not perceived as an obstacle, with 61 percent of respondents believing that at least moderate market interest in TOD exists throughout their city (Barbour et al., 2021). The survey also investigated financing hurdles for upgrading infrastructure needed to support TOD, finding that improvements to transit facilities were perceived as the biggest challenge (Barbour et al., 2021).

It is notable that resident opposition and lack of market interest, two factors commonly considered critical for TOD success but which are largely out of the direct control of city officials, were rated as less of an obstacle than factors more directly under the control of public decision-makers, in particular, transit infrastructure and service and assembling land parcels. Assembling land parcels has been a problem for California cities especially since 2012 when the legislature dissolved local government tax increment financing (TIF) redevelopment authority, which was the main tool cities used to revitalize deteriorated downtown areas and also to produce affordable housing, due to a mandatory 20 percent set-aside for that purpose. Although various legislative proposals have subsequently restored some TIF authority, the lost powers have not been fully restored.

The most commonly adopted policies to support TOD include zoning and parking strategies, Specific Plans, and CEQA tiering from Specific Plans. The Barbour survey found that more than half of cities with adopted TOD policies and programs employed the following strategies to promote TOD: density bonuses for affordable housing (required by state law), mixed-use zoning, development of Specific Plans, reduced parking requirements, upzoning, and strategies for expediting environmental review under the California

Environmental Quality Act (CEQA) such as "tiering" project-level review from Specific Plans and using available streamlining mechanisms when reviewing infill projects.

These findings underscore the importance of local regulatory measures for promoting TOD. The value of this nexus of policies was confirmed in case study research conducted in eleven California cities (Barbour et al., 2021). The cities investigated had been experimenting with how best to combine top-down policymaking, including systematic de-regulation and permit streamlining, with bottom-up neighborhood planning. A model considered effective in several of the cities studied was to use a neighborhood Specific Plan development process, and the associated Programmatic Environmental Impact Report (PEIR), as the basis for providing subsequent "ministerial" (non-discretionary) review of development project proposals. This model was praised by city planners for its capacity to incorporate resident input and democratic decision-making alongside de-regulatory streamlining to make development easier to permit. This type of strategy also aligns with the perception of many of the planners interviewed for the study that state-imposed performance targets, such as RHNA housing allocations, are not onerous so long as flexibility is maintained for devising strategies to achieve the targets. The planners interviewed were resistant to state legislation perceived as dictating local zoning decisions but supported strategies whereby the state rewards and incentivizes localities that effectively achieve state performance targets.

The tools viewed as most important for promoting TOD were not necessarily the most frequently adopted. Both mixed-use zoning and upzoning were considered "very important" by almost 75 percent of respondents in cities that had adopted these tools to promote TOD. Other tools viewed as very important by most adopter cities included developing Specific Plans for areas near transit stations, using these plans to streamline environmental review, and reducing parking requirements near transit.

Adopter cities rated several policy measures substantially higher than their actual adoption rates would suggest; these policy measures included upzoning, streamlined permitting in TOD zones, subsidies for affordable housing, and parking pricing. This suggest that despite their potential impact, some strategies may be challenging to implement due to political opposition or other factors. The reverse was true for some other strategies, most markedly for density bonuses, which are required by state law.

The likelihood of a city choosing to adopt TOD policies is strongly correlated with city size. Controlling for the city characteristics considered in the Barbour study, the likelihood of a city choosing to adopt TOD policies was significantly correlated with city size, with bigger cities being likelier to support TOD, and with location in the Los Angeles region (negatively associated with TOD policy adoption). The degree of existing high-quality transit coverage was not a significant indicator, suggesting that enthusiasm for TOD is neither limited to, nor driven by, the pre-existence of appropriate TOD sites.

More than half of TOD projects have generated significant concerns or opposition from nearby residents or firms. According to the Barbour study, about one-fifth (19%) of survey respondents from cities that had adopted TOD policies, programs, or plans indicated that no projects had generated concerns or opposition from nearby residents or firms, while another 61 percent said that "a few" or "some" projects had generated opposition, and 19 percent indicated that "most" or "almost all or all" projects had done so. Level of high-

quality transit coverage was the only characteristic found to be significantly associated, after controlling for the other factors, with whether "most" or "almost all or all" TOD projects had generated significant concerns or opposition in a city. In other words, the more high-quality transit coverage in a city, the more that resident opposition to TOD has emerged.

Integrating affordable housing with other TOD goals can be challenging. About one-third (30%) of respondents indicated that "some" or "almost all or all" TOD projects in their city had generated local concerns specifically about gentrification or displacement of current residents. Not surprisingly, larger, job-rich cities were most likely to have experienced concerns about gentrification and displacement. Asked how difficult their city's elected officials and planners find it to balance and integrate policies to promote affordable housing along with other development and multi-modal transport improvements, about one-third (36%) responded that it is very difficult, another 40 percent that it is somewhat difficult, and only one-quarter (24%) that it is not difficult (Barbour et al., 2021).

State and regional TOD programs and policies have been influential locally. Survey respondents indicated that among a number of state and regional programs and policies influencing TOD objectives, the most important one is the RHNA process. Among those with adopted policies to promote TOD/transit/active transport, half or more of surveyed cities had applied for state or regional planning grants, and most beneficiaries indicated the grants had been "very important" in helping achieve TOD goals. More than half (52%) of survey respondents also indicated their city had officially designated TOD zones, and of these respondents, 67 percent indicated that their TOD zones coincided with priority growth zones designated in MPO regional plans.

California cities are attempting to straddle metrics for transportation planning that encompass both VMT reduction and congestion management. Senate Bill (SB) 743, adopted in 2013, redirected environmental review of development projects and plans under the California Environmental Quality Act (CEQA) away from the prior focus on analyzing and mitigating project impacts based upon traffic "level of service" (LOS) measures (that favored congestion relief through additional road capacity) toward project contributions to minimizing VMT, in order to meet state climate goals for reducing air pollution. More than half (53%) of cities reported that they intended to employ both VMT and LOS standards and metrics for CEQA review, and another 27 percent said they would use "VMT, LOS, and other" metrics. Thus, the majority of California cities are attempting to straddle and combine VMT and LOS standards and metrics moving forward.

The study also indicated that SB 743 is likely to affect locally approved development impact fees. Among all respondent cities, 70 percent had adopted development impact fees for transportation, three-quarters of which fund not just roadways but other transportation modes. A small share of cities (14%) exempt certain project types, and/or impose a lower impact fee in areas near transit, recognizing that TOD can reduce the need to drive relative to projects in less transit-friendly locations. About one-third (36%) of respondents indicated their city either had revised or would revise its impact fees to align with SB 743, while 43 percent indicated they might do so (Barbour et al., 2021).

4. Contemporary Policies in California

Myriad state policies in California affect travel behavior and land use patterns. This section describes the most prominent policies adopted by the state government and regional agencies in recent years that carry major implications for how and whether transportation and land use is addressed in conjunction, to promote reductions in auto use, accessibility improvements, and affordable housing.

4.1 SB 375: Regional-Local Transportation-Land Use Planning and Coordination

Senate Bill (SB) 375 was adopted in 2008. It was intended to reduce VMT and associated GHGs by coordinating regional and local transportation and land use planning. The law mandates that metropolitan planning organizations (MPOs), which are federally-mandated transportation planning agencies in the state's urban regions, include a Sustainable Communities Strategy (SCS)—a regional land use plan—within their periodically updated long-range Regional Transportation Plans (RTPs). The combined RTP/SCSs must demonstrate that they will reduce VMT and GHGs from automobiles and light trucks in the region by state-mandated, targeted amounts over the plan duration (20+ years). SB 375 also requires that RTP/SCSs be aligned with RHNA plans, by which regional Councils of Government, or COGs (coincident with MPOs in most California metropolitan regions) allocate identified housing need at all income levels among localities.

RTPs/SCSs adopted after SB 375 have been only incrementally more ambitious than pre-SB 375 plans in their performance objectives for reducing auto mode share, and for densifying development by increasing the share of multifamily housing (Barbour et al., 2020). In part, this pattern of incremental change reflects the fact that many MPOs in the state were already developing RTPs that aimed to achieve more efficient development; indeed, the SB 375 statute explicitly builds upon those prior efforts.

A second explanation is that MPO/COGs do not control land use decision making, which is under the control of municipal governments; SB 375 explicitly defers to local authority over land use decisions. Thus, while MPOs can attempt to coordinate land use plans and policies with local governments, they cannot force land use changes deemed important to support regional plan goals. With MPO governing boards in California composed mainly of local elected officials, appointed by their local jurisdictions, decision-making tends to reflect local interests.

Nor do MPOs directly control transportation project funding or design; rather, MPOs provide a planning interface for transportation programs and investments initiated by multiple sources. MPOs themselves have little autonomous authority, directly controlling only a small portion of the total funding represented in RTPs. One California study conducted in 2011 found that the state's MPOs directly controlled only 15 percent of capital funds in RTPs, on average (Rose, 2011).

The essentially voluntary MPO/COGs governance structure, and lack of MPO resources or authority to ensure plan implementation, means that the wider context of federal and state policies and grants of authority which facilitate and constrain local land use decision making will condition cooperation to achieve SB 375 goals and objectives. This situation makes the state government as much or more responsible as MPOs for determining whether localities cooperate to achieve ambitious objectives in RTP/SCSs under SB 375. However, in the wake of SB 375's passage, the state government reduced transit funding by billions of dollars and eliminated redevelopment authority, the principal means by which localities, through tax increment financing (TIF), had heretofore worked to revitalize downtown areas and provide for affordable housing, with a mandatory set-aside of 20 percent of TIF revenue required for that purpose.

The only direct incentive provided in SB 375 for localities to conform land uses to support regional plan goals was to provide some streamlining of environmental review, required under the California Environmental Quality Act (CEQA), for development projects deemed to be consistent with RTP/SCSs. However, the method for determining consistency was not spelled out, and take-up of the streamlining provisions has been limited. The full CEQA exemption available requires that a project meet extremely stringent criteria, including transit access, density levels, high building quality standards including for green construction, and furthermore the exemption applies only to small scale development of not more than 200 units and not more than 75,000 square feet. A more widely applicable though less extensive streamlining provision called a Sustainable Communities Environmental Assessment (SCEA), also provided in SB 375, has also not been widely used; a survey conducted in 2016 by the Governor's Office of Planning and Research found that less than five percent of responding localities had made use of the SCEA option (GOPR, 2016).

In recent years, the state government has begun to adopt more policies conducive to and supportive of SB 375 objectives, some of which we discuss in more detail below. As mentioned above, SB 743 orients the CEQA process toward VMT reduction, thereby supporting infill and TOD. The state's carbon trading Cap-and-Trade Program has dedicated substantial funding on an ongoing basis to competitive programs that fund transit, active transportation, and affordable TOD projects. Multiple state legislative efforts have been launched to induce more housing production, many of which facilitate TOD. The most successful legislative efforts, so far, have been in adopting bills to strengthen RHNA compliance (discussed below). Given that MPO/COGs are directed under state law to ensure that their methods for allocating "fair share" housing need among localities under RHNA must support state sustainability goals and given that RHNA plans must be consistent with RTP/SCSs, stronger RHNA enforcement and accountability for implementation can help support SB 375 indirectly.

As state-level efforts have ramped up to support housing production and TOD, SB 375 has come under scrutiny. In 2016, under AB 32 the legislature and governor extended California's overall GHG reduction target beyond its original sunset date of 2020, codifying a new more stringent goal of a 40 percent reduction in GHGs from 1990 levels by 2030 across all sectors of the economy. Pursuant to this action, in 2017 and 2018, the California Air Resources Board (ARB), responsible for overseeing SB 375 implementation, re-negotiated GHG

reduction targets with the MPOs under SB 375, proposing stiffer targets than those adopted originally in 2010 for the MPOs to achieve by 2035.

In response, the MPOs in the state's four largest regions, which have acted as a peer group under SB 375 in negotiations with the ARB, countered that deeper reductions would be difficult to achieve absent action by the state government to adopt certain policies needed to support SB 375, including road and parking pricing, mileage-based user fees, more dedicated funds for multimodal transport, and "direct support" for regional plan implementation through state incentives for infill (CARB, 2018a). (The MPOs' letter is at https://www.arb.ca.gov/cc/sb375/big_4_target_recommendation_may_2017_v2.pdf.) The ARB adopted more stringent targets in 2018 for the MPOs, though not as stiff as the Board had initially proposed. To address the gap in per capita reductions between the adopted targets and the level the Board has identified as necessary, the Board committed to ongoing deliberations with MPOs on adoption of new policy measures (CARB, 2018a). In this fashion, the target re-negotiation process became a venue for debate and deliberation on roles and responsibilities at different levels of government for ensuring the success of SB 375.

In 2018, the ARB released a required report to the state legislature on MPO progress under SB 375, concluding that, "California is not on track to meet greenhouse gas reductions expected under SB 375" (CARB, 2018b, p. 3). This conclusion was based on evaluation of 24 data-supported indicators, of which the most concerning was a recent rise in VMT and GHGs per capita starting after 2013. The report also identified various barriers to SB 375 success, one being local zoning and permitting practices that constrain housing production and/or make it more expensive.

Despite the disheartening trend in GHG reductions in California recently, the ongoing debates on SB 375 implementation have been useful in prompting discussion about roles and responsibilities for achieving the law's goals (Barbour, 2020). The debates have brought to the surface the need to address the SB 375 "implementation gap" described earlier. In response to these concerns, the ARB adopted a new direction for monitoring SB 375 implementation in 2018, aiming to pay less attention to technical aspects of MPO scenario modeling, and more to performance monitoring and adoption and implementation of best practice programs and strategies from plan to plan (CARB, 2018a).

4.2 State and MPO Grant Programs for TOD

At the state level, a notable program that explicitly links affordable housing to transit and active transport enhancements is the Affordable Housing and Sustainable Communities (AHSC) Program, which since 2014 has been allocated 20 percent of funds, on an ongoing basis, from California's Cap-and-Trade Program, to funding affordable housing projects combined with transit and/or active transport facilities upgrades. The program's initial design provoked debate among stakeholders, including some complaints that MPOs should have been provided a larger role in administration (Barbour, 2016). This debate reflects ongoing tension between the MPOs and the state government about how much independent authority MPOs should be provided for

directing resources for TOD. This debate is part of a larger question about how to properly assign roles and responsibilities for sustainable development at different levels of government.

The AHSC program requirements are competitive and stringent. Mawhorter et al. (2020) found that the program has been successful in incentivizing the development of complex partnerships, and inducing more critical thinking about project types, including the integration of affordable housing and transit access by developers. AHSC has, however, provided or supported only 6000 units of affordable housing in California, compared to the estimated 540,000 units needed over the period of its implementation (Mawhorter et al., 2020).

Another noteworthy funding incentive program intended to support SB 375 goals is the San Francisco Bay Area's One Bay Area Grants (OBAG) program, created in the wake of SB 375 by the Metropolitan Transportation Commission (MTC), the region's MPO. The program allocates more than $100 million annually to local transportation enhancement projects which must be located mainly in Priority Development Areas (PDAs) designated by localities in conjunction with MTC for infill development. The OBAG program conditions the awarding of funds, many of which had previously been provided through MTC without strings attached, upon local RHNA compliance, actual housing production, and adoption of "complete streets" policies by localities.

The OBAG program appears to have prodded Bay Area municipalities to update their housing elements, needed for RHNA compliance. Before that stipulation being required for OBAG funding, many cities had let their housing elements become out-of-date (Mawhorter et al., 2020). However, the funding level may be too low to induce dramatic change; and wealthier jurisdictions, which have been particularly lagging in housing production, are likely to pass up OBAG transport funding (Mawhorter et al., 2020).

To address the affordable housing funding concern, MTC, in coordination with other groups, undertook an 18-month planning effort to identify steps to improve the Bay Area housing situation. The final "compact" released by the Committee to House the Bay Area (CASA), released in early 2019, contained ten elements, several of which called for state legislation to ease local approval of housing and to create a state override of certain local powers, such as for establishing minimum densities near transit stops.

One bill adopted to support CASA, AB 1487, established the Bay Area Housing Authority, to be governed by the same board as MTC, with the power to issue bonds, propose tax measures, and implement fees such as linkage fees regionwide, for the purposes of funding affordable housing. In this manner, the CASA compact has prepared a basis for MTC to become far more than just a transportation planning agency.

4.3 SB 743: From LOS to VMT

SB 743, adopted in 2013 and promulgated through state implementing guidance in 2018, shifts the focus of analysis and mitigation required under CEQA of transport impacts of development from maintaining level of service (LOS) standards for vehicular throughput, to considering impacts on reducing VMT. The reliance, for decades, on maintaining LOS standards has translated to maintaining smooth traffic flow, with the consequence that infill developments were often required to limit their size and density, and/or widen roads and in other ways to develop higher-flow junctions. The LOS standard meant, in practice, that CEQA regulations were facilitating increased driving and lower densities.

Shifting to VMT reduction as a focus of CEQA review, in contrast, should provide support for dense, infill, mixed-use and transit-adjacent developments (Barbour et al., 2019). However, as discussed previously in this report, most California jurisdictions say they intend to retain use of LOS in their development approval procedures, meaning they must balance and somehow integrate LOS with VMT metrics and standards. Also as previously discussed, a substantial share of jurisdictions aim to integrate VMT standards into their transportation impact fees, which means that SB 743 will affect not just project-by-project CEQA review, but also may more systematically influence local transportation plans and policies.

Elkind et al. (2018) point out that while many mechanisms for mitigating VMT, such as transit enhancements, infill development incentives, or pricing road use, are broadly familiar, tying them directly to a given, single project can be more difficult. These authors therefore propose “mitigation banking” or “exchange,” providing developers the ability to dedicate funds to a general fund which would be targeted to prioritized, regional VMT mitigation projects and strategies.

4.4 Recent Housing Legislation

Since 2016, a flurry of housing-related legislative bills have been proposed, and many adopted, which cumulatively have the potential to transform the state’s housing policy (Fulton, 2019). Aiming to increase housing production, the legislation has pursued a few principal strategies including upzoning near transit, ministerial end-runs around CEQA, reforming RHNA and strengthening the Housing Element law, and encouraging accessory dwelling units. The most aggressive efforts to stipulate upzoning near transit, as envisioned in Senator Scott Weiner’s bill SB 50 (and its predecessors), gained national attention but failed to overcome opposition from localities and various stakeholder groups. The other three strategies have had more legislative success.

The primary enforcement tool in California state housing policy for decades has been its Housing Element law. Since 1980, housing elements in local general plans have been required to address the locality’s “fair share” contribution to meeting regional housing needs across a range of affordability levels. The RHNA process is used to implement the state’s fair share requirements, under which the California Department of Housing and Community Development (HCD) provides a target production number of housing units to the MPO/COGs in

each region, to distribute among all jurisdictions. The jurisdictions are then required to use these "fair share" targets as the basis for the housing elements of their general plans.

California's fair share requirements have been one of most active methods by the state government to direct local planning toward a substantive policy goal, with housing elements being the only sections of local general plans that must be reviewed by the state. While the RHNA housing element process was originally designed primarily as a fair-housing law, the state government has increasingly also used it as a policy tool to increase housing production.

However, traditionally, the Housing Element law has been seen as "just strong enough to be annoying but just weak enough to be useless" (Fulton, 2018). Various fundamental shortcomings in the law have hampered its success. It calls for localities to accommodate housing through zoning, but since localities do not actually build housing, that stipulation has provided no guarantee of actual housing production. In addition, RHNA enforcement has traditionally been notoriously weak, with most localities for many decades letting their housing elements become out-of-date. Also, the premise for estimating regional and local housing need has been based on faulty logic, extrapolated based on previous growth trends, failing to account for the effects of policy constraints, such as restrictive zoning, on housing supply (Elmendorf, 2019). Essentially, the RHNA/housing element process has been a bureaucratic endeavor, weakly enforced and not directly connected to the economics of actual housing production.

In recent years, the RHNA/housing element policy landscape has changed substantially and has been given more teeth. Senate Bill 35, passed in 2017, is the most prominent bill adopted to strengthen RHNA compliance, by making local governments liable for the first time for failing to meet state housing targets. SB 35 directs HCD to determine mid-cycle and at the end of the RHNA cycle whether each local government is on pace to meet, or has met, its RHNA targets. If a local government falls short, it is now required to permit certain housing projects. Qualifying housing proposals must be multifamily, urban, on an infill site, include an affordable housing component, and use union labor. For cities that have failed to meet above-moderate income affordable housing goals, any such development with 10 percent affordable housing must be permitted. For cities that have failed to meet their low and very low income goals, projects with 50 percent affordable units qualify. Under SB 35 any such housing proposal must be approved within a maximum of 60 to 90 days if it meets other existing "objective" zoning and development standards within a maximum of 60 or 90 days. If the city fails to do so within that time frame, SB 35 stipulates that the development is approved automatically. For qualifying housing proposals, the bill grants exemption from CEQA review, exemption from local design guidelines beyond height and density restrictions, consideration of density bonuses, and exemption from any minimum parking requirements for projects within ½ mile of public transit (Clare, 2019).

As of July 2020, only 29 of California's cities and counties, or five percent, were *not* subject to SB 35 for at least some projects. These 29 localities had met their low-income and market-rate targets under the current RHNA cycle (Fulton, 2020b). In fact, most jurisdictions in California have met or exceeded their RHNA targets for producing market-rate housing, but most have also produced substantially fewer low- and moderate-income

housing units than required, especially in high-priced coastal counties. Developers have submitted several projects, mostly in Northern California, for approval under SB 35, with a few resulting in litigation.

Other recent legislation intended to strengthen RHNA includes SB 828, passed in 2018, which requires that RHNA take account of past housing shortages in addition to estimates of future housing need. The bill leaves in place the old approach of tying future housing quotas to population projections but adds a new overlay of standards for determining targets (Elmendorf, 2019). Determination of housing need now must account for the percentage of households in the region which spend more than 30 percent of their income on housing, relative to what that percentage would be in a "healthy housing market." In addition, rental housing need is based on estimated occupancy; overcrowding rates among renters should be "no more than the average…in comparable regions throughout the nation" (ibid). While pointing to certain conceptual flaws in the approach, some housing scholars believe that SB 828 will strengthen HCD's hand in setting more ambitious regional RHNA targets (ibid). Indeed, in the fall of 2019, HCD used its new authority to triple the RHNA target assigned to the Southern California Association of Governments, the MPO/COG for the Los Angeles region.

Other recent legislation further chips away at local discretion in the housing permit approval process. SB 330, the so-called "Housing Crisis Act of 2019," essentially outlaws plan-level downzoning and moratoria on housing for the next five years. The law also limits the time and number of hearings a local government can conduct in considering a development project, and it prevents cities from assessing project-specific impact fees or changing permit requirements after a developer has submitted a "preliminary" application.

These three bills addressing RHNA and the Housing Element law are only a few of the measures put in place in recent years to induce housing production. Various state incentive programs have been tied to RHNA compliance, and RHNA compliance has been made stricter, such as by requiring that localities demonstrate that RHNA allocations are accommodated on imminently developable sites, to address a long-standing complaint that anti-housing local governments often assign their RHNA shares to sites not practical for actual development (Elmendorf, 2019).

The result of these accumulating RHNA reforms has been to encourage greater attention from localities to updating their housing elements and to promulgating clearer, up-front conditions of development approval, to limit negotiation and delay (Elmendorf, 2019; Stephens, 2020, February 17). While in the early 1990s, only about a quarter of California jurisdictions had HCD-approved housing elements in place, by 2019 the figure was about 90 percent (Elmendorf, 2019).

Some scholars contend that while the recent laws are supporting better local RHNA compliance, ongoing, structural weaknesses hamper the state's basic approach. Elmendorf states that "the California model's most fundamental weakness [is that] the state-law framework positions an agency to pressure local governments from above, but it does not generate bottom-up political incentives for local officials to heed the interests of the outsiders (such as prospective residents) they now ignore" (Elmendorf, 2019, p. 85). Monkonnen and co-authors characterize the basic problem with RHNA logic as "ask[ing] cities to zone for much more subsidized housing than we have subsidies available to build, and cities face few consequences when housing they zone for goes unbuilt" (Monkonnen et al., 2019, p.4).

Criticizing the state's bureaucratic reliance on determining housing need, these scholars advocate more straightforward strategies to mandate that localities accommodate a substantial increase in housing, and then let the market respond (Elmendorf, 2019; Monkkonen et al., 2019). This technique has already been applied to accessory dwelling units (ADUs) in California, through recently adopted legislation that flew under the radar politically, even as more controversial upzoning proposals such as SB 50 gained intense scrutiny and conflict. California's ADU framework, which dates to the 1980s, was recently modified to create an "essentially unqualified right" for any homeowner to add a freestanding backyard ADU of up to 800 square feet, plus a 'junior ADU' of up to 500 square feet within the envelope of an existing structure. The new measures seem to have generated a flood of ADU applications (Elmendorf, 2019). Another similarly straightforward policy, adopted in September 2021, is SB 9, which requires ministerial approval for property owners who split their lot in half and who build up to four units in the resulting two parcels.

Given the current state-local standoff about costs and benefits of upzoning, some scholars also advocate policies to provide a way for localities to capture a portion of the value of upzoning. For example, Elmendorf and Shanske (2019) advocate the establishment of state-supervised development-rights auctions for the purpose, to allow local governments that expand their zoning envelopes pursuant to a state-approved plan to auction, and thus profit from, the newly created developable space.

Such policies to de-regulate the housing market would have the advantage that more multi-unit housing might be built in areas currently constrained from such development. Over the long run, producing more housing supply would help improve affordability, considered across metropolitan housing markets.

These issues also point to the importance of considering the role of MPO/COGs in the RHNA process, and whether and how it might be strengthened. The methodologies that MPO/COGs develop each RHNA cycle for allocating "fair share" housing need among localities in the regions have not been subjected to much legislative scrutiny.

4.5 CEQA Reform

Over the past decade, the state government has made it easier for infill projects to use exemptions from CEQA review, with the result that the use of these exemptions has increased so dramatically as to become "a revolution" in CEQA practice (Fulton, 2016). CEQA exemptions had been provided for infill projects since 1998, but use of these mechanisms was limited. That changed in 2011, when the legislature passed SB 226, creating the first comprehensive infill exemption, which Governor Brown then promoted heavily.

Two factors then converged by the mid-2010s to induce greater use of the available exemptions. A California Supreme Court case (Berkeley Hillside Preservation v. City of Berkeley) was handed down in 2015, which made it harder for project opponents to claim that "unusual circumstances" prevent the use of an exemption, signaling to localities that expansive use of exemptions would be upheld by the courts. Secondly, the market was shifting dramatically toward multi-family housing coming out of the Great Recession, reaching its peak in 2016 and 2017, when multifamily construction went up 40 percent over previous post-recession years and

amounted to almost 60 percent of all housing construction in California (ibid). In the wake of these events, since 2017, exemptions have accounted for almost 60 percent of all CEQA actions filed with the state, according to research conducted by the Governor's Office of Planning and Research (cited in Fulton, 2020a). Meanwhile, full-blown Environmental Impact Reports—reliably about five percent of all CEQA actions over the past 20 years—now account for less than three percent of CEQA actions.

A few recent CEQA amendments specifically support plan-based approaches for supporting affordable infill. SB 540, passed in 2017, allows local governments to establish "Workforce Housing Opportunity Zones," areas located near jobs and transit in which environmental review under CEQA can be streamlined, based on development of a Specific Plan and an associated Environmental Impact Report. The environmental assessment then facilitates ministerial (non-discretionary) review of housing developments within the designated area for five years. Development of these plans can be supported by loans or grants from the State Department of Housing, and they must contain minimum levels of affordable housing (Bill Text - SB-540 Workforce Housing Opportunity Zone., n.d.).

4.6 Restoration of Tax Increment Financing Authority

With the state government eliminating redevelopment authority in 2012, local governments lost the principal means by which they had been able to revitalize downtown areas and to fund affordable housing, using the mandatory 20 percent of revenue raised by tax increment financing (authorized under redevelopment powers) set-aside for that purpose. (Tax-increment authority allows implementing agencies to capture gains in property tax revenue [the "increment"] in a designated area, attributable [presumably] to investments made by the agency in the area; the gains can be used to pay off the cost of the investments.)

Since 2012, various legislative efforts have been launched to restore the lost redevelopment powers at least partly. SB 682, adopted in 2016, allows jurisdictions to establish Enhanced Infrastructure Financing Districts (EIFDs) in which tax increment financing can be used for a limited number of purposes including transit and affordable housing development. Projects financed under EIFDs may not, under most circumstances, demolish any housing units, or if they do, they must provide for their replacement (Shnell and Khosharay, 2016). AB 2, passed in 2015, established another tax increment financing tool for localities called Community Revitalization and Investment Authorities, which can be used to develop new housing, including affordable housing and to promote economic regeneration in distressed areas.

A survey of local planning directors conducted in 2019 found that only a small share of cities had adopted these two new TIF mechanisms (Barbour et al., 2020). This could reflect the newness of the mechanisms, or their more limited scope than was provided under original redevelopment authority. EIFDs, for example, may not capture property tax revenue that would go to K–14 schools, as redevelopment agencies could do in the past, and although EIFDs can raise funds for purposes similar to redevelopment authorities, affected taxing entities must agree to cooperate in doing so.

Legislation has been periodically introduced in recent years to more fully restore TIF powers, but these efforts have so far met resistance. For example, SB 5, the Affordable Housing and Community Development Investment Program, was proposed in 2019 to enable TIF to be used for affordable housing, TOD, and infill housing. Initially, tax increments statewide would have been limited to $200 million annually, with jurisdictions needing to gain approval from a state board.

Although it passed the legislature, Governor Newsom declined to sign SB 50, citing budget constraints. This argument hearkens back to the reasons provided for dissolving redevelopment authority in 2012, when the state government needed to take back the revenue lost to K-12 funding which had been accruing to localities through the TIF provisions. In California, the state government is responsible for "back-filling" K-12 school funding to meet equity standards across all school districts, meaning that TIF powers diverted a funding stream that would otherwise have been available to meet state priorities for school funding to support infill development and affordable housing. As the state government seeks ways to induce localities to support infill, restoration of TIF powers represents a "carrot" that could be revived for that purpose.

4.7 AB 2923: Turning BART Stations into TOD Zones

AB 2923, adopted in 2018, called on the Bay Area Rapid Transit (BART) system to adopt TOD standards for BART-owned land within one-half mile of a station, and for cities and counties that have qualifying BART-owned sites to adopt those standards into their zoning ordinances by 2020. BART released its guidance in 2020, stipulating minimum allowable densities of 75 housing units per acre, no minimum parking requirement, and maximum height, FAR, and parking standards that vary by community type.

Localities were also encouraged to adopt minimum allowable density standards—not the same thing as minimum required densities. In this fashion, AB 2923 respects local government control over land use and development permitting, even as BART project proposals will seek to achieve BART's development goals. The BART guidance, therefore, serves to indicate BART's preferences, which must be ironed out with local jurisdictions in terms of how they will apply in specific situations.

4.8 Summary

The track record of policymaking in California to support sustainable development patterns shows some achievements but also gaps in providing for effective local implementation. SB 375 gained national attention for linking regional and local transportation and land use plans, connecting an environmental performance mandate (for reducing per capita GHGs) to plan consistency between RTP/SCSs and RHNA (including RHNA's stipulation for providing affordable housing).

Since its passage, the Achilles heel of SB 375 has been the lack of state-supported strategies to induce the compact infill development and alternative transport investments envisioned in the law. Only recently has the state government begun to adopt strong supportive policies, such as SB 743's reorientation of CEQA review toward reducing VMT. Meanwhile, the state government has not restored the redevelopment authority that

localities lost in 2012, representing their main source of funds and "patient capital" to use for revitalization strategies as well as for funding affordable housing. The various state funding and regulatory measures adopted by the state since 2012 have not compensated for this loss of local resources.

Regional plans since SB 375 have shown only incremental improvements in reducing VMT and inducing compact growth and non-driving mode shifts. The structure of MPO/COG governance boards, in which board members are appointed from individual municipalities in the region, means they will generally produce plans that serve collective local interests, which may not be consistent with regional or state interests. However, given that the state government establishes the wider framework of fiscal, regulatory, and planning powers exercised by localities, even local prerogatives and incentives should be viewed as operating within state-framed parameters (Barbour, 2020). Ultimately, the state government is as much or more responsible for the success of SB 375 than localities are.

The stand-off that emerged between the MPOs and ARB in negotiations on updating the MPOs' GHG reduction targets underscores this point, calling for state level action, specifically passage of mileage-based fees statewide, greater funding for transit, and direct support for local TOD projects conducive to SB 375 goals, as a condition for the MPOs taking on more responsibility for GHG reduction.

5. Conclusions and Recommendations

Housing and transport are inextricably linked and between them do much to define the overall pattern of daily life for households and individuals. Decisions about where to work, go to school, shop, eat, socialize, and spend time throughout the city are all shaped by the relative costs of transport (in time and money) and the subsequent travel and location choices made by individuals, firms, and households. Housing—the location of home—is ultimately the center of gravity for travel decisions, and research increasingly stresses that no effort to reform transportation alone will succeed without attention to the location of housing. But the converse is equally true—no land use policy, if unmatched by complementary transportation interventions, should be expected to meaningfully reduce VMT.

Several key findings about sustainability and housing policy emerge from our analysis of current research. The city and regional scale are important, but policies often focus only on smaller scale areas such as neighborhoods or even parcels. Research tends to over-emphasize developing housing near rail stations, which accounts for only a small portion of developable land in the state and cannot suffice to address the scale of the problems, compared to concentrating on areas dominated by single-family zoning. There is also too much focus on development regulations and not enough attention paid to the state government's potential role in allowing and encouraging road pricing and parking pricing, which can significantly improve the effectiveness of land use and multi-modal transport strategies for reducing VMT.

We strongly recommend policies focused more generally across urban areas in infill locations and inner ring suburbs, not just near rail stations; and we strongly recommend transportation investments focused on buses, carpooling infrastructure, and pedestrian improvements, not just rail transit. At the same time, we note the value local planners place on combining de-regulatory approaches, particularly upzoning, mixed use zoning, and parking de-regulation, with the development of neighborhood plans that incorporate resident input, and which facilitate subsequent streamlining of development approvals.

In the remainder of this section, we draw generalized conclusions about state-level policies that are likely to both decrease VMT and increase housing affordability while improving accessibility. We also address how the state can support metropolitan planning organizations and municipalities in advancing housing production to increase affordability, reduce transportation related GHGs and improve accessibility. The approach we advocate is deregulatory; it emphasizes providing larger amounts of market rate housing built in smaller multifamily developments in infill locations and inner suburbs over producing small amounts of affordable housing as part of large multifamily developments near.

5.1 Price roads and parking

Pricing has the potential to be important in many situations but particularly in instances where available technology makes it possible to internalize external costs. Pricing enables more efficient use of resources, reducing GHGs while disincentivizing development at the urban periphery. The incidence of price burdens

tends to fall on more affluent households, who own and drive autos at a higher rate. Pricing also generates revenues that can be used to address equity concerns, for example, by replacing regressive forms of revenue generation like transportation sales taxes.

5.1.1 Allow and encourage congestion tolls and other forms of road pricing

Road pricing can significantly reduce VMT, working synergistically with land use and multi-modal transport strategies. The state has a potentially important role in facilitating the adoption of road pricing, including in enacting enabling legislation. For example, there is an ongoing effort in San Francisco to adopt a cordon pricing scheme which is becoming more likely to be implemented. Another example that has begun to be adopted in other states is VMT pricing, in which fees are levied based on vehicle miles traveled within a metropolitan area or state. The state could even tie some transportation assistance to a willingness to carry out road pricing, similar to what was done by the U.S. Department of Transportation under U.S. Secretary of Transportation Mary Peters.

The importance of road pricing has been underscored by the state's MPOs, not just in their regional plans but in their recent negotiations with ARB about achieving stiffer GHG reductions under SB 375. Indeed, the MPOs are calling on the state to adopt road pricing as part of a package of strategies, including more funding for multi-modal transport and support for local infill strategies, to achieve SB 375 goals. The recent debates and concerns that have emerged about ineffective implementation of regional plans under SB 375 point to the need for a much more concerted conversation about multi-level roles and responsibilities for achieving the law's goals. MPO plans have succeeded in what they were mandated to accomplish, namely, to depict how each region could achieve GHG reductions if plan strategies are implemented. But MPOs lack adequate authority and resources to implement the strategies called for in their plans; state and local governments have the authority and resources. If MPOs fail to implement the policies and programs that their RTP/SCSs are calling for, which includes road pricing, then SB 375 could fall under the weight of misplaced expectations. Voluntary planning coordination among localities, on its own, is insufficient for achieving SB 375's goals.

5.1.2 Meter on-street parking

On-street parking pricing helps create a more efficient market in parking, reducing GHGs associated with cruising, and critically, providing better support for reforming off-street parking requirements. California cities are currently allowed to meter on-street parking, but cities tend to leave most spaces unpriced. A state law being proposed now would ban off-street parking minimums. If that fails, the state could require pricing on any street with minimums and could reform on-street parking permits by requiring that they be auctioned.

5.2 Lift regulatory dampers on housing development

Regulatory housing reform should be spatially broad, not just limited to rail station areas, in order to reduce driving, reduce housing costs and improve accessibility. It is not clear that transit-oriented development policies are particularly good at reducing VMT; the influence upon auto use of transit proximity, by itself, is modest. Other factors sometimes found near rail, including lower parking supply and higher transit

accessibility (including bus service), appear to be more important. Among land development policies, it is much clearer that reducing parking requirements and allowing more infill development near existing employment clusters has more influence on reducing VMT. Among transport policies, reinforcing existing bus services with dedicated lanes holds promise.

5.2.1 Reform single-family zoning

Reforming single-family zoning makes widespread sense particularly in wealthier suburban locations. There are stronger equity benefits to be gained from allowing housing supply to respond to demand to drive down housing prices for poorer households, than from funneling new housing development primarily to neighborhoods near rail stations. At the same time, there is higher demand for housing in most infill urban locations than in suburban lower density locations. A more general relaxation of single-family zoning would also likely have large effects on racial and income integration, since the most prevalent form of exclusionary zoning is an R1 designation. The passage of Senate Bill 9 certainly moves in the direction of reform but is limited to four units per parcel and will likely have a limited effect on housing production (Metcalf et al., 2021).

Much of the political concern about new development, particularly near rail stations, arises from it being sited near existing, older multifamily buildings. As we have described above, there is ample reason to believe that concerns about gentrification leading to displacement are overblown: as described in detail earlier in this report, there is no reliable evidence that rents or prices of multifamily units increase on average when new housing is developed nearby. However, the concern remains a significant political obstacle. The existence of this concern makes it all the more important, from a political perspective, to site new housing in lower-density parts of expensive metropolitan areas, particularly those parts that are relatively accessible in terms of being near job centers and other valuable resources such as schools, thereby enabling shorter commutes or use of alternative modes. Examples of locations that are likely candidates include inner suburbs such as Beverly Hills, West Los Angeles, and Marin County.

Some sustainability advocates may worry that a more general housing strategy like this would undermine TOD and increase VMT. But this worry is misplaced. First, as we have established above, mere proximity to rail is not a strong predictor of driving, although providing access to transit (including bus service, in particular) and bike- and pedestrian-friendly environments can be important for effective infill strategies. The regional context, distance to job centers, population and employment density, and particularly the availability of off- and on-street parking, and even bus service, are bigger influences on auto ownership and use than proximity to rail. Second, an over-focus on rail neglects buses, which are cheaper and can run in dedicated lanes. This strategy could be encouraged by explicit state support and funding for dedicated bus lanes. Finally, and perhaps most importantly, meeting the accessibility needs of poorer households includes road travel. Compact development, and continued reform of single-family zoning, will help make those trips shorter, more likely to be shared, and more likely to be carried out on foot or via transit, according to the spatial mismatch research and research showing the importance of intermediate-scale built environment factors on travel.

5.2.2 Abolish minimum off-street parking requirements

Minimum off-street parking requirements decrease housing affordability and increase VMT. Developers provide parking at the minimum or below it when possible; and when parking minimums are reduced, the amount of parking provided by developers drops sharply. The market would provide new housing and nonresidential developments with many fewer parking spots per unit than most regulations currently require. This would lower the cost of development not only in terms of reducing the cost of providing structured parking in a dense area (which can easily cost $60,000 per space in some locations) but could also allow developers to develop and market their housing for a different demographic at a lower price point. Fewer parking units would also result in a reduction in auto ownership and use, a reduction that we would expect to be substantially larger than that caused by other built environment factors such as proximity to rail.

Off-street parking requirements are parochial. Most people can look at them in the abstract and see that they are harmful; but they may also want parking requirements in their neighborhoods. The state should consider banning minimum parking requirements, while encouraging the use of on-street parking management in ways that protect existing homeowners and renters and make the elimination of off-street parking requirements politically palatable. Requirements to unbundle parking are less important than the underlying minimums; while a policy worth considering, unbundling is far from the most important parking reform.

5.3 Adopt state incentives for housing and transport development

The state also has a role to play in providing incentives to regional and local governments to engage in development and planning practices that promote housing affordability, decrease auto use and increase accessibility. This state role should not be thought of primarily as providing financial incentives for affordable housing development, since the amount of affordable housing that can realistically (politically speaking) be financed is a small share of the overall need for housing. Based on the available literature, the state should play a stronger role in pre-empting local zoning to meet housing goals.

5.3.1 Expand the use of state transport funds beyond rail and transit

The state has a potential role to play in encouraging the use of alternative modes like transit and walking, as well as in reducing the duration and distance of driving trips. A relatively small share of households is going to be helped by transit improvements, and a much larger share by all the other modes particularly shorter driving trips, carpooling and walking.

5.3.2 Support the taxation of land value rather than property value

If the state wants to *finance* affordable housing it should aggressively tax land value, not development. A tax on land value incentivizes the production of more housing to cover carrying costs, reducing speculation. In contrast, a conventional property tax has the effect of reducing housing development since there are tax consequences for development. A progressive tax on real estate transactions (which could be rebated if the parcel purchased was redeveloped into more units within five years) would be an efficient and equitable way to raise money for affordable housing. A preferable policy route would be a rollback of Proposition 13 and replacing the property tax with a land value tax.

5.3.3 Incentivize "gentle" but widespread density improvements

Measures of urban form at the community and regional scale seem to be better predictors of VMT than neighborhood-level measures. This fact happens to correspond to our housing market needs as well. Less dramatic but more widespread changes in housing and population density over time are likely to have a less disruptive effect on housing markets, raising fewer political concerns about displacement while reducing prices overall due to supply increases. Gentle density is much cheaper, and much less susceptible to market swings and corrections than larger scale multifamily developments. Letting people build 4- to 10-unit wood-framed buildings has significant private and social cost advantages over concentrating multifamily development in steel-framed towers in a small fraction of urban neighborhoods.

5.3.4 Reward localities that meet state performance goals for housing production

Studies indicate that planners often feel less averse to state requirements for meeting performance goals, such as for facilitating housing production, than to "one-size-fits-all" policies that do not allow for tailoring to local conditions. The state should consider how to reward localities that increase housing production, by providing planning funds and other means to facilitate neighborhood planning that combines public input with development permit streamlining.

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