Draft Final Report:
Evaluating the Potential for Housing Development in Transportation-Efficient and Healthy, High-Opportunity Areas in California

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Table of Contents

List of Exhibits

Abstract

This report identifies transportation-efficient, healthy, high-opportunity areas for housing development. Adding housing in these areas could promote housing affordability and reduce greenhouse gas emissions, while contributing to enhanced socioeconomic mobility and more equitable development patterns. The development potential in the identified areas, according to data provided by regional planning organizations and local jurisdictions, substantially exceeds the number of existing units, but the layering of regulatory restrictions may impede development at the putatively planned densities. This report therefore identifies enhanced data collection procedures and policy levers to promote development in the identified areas. The policy levers include regulatory changes to expedite the approval of infill housing, to increase the financial feasibility of infill housing, and to more effectively target regulatory requirements related to the provision of below-market-rate housing units.

Executive Summary

Background

To achieve California's goals of reducing greenhouse gas emissions and improving housing affordability, the state must both facilitate transportation alternatives to single-occupancy vehicles and allow more housing to be built in areas where households are less likely to rely exclusively on single-occupancy vehicles. To date, many of the state's housing initiatives have focused on areas with high-frequency public transit infrastructure, particularly rail. However, there are relatively few such areas in the state. Moreover, many rail-adjacent neighborhoods are communities of color that have experienced discrimination and disinvestment. Concentrating new development solely in these areas can bring investment, but it can also bring unwelcome changes for longtime residents and raise concerns about displacement. Opening more sites statewide for infill housing development would expand housing supply in a more equitable manner. In order to achieve this goal in a way that could reduce per capita greenhouse gas emissions, the California Air Resources Board asked the research team to identify transportation-efficient, healthy, high-opportunity (TE-HHO) areas where new housing development should be prioritized, to evaluate the potential for new development therein, to assess implications for social and racial equity, and to identify policy levers to promote development.

Objectives and Methods

We assess various approaches for identifying healthy, high-opportunity (HHO) and transportation-efficient (TE) areas. The HHO metric, which draws on publicly available sources of statewide demographic and environmental data, is based on measures of neighborhood income, income mobility, and pollution burdens. We identify TE areas using factor-cluster analysis based on a range of built environment characteristics, including population density, job accessibility, public transit utilization, housing types and ages, and road density. We also identify TE-adjacent, HHO areas. These are HHO areas that may be particularly susceptible to becoming TE, due to their proximity to TE areas. We generate a geodatabase identifying census tracts as "TE-HHO", "TE-adjacent, HHO," "TE", or "non-TE, non-HHO."

We next evaluate the development potential in priority areas (i.e., TE-HHO areas and TE-adjacent, HHO areas). The estimates of potential buildout are primarily based on the maximum allowable density provided in local general plans. We use harmonized land use data provided by regional planning agencies, supplemented by local data collected from individual jurisdictions. We also investigate the feasibility of analyzing cumulative constraints resulting from the layering of various regulatory restrictions. However, we determine that analysis of cumulative constraints across jurisdictions is infeasible due to extensive inconsistencies in the data and significant gaps in relevant information.

Additionally, we compare the estimated development potential, based on general plan data, to housing needs identified via two different methods: the regional housing needs assessments conducted under California's Housing Element Law and the land use plans created pursuant to the Sustainable Communities and Climate Protection Act (SB 375). We assess implications for social and racial equity by examining the degree of ethno-racial segregation, screening for gentrification, and analyzing residential mobility patterns to and from priority areas.

Results

The estimated development potential in priority areas generally significantly exceeds the number of existing units, providing adequate capacity to accommodate existing and future housing needs assessed through different methods. The notable difference between the estimated buildout and existing units is largely due to the high densities indicated in many land use plans. These plans should serve as blueprints for future development, but the densities indicated therein may be unattainable due to other regulatory constraints. The lack of harmonized data concerning other land-use regulations across jurisdictions limits the viability of analyzing cumulative regulatory constraints.

Expanding housing opportunities in the identified priority areas can contribute to enhanced socioeconomic mobility. Relative to the rest of the state, these priority areas are more likely to be racially concentrated areas of affluence (as defined by the California Department of Housing & Community Development) and less likely to be confronting gentrification. Our findings also reveal that these priority areas do not provide substantial housing opportunities for new entrants, which could perpetuate a lack of diversity in household composition.

We survey existing state and local policies to promote housing development, assess how these policies could affect development in priority areas, and propose additional policies to address this goal. We identify four principal mechanisms for opening TE-HHO and TE-adjacent, HHO areas to more housing: reforms to zoning and housing element law, reforms to the laws authorizing impact fees, reforms to the California Environmental Quality Act, and incentives (such as funding for the production of below-market-rate housing units).

Conclusions

A variety of policy levers and data resources could facilitate housing development in TE-HHO and TE-adjacent, HHO areas. These include:

- Changing substantive and procedural requirements for the development of housing types such as townhomes, duplexes, triples, and quadplexes in single-family zoning districts statewide, including in TE-HHO and TE-adjacent, HHO areas;
- Requiring each local government to identify presumptive densities for sites included in the Housing Element of its general plan;
- Providing authoritative maps of sites that should be exempt from California Environmental Quality Act review for housing development or that should qualify for expedited review of their exempt status;
- Facilitating the targeting of incentives and mandates for below-market-rate housing based on quantitative models; and
- Improving data collection to enable accurate statewide mapping and policy modeling.

I. Defining and Operationalizing "Healthy, High-Opportunity Areas"

Since the 1990s, a large scholarly literature on the "geography of metropolitan opportunity" (Galster and Killen 1995) has emerged, documenting that place can have significant effects on life outcomes such as educational attainment, employment, and health, independent of individual and household characteristics. There is also abundant evidence that public policies and private actions have: (1) systematically limited the ability of members of racial and ethnic minority groups to live in areas with the most resources; (2) frequently restricted members of racial and ethnic minority groups to areas with the fewest resources; and (3) targeted areas with large minority populations for the placement of harmful disamenities, such as highway infrastructure. Thus, an important goal associated with identifying existing "healthy, high-opportunity" areas is to remediate the unequal geography of opportunity resulting from historical and ongoing forms of discrimination. Also vital (although outside the scope of this literature review) is the goal of improving health and access to opportunity in areas that are under-resourced due to racially discriminatory policies and practices.

The following sections: (A) describe the roles of public and private entities in generating and perpetuating spatial segregation and unequal access to resources; (B) survey the literature on the effects of residential context on life outcomes; (C) detail the various methods for classifying residential contexts in order to develop and implement policies that can promote equitable access to existing "healthy, high-opportunity areas," discussing the advantages and limitations of each approach; (D) distinguish between different policies that can be informed by delineating "healthy, high-opportunity areas" and discuss how different policies may best be served by different methods for identifying "healthy, high-opportunity areas."

A. The generation and perpetuation of spatial segregation and unequal access to resources

Governments in the United States have long played a role in generating and perpetuating spatial segregation by race, ethnicity, and income. And, despite some government efforts to mitigate and reduce ethno-racial segregation, other government actions continue to perpetuate it. The history of land-use regulation and housing in the United States provides countless examples of both intentional discrimination and callous disregard for the interests of members of ethnic and racial minority groups. This history involves a litany of wrongs widely recognized as such, including government support for racially discriminatory mortgage underwriting criteria, the enforcement of racially restrictive private covenants, and the intentional segregation of public housing projects. Such forms of *de jure* discrimination have been unlawful for decades, but their effects have persisted and have been compounded by policies that perpetuate *de facto* discrimination, which can limit access to resources and opportunities in more subtle ways than explicit *de jure* discrimination. This section first briefly describes forms of *de jure* discrimination that have produced lasting harms for communities of color, and it then describes historic and ongoing ways that governments have perpetuated *de facto* discrimination. It concludes by discussing non-governmental forms of discrimination that perpetuate segregation and noting how governmental intervention could mitigate private discrimination.

1. De jure government discrimination

Well into the twentieth century, a variety of laws and policies explicitly discriminated on the basis of race and ethnicity. *De jure* discrimination by government entities included:

- Racial zoning ordinances, such as those prohibiting block-level intermixing of African American and white households (Rothstein 2017, 44; Silver 1997);
- The promotion and enforcement of racially restrictive private covenants, prohibiting the sale of property to members of specified racial, ethnic, and religious groups (Rothstein 2017, 77–85);
- Explicit federal policy against insuring home loans in racially integrated areas and in areas without private covenants designed to prevent racial integration, as well as restrictions on insuring loans in the neighborhoods where almost all African Americans in urbanized areas lived (Fishback et al. 2021; see also, Trounstine 2018, 93);
- The intentional segregation of public housing projects, "even in communities where other public facilities [we]re nonsegregated" (Weaver 1946, 100).

These forms of *de jure* segregation became unlawful over the course of the twentieth century. The U.S. Supreme Court found racial zoning unconstitutional in 1918 (*Buchanan v. Warley*, 245 U.S. 60), and it barred enforcement of racially restrictive covenants in 1948 (*Shelley v. Kraemer*, 334 U.S. 1). The federal government's discriminatory mortgage insurance practices were prohibited by a 1962 executive order (Gordon 2005, 217–18), and the Civil Rights Act of 1964 barred federal agencies from authorizing or assisting racially discriminatory public housing programs (42 U.S.C. §2000d; *see also*, *Gautreaux v. Romney*, 448 F. 2d 731, 739-740 (7th Cir., 1971)).

Although subsequent federal laws, such as the 1975 Home Mortgage Disclosure Act and the 1977 Community Reinvestment Act, were intended to mitigate previous forms of state-authorized *de jure* discrimination, they have proved insufficient to overcome this pernicious legacy. *De jure* racial segregation in housing markets — in conjunction with the ongoing forms of discrimination discussed below — has limited the ability of African Americans and members of certain other racial and ethnic minority groups to accumulate wealth via home equity, contributing to persistent, substantial disparities in wealth between households identifying as non-Hispanic white and households identifying as either (1) Black or African American or (2) Hispanic or Latino (Akbar et al. 2019; Bhutta et al. 2020; Perry, Rothwell, and Harshbarger 2018). Moreover, coupled with the ongoing housing market discrimination described below, this ethno-racial wealth gap has limited access to areas with high-quality resources and amenities for many members of racial and ethnic minority groups, by making housing in such areas too costly.

2. De facto government discrimination

De facto discrimination long coexisted with *de jure* discrimination in the United States. As *de jure* discrimination became increasingly impermissible during the twentieth century, *de facto* discrimination replaced it in many instances. Relevant forms of *de facto* discrimination include:

- Disparate siting of toxic waste facilities in African American neighborhoods. Even if such siting decisions were not intended to contribute to the deterioration of these neighborhoods, they were motivated by "a desire to avoid the deterioration of white neighborhoods," and "[t]he welfare of African Americans did not count for much in this policy making" (Rothstein 2017, 55).

- Placing highway corridors in low-income communities of color. "This phenomenon occurred due to the congruence of several factors: relatively cheap land acquisition; lack of community resistance in contrast to a middle class neighborhood; actual intent to use the highway as a form of slum clearance project; and, in some cases, the desire to place a physical barrier between black communities and the envisioned rejuvenation of white middle class, urban centers" (Kushner 1979, 585–86). As Eric Avila (2014, 834) observes, government policies also imposed this burden on "many Mexican American families of East Los Angeles during the 1950s and 1960s."
- Using federal urban renewal funds to displace approximately 300,000 families, most of whom were nonwhite (Trounstine 2018, 125). Cities with higher expenditures on urban renewal activities, such as land clearance, later experienced higher levels of racial segregation, controlling for other relevant factors (Trounstine 2018, 125–31).
- Raising the price of necessary infrastructure, such as public sewers, to prevent the development of racially integrated housing development projects, as occurred – for example – in Milpitas, California in the 1950s (Rothstein 2017, 119–20).

As with *de jure* discrimination, *de facto* discrimination systematically prevented many members of racial and ethnic minority groups from securing housing in areas with good access to high-quality resources and amenities. And, as with *de jure* discrimination, many forms of *de facto* discrimination have subsequently become unlawful (or subject to additional legal hurdles). For example, beginning in the 1970s, environmental laws such as the Clean Air Act, the National Environmental Policy Act, and the California Environmental Quality Act required government agencies to consider the impacts of their actions on human health and, in many cases, take mitigation measures. Such laws have reduced, although not eliminated, adverse health impacts from infrastructure such as high-volume roadways that disproportionately burden low-income communities of color (see, e.g., Currie, Voorheis, and Walker 2020). The federal Fair Housing Act, adopted in 1968, bars actions such as those of Milpitas in the 1950s.

Despite these legal reforms, many forms of local land-use regulation remain powerful tools of *de facto* discrimination and can be a significant barrier to desegregation. Euclidean zoning, so named after the Supreme Court case that affirmed its constitutionality (*Village of Euclid v. Ambler Realty Co.*, 272 U.S. 365), entails the division of a jurisdiction (such as a city) into districts where different land uses are allowed. In addition to specifying permitted uses (e.g., single-family housing, multi-family housing, commercial, industrial), Euclidean zoning ordinances typically dictate dimensional requirements for development (e.g., minimum lot sizes, required setbacks) and include other mandates such as minimum parking requirements. Zoning ordinances also largely determine the procedural requirements for new development proposals, including the number of hearings mandated for a proposed development project and the steps required for appeals.

Many municipalities adopted Euclidean zoning as a substitute for the kind of racial zoning that had been found unconstitutional by the U.S. Supreme Court in 1918 (Silver 1997). Zoning ordinances restricting residential development to single-family homes frequently proved effective at maintaining racial segregation by driving the cost of housing beyond the means of many African American households, which — as noted above — had been systematically prevented from accumulating wealth. As Richard Rothstein (2017, 53) notes, when jurisdictions adopted such zoning ordinances, "class snobbishness and racial prejudice were [often] so intertwined that … it was impossible to disentangle [these] motives and to prove that the zoning rules violated constitutional prohibitions on racial discrimination." Local exclusionary motives were reinforced by federal policy, because "[u]ntil 1949, the Federal Housing Administration officially encouraged the use of zoning to generate race and class segregation" (Trounstine 2018, 93). A range of scholarship provides compelling quantitative evidence that single-family zoning both entrenched existing segregation and increased racial segregation (Pendall 2000; Rothwell and Massey 2009; Trounstine 2018).

Although explicit discrimination based on race and ethnicity has been unlawful for decades, restrictive land-use regulation in relatively affluent municipalities continues to contribute to problems that disproportionately harm communities of color in at least two ways. First, there is extensive evidence that restrictive land-use regulation in areas with high demand for housing drives up the cost of housing (e.g., Albouy and Ehrlich 2018; Glaeser, Gyourko, and Saks 2005; Glaeser and Ward 2009; Gyourko, Saiz, and Summers 2008; Jackson 2016; Kahn, Vaughn, and Zasloff 2010; Zabel and Dalton 2011). Such regulation can include single-family zoning, but it can also include cumbersome review requirements for multifamily projects and unpredictable or excessive impact fees (Monkkonen, Lens, and Manville 2020; Mawhorter, Garcia, and Raetz 2018; Raetz, Garcia, and Decker 2019). In California, communities of color are disproportionately harmed by the resulting high housing costs. For example, according to the 2014-2018 Comprehensive Housing Strategy Affordability data from the U.S. Department of Housing & Urban Development, 33.3% of California renters identifying as Black or African American were severely cost-burdened (i.e., spent more than 50% of their income on rent), as were 27.8% of renters identifying as Hispanic (any race), as compared with 24.3% of renters identifying as non-Hispanic white (Exhibit I-1). Second, restrictive land-use regulations contribute to ongoing racial segregation, limiting access to resources based on race and ethnicity (Pendall 2000; Rothwell and Massey 2009; Trounstine 2020).

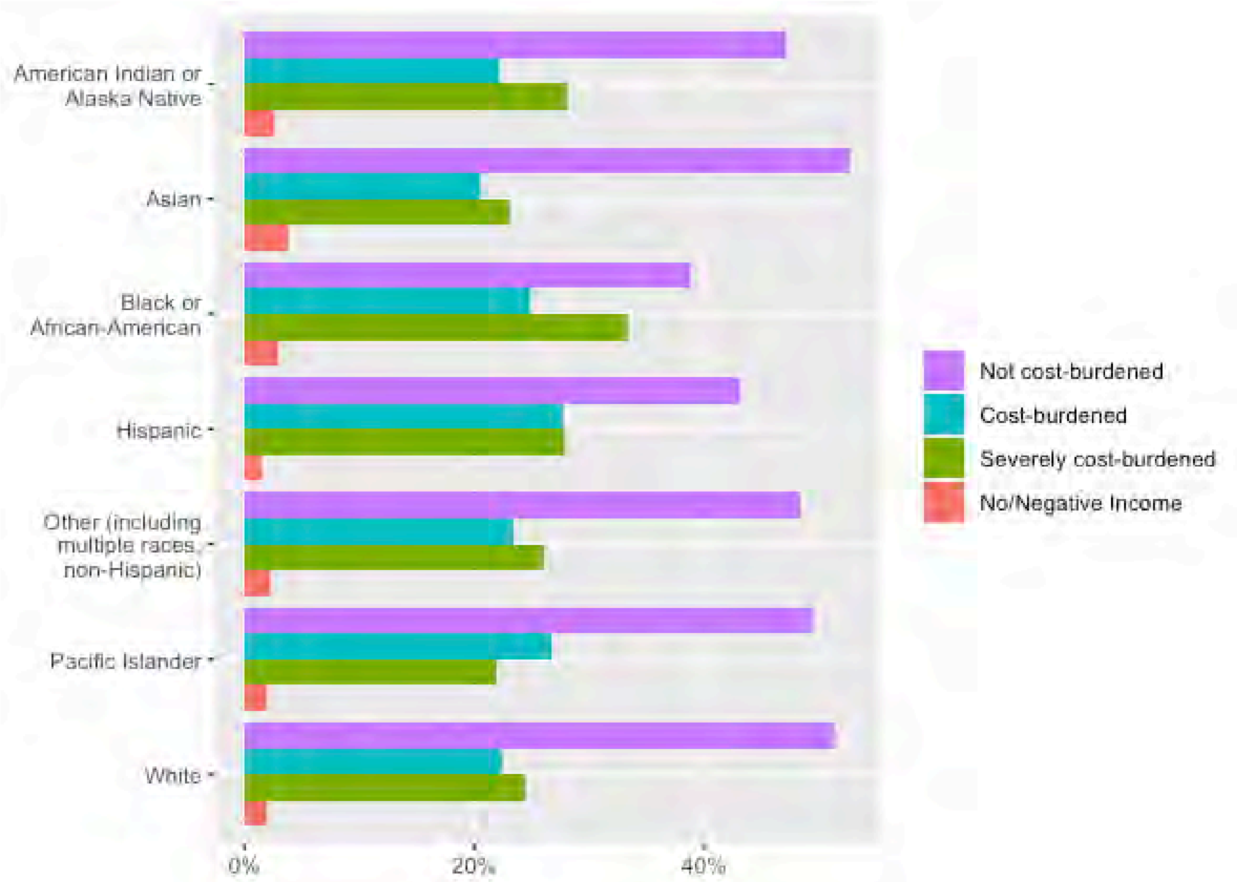
3. *Private discrimination*

As with *de facto* governmental discrimination, private discrimination both coexisted with *de jure* governmental discrimination and has outlived it. The federal Fair Housing Act prohibits various forms of discrimination based on race, ethnicity, and other characteristics including:

- Steering by real estate agents, which "occurs when the characteristics of the neighborhoods in which a homeseeker is shown houses depend on the homeseeker's race or ethnicity" (Oh and Yinger 2015, 29).
- Discrimination by landlords on the basis of prospective tenants' race or ethnicity.
- Discrimination by mortgage lenders on the basis of borrowers' race or ethnicity. (The Equal Credit Opportunity Act, adopted in 1974, provides additional legal protection against such discrimination.)

Despite these legal prohibitions, there is substantial evidence that these forms of discrimination persist (Bayer, Ferreira, and Ross 2014; Hanson and Hawley 2011; Hanson, Hawley, and Taylor 2011; Oh and Yinger 2015; Massey et al. 2016; Rugh, Albright, and Massey 2015; Taylor 2019).

Exhibit I-1: Housing Cost Burdens for Renters in California



Note: Cost-burdened renters spend more than 30% of household income on rent; Severely cost-burdened renters spend more than 50% of income on rent.
Data source: US Department of Housing & Urban Development, 2014-2018 Comprehensive Housing Affordability Strategy

The persistence of private discrimination suggests that expanding housing supply, including below-market-rate (BMR) housing, in historically exclusionary areas may be insufficient to promote equal access to healthy, high-opportunity places to live. In addition to expanding housing supply and more vigorously enforcing fair housing laws, relevant strategies could include expanding housing voucher programs, ensuring inclusive marketing strategies for new housing development projects, and creating counseling programs to help homeseekers identify and secure housing (Krysan and Crowder 2017; Darrah and DeLuca 2014). Beyond expanding access to housing, it may be necessary to adopt other policies reforming, for example, "police practices and school academic and disciplinary policies in predominantly white areas" (Rothstein 2017, 224; A. E. Lewis and Diamond 2015).

B. The effects of residential context on life outcomes

There is a large literature addressing the influence of residential environments on life outcomes related to educational attainment, socio-economic mobility, employment, incarceration, and physical and mental health. Much of the relevant literature uses the term "neighborhood effects" to describe the effects of residential environments, as distinguished from the effects of other factors such as household and individual characteristics. But it may be more accurate to describe the relevant effects as stemming from "residential context" both because there are many different ways to define the contours of a "neighborhood," and because multiple scales are relevant when considering the effects of residential environments on life outcomes.

Myriad attributes of residential contexts could affect life outcomes, including:

- The quality and quantity of nearby institutions fostering the development of children and families (e.g., "schools, child care and after-school programs, libraries, recreational programs, and social service providers") (Sastry 2012, 425).
- The extent and frequency of violent and property crime (Sampson, Morenoff, and Gannon-Rowley 2002, 458–59).
- The strength and density of social ties (Sampson, Morenoff, and Gannon-Rowley 2002, 459).
- The presence of "positive role models," who can "provide a collective means of socializing children to the rewards of academic achievement" (Sastry 2012, 425).
- The distribution of land uses, which could affect, for example, how social interactions occur, the amount of time spent commuting, and the extent of exposure to pollution (Sampson, Morenoff, and Gannon-Rowley 2002, 458).

Crucially, different attributes of residential context may affect different life outcomes in different ways. Moreover, the impact of residential context may vary depending on a resident's age, gender, and ethno-racial identity (Chetty et al. 2020; Sastry 2012; Sharkey and Faber 2014). In addition, although researchers commonly use the census tract as the unit of analysis for identifying the effects of residential context, it is widely recognized that different dimensions of opportunity and health are probably best measured at different scales (Galster 2012; Hipp 2007; Kwan 2012; Sharkey and Faber 2014, 560).

The "social determinants of health" (SDH) literature in public health also sheds light on how area-level factors can influence health outcomes. SDH frameworks examine how social, physical, and economic conditions impact health and describe how conditions in places where people live, learn, work, and play affect a range of health and quality of life outcomes (Centers for Disease Control and Prevention 2021; World Health Organization 2016). Although the scales and measures used in SDH studies vary, major SDH components often relate to neighborhood built environment characteristics, economic stability, social and community context, education opportunity, and healthcare access (California Planning Roundtable 2015). While biological and behavioral susceptibilities play an important role in individual and community health, such neighborhood environmental, social, and economic conditions can cause or exacerbate illness. SDH determinants have been associated with various health outcomes including infectious, cardiovascular, and pulmonary disease and many other ailments (Cockerham, Hamby, and Oates 2017). Given the wide range of SDH constructs employed and health outcomes examined in previous studies, methods for operationalizing area-based SDH measures vary and can include approaches such as selection of individual neighborhood indicators, specification of a singular index such as area deprivation, or development of a multivariate classification approach which accounts for several underlying factors simultaneously (Kolak et al. 2020). Previous SDH studies have confirmed that the relationship between social and neighborhood characteristics and health outcomes is complex due to multidimensional and overlapping factors and variations across geographic space (Kolak et al. 2020).

Rigorous empirical evidence that place could affect life outcomes began to emerge in the wake of a program implemented beginning in the late 1970s to resolve a civil rights lawsuit, filed in 1966, against the Chicago Housing Authority and the U.S. Department of Housing & Urban Development (Rubinowitz and Rosenbaum 2000). Under the Gautreaux program – named after Dorothy Gautreaux, an activist and a plaintiff in the 1966 lawsuit – African American residents of Chicago public housing (as well as people who were on the waiting list for public housing as of 1981) could receive vouchers to rent privately owned apartments (Rosenbaum 1995; Rubinowitz and Rosenbaum 2000). The program's housing agents identified landlords willing to participate in the program, and the program's counselors notified participating households of available apartments. Through the program, some participating households obtained apartments in low-poverty, predominantly white suburbs close to (but outside of) the City of Chicago, while others secured apartments in predominantly African American neighborhoods within Chicago, where poverty rates were higher. Early studies of the Gautreaux program indicated that the assignment of households to apartments was quasi-random prior to 1990, meaning that differences in outcomes were attributable to variations in the placement locations (i.e., between the City of Chicago and the suburbs included in the program), rather than to differences among the households participating in the program (DeLuca and Rosenbaum 2003; Popkin, Rosenbaum, and Meaden 1993; Rosenbaum and DeLuca 2000; Rosenbaum 1991; 1995). These studies showed promising results from placement in the suburbs, including increased employment, higher wages and benefits, decreased use of public assistance, improved school attendance, and better educational outcomes. Although there is evidence that the assignment mechanism did not perfectly mimic random assignment (Votruba and Kling 2009), the Gautreaux program helped to motivate Congress to fund a true randomized program design – the Moving to Opportunity for Fair Housing Demonstration Program (MTO), authorized by Congress in 1992 and launched in 1994 (Goering 2003).

The MTO program enrolled families in Baltimore, Boston, Chicago, Los Angeles, and New York. Eligible families who volunteered for the program "had to have children under age 18 and live in public housing developments or project-based assisted housing in high-poverty areas (census tracts in which more than 40 percent of the population was living in poverty in 1990)" (Sanbonmatsu et al. 2011, 7). Volunteer families were randomly assigned one of three groups: (1) An experimental group that received housing certificates or vouchers, which could be used only in census tracts with a 1990 poverty rate under 10%, along with special mobility counseling to assist in finding a suitable rental housing unit; (2) a comparison group that received housing certificates or vouchers that could be used anywhere and no special mobility counseling; (3) a control group that "received no certificates or vouchers, but continued to be eligible for project-based assistance [i.e., deed-restricted below-market-rate units, including public housing] and whatever other social programs and services to which families would otherwise be entitled" (Sanbonmatsu et al. 2011, 12).

Evaluations of the MTO program revealed a heterogeneous set of outcomes that defy compact summary, although — in some domains — the benefits for members of the experimental group are clear. In comparison to both the control group and the comparison group, adults in the experimental group experienced improved mental health, physical health, and subjective perceptions of wellbeing, and families in the experimental group experienced improvements in objective and subjective measures of safety (Ludwig et al. 2013). Chetty et al. (2016, 859–60) demonstrate that "moving a child out of public housing to a low-poverty area when young (at age eight on average) using an MTO-type experimental voucher will increase the child's total lifetime earnings by about $302,000," thereby "reduc[ing] the intergenerational persistence of poverty and ultimately sav[ing] the government money."

One important question concerning programs intended to facilitate moves to "high-opportunity" areas, discussed in more detail below, is the extent to which they confer autonomy on households and individuals from historically marginalized communities in choosing where they wish to live. In addition, some advocates and scholars have noted a potential tension between the goal of facilitating voluntary migration to new places and the goals of ameliorating conditions in places that have experienced disinvestment and ensuring that residents with low incomes can remain in places with rapidly escalating housing prices, if they desire (e.g., E. G. Goetz 2015). The extent to which there is a tradeoff between the two goals could depend, in part, on the extent to which public resources deployed to facilitate households' moves to "high-opportunity" areas would otherwise be used for investment in under-served and under-resourced communities.

C. Classifying residential contexts to identify "healthy, high-opportunity areas"

Researchers have developed many categorization methodologies to identify variation in residential contexts in order to facilitate policies that improve life outcomes. There are at least four general types of measures that could be used for this purpose:

- ***Composite quantitative proxy measures*** have become widely used in the past two decades. Such measures combine multiple indicator variables predicted to affect life outcomes. They are typically based on researchers' subjective judgment and informed by subject matter expertise, although they may be based on (or incorporate) community consultation. Examples include the diversitydatakids.org Child Opportunity Index (Noelke et al. 2020), the Opportunity Area Maps sponsored by the California Tax Credit Allocation Committee (TCAC) and the California Department of Housing & Community Development (HCD) (California State Treasurer's Office 2022), the pollution burden scores in the CalEnviroScreen database created by the California Office of Environmental Health Hazard Assessment (2022), and the Healthy Places Index from the Public Health Alliance of California (Delaney et al. 2021).
- ***Simple quantitative proxy measures*** consist of a single variable (e.g., poverty rate). As with the composite measures, a simple measure requires subjective judgment to select the measure. Unlike composite measures, a simple measure does *not* require subjective judgment to determine the method for combining multiple variables, because there is only one variable.
- ***Outcome-based quantitative measures*** directly measure the outcomes of interest, such as socio-economic mobility or incarceration rates, by following individuals over time and linking measurable life outcomes (e.g., earnings, employment, incarceration) to the

residential context where they grew up. In a sense, outcome-based measures are also proxy measures, inasmuch as they treat past outcomes as proxies for future outcomes.

- ***Qualitative measures*** are derived from residents' own evaluations of their residential context (or their desired residential context), as determined via interviews or surveys (Lung–Amam et al. 2018; Reid 2019).

In order to assess the advantages and disadvantages associated with each of these approaches to measuring and classifying residential contexts, it is necessary to identify the *reasons* for classifying residential contexts and the *criteria* for evaluating the relevant classifications.

Policy-makers generally have two reasons for classifying residential contexts. First, such classification is necessary in order to design and implement policies to improve life outcomes by enabling people to move to different residential contexts (i.e., moving to a new neighborhood). Second, it is also necessary for policies intended to improve life outcomes by changing the residential context of existing neighborhoods (i.e., community development). Each of these goals may entail different measures of residential context, because – as discussed below – different criteria may be relevant to the different goals. Below, we discuss two overarching criteria for the selection of indicators of residential context: validity and availability.

1. Indicator validity

An indicator is valid when it accurately represents the underlying phenomenon of interest. In identifying "high-opportunity" areas, researchers typically seek to identify a geographic area (a_1) such that an individual (i) residing in a_1 will have better life outcomes (e.g., higher wages, greater educational attainment, longer life expectancy) than if i had resided in a "lower-opportunity" area (a_0). A valid indicator measures an aspect of residential context that distinguishes a_1 from a_0 and contributes to better life outcomes for residents of a_1, independent of individual and household characteristics.

a. Composite quantitative proxy measures

In order to construct a valid *composite* measure to predict better life outcomes in future years, one would need to identify: (1) a theoretical model linking residential context to each outcome, (2) empirical indicators for all components of the theoretical model, and (3) weights for each empirical indicator (Knaap 2017, 915). Unfortunately, although there are many relevant theoretical models and many studies of different indicators, there is no consensus about either the specific empirical indicators that a model identifying "high-opportunity" areas should include or the weights that should be assigned to each indicator included in such a model (Galster 2008; 2012; Knaap 2017).

A composite opportunity index is often structured in two levels: the higher level domains or dimensions of opportunity (e.g., education, transportation, and environmental health), and the lower level indicators intended to measure each dimension. Weights, either determined by non-statistical methods (e.g., expert assessment) or statistical models, are applied in the processes of aggregating the indicators within domains and of aggregating the multiple domains into a composite index of opportunity. Ideally, each indicator or domain is assigned a weight that reflects its importance with respect to the phenomenon being measured (i.e., opportunity). In practice, because the relative importance of indicators is often a source of contention, the approach to weighting remains a matter of considerable technical uncertainty and debate. In this section, we assess the validity of opportunity measures that use different weighting methods, including equal weighting, empirically-derived weights, and weights based on expert judgment.

Different weighting methods have their advantages and limitations. Equal weighting – often resulting from non-statistical methods – is a commonly used approach in opportunity mapping and implies that all variables are equally important in shaping opportunity. Under an equal weighting approach, indicators are weighted equally within each opportunity domain, and the resulting domain scores are averaged with equal weights to obtain the final opportunity index (e.g., Kirwaan Institute for the Study of Race and Ethnicity 2009). The TCAC/HCD Opportunity Area Maps used to allocate Low Income Housing Tax Credits in California employ this approach, except that — within the environmental domain — indicators of exposure to pollution (such as PM2.5 concentrations) are weighted twice as heavily as indicators of environmental effects burden (such as cleanup sites), because the pollution exposure indicators are "considered to have more of an impact on pollution burden" (California Fair Housing Task Force 2020). Equal weighting has the advantage of simplicity and provides an alternative when there is a lack of consensus on the relative importance of variables or insufficient knowledge about the underlying causal relationships.

Equal weighting, however, is subject to at least three limitations that can undermine the validity of an opportunity measure. First, equal weighting typically lacks an empirical basis, and the assumption that each indicator and each domain contribute equally to the specific life outcomes is likely to be flawed. Second, double-counting can result from the assignment of equal weights to two highly correlated indicators – which will likely measure the same aspects of opportunity. Third, some dimensions of opportunity, such as transit accessibility and access to high-performing schools, often point in different directions. Equal weighting is especially problematic when the equally weighted sub-indices are aggregated linearly – another common practice in opportunity mapping. Linear aggregation implies compensability among different indicators/domains (e.g., that access to good schools can compensate for the lack of transit services in determining the final opportunity level).

Alternatively, statistically determined weights can be combined with weights based on expert judgment in a composite opportunity measure. This approach is exemplified in the Child Opportunity Index (COI) 2.0 developed by *diversitydatakids.org* (Noelke et al. 2020). Weights are derived for each indicator and each domain based on the strength of correlations with measures of intergenerational economic mobility, health, and life expectancy. The estimated correlations are subject to several limitations, such as relying on aggregate rather than individual outcome data and being confounded by unmeasured neighborhood characteristics. Given these limitations, the creators of the COI 2.0 opted not to rely on the estimated correlations alone for constructing weights. Instead, they combined the correlation-based weights with a constant weight for each indicator within each domain.[1] This procedure will inflate the weight of indicators that are weakly associated with the outcome variables and shrink the weight of the indicators that are strongly

[1] Mathematically, the weight for indicator i in domain j is equal $(r_{ij} + 1)/2$, where r_{ij} is the mean of the coefficients between indicator i and each of the outcome measures in domain j. Next, r_{ij} is rescaled so that weights for all indicators within domain j sum up to the number of indicators in domain j.

associated with the outcome variables. While the creators of the COI 2.0 consider this procedure as "a safeguard against biased weights in the tails of the weight distribution" (Noelke et al. 2020, 16), it could undermine the validity of the final measure of opportunity by arbitrarily inflating (or reducing) the relative importance of indicators.

In sum, there are trade-offs involved in the complex weighting scheme used in the COI 2.0. On the one hand, the use of the correlation-based weights can potentially improve the predictive accuracy of the composite index. As described above, the COI 2.0 captures many measurable variables that are linked to opportunity dimensions suggested in the empirical literature, and it employs statistical tests to examine the validity of the measures. Weights are then determined by the statistical relationships between the indicators and the outcomes of interest.[2] On the other hand, how to apply the empirically-based weights are subject to analysts' judgment. In the COI 2.0, the correlation-based weights are adjusted and rescaled using a complex procedure that is not empirically grounded. Because weights determined by expert opinion depend on the selected experts' understanding of the processes underlying the weighting scheme, they are inherently idiosyncratic. The complex weighting scheme does not necessarily result in substantial improvement from simple alternatives (e.g., measures using equal weighting). For example, 53% of the variance in the selected intergenerational mobility measure can be explained by the COI 2.0 overall score, as compared to 49% if constant weights had been used in constructing the index. Therefore, the gain in explanatory power from using complex weighting schemes could be fairly small, and such weighting methods may make an opportunity database hard to keep up-to-date and prevent users from understanding and engaging with the data.

Weights determined by statistical decomposition techniques, such as factor analysis and principal component analysis, could address some of the limitations of equal weighting and complex empirical-based weights (Knaap 2017). For example, factor analysis decomposes a large number of indicators into fewer numbers of factors that represent meaningful subdimensions of opportunity. Each indicator's weight is derived from its factor loading that reflects how strongly the indicator is associated with the underlying factor. However, in our review of opportunity measures, we did not find any weighting schemes using such decomposition methods.

Knaap (2017) proposed an empirically derived alternative to overcome the several challenges underlying opportunity mapping. First, the opportunity dimensions and indicators are selected based on the causal pathways of neighborhood effects supported by the empirical literature. Next, confirmatory factor analysis (CFA) is used to verify the construct validity of the proposed theoretical framework by showing whether the selected indicators load strongly on the opportunity dimensions as expected in theory. Finally, rather than aggregate the opportunity domains into one composite score, a clustering algorithm is used to develop a typology of neighborhoods (e.g., a cluster of neighborhoods with decent schools and moderate transit accessibility). Overall, Knaap's approach improves the opportunity mapping practice by providing a better connection to the literature and an empirical basis. The use of cluster analysis and other statistical decomposition techniques can generate meaningful subdimensions of opportunity

[2] Noelke et al. (2020) examine the predictive accuracy of COI 2.0 by analyzing the correlations between the COI and measures of intergenerational mobility, health, and life expectancy.

without the need for deriving weights for each variable. However, cluster analysis requires analysts to make other decisions such as the numbers of clusters to create.

Following Knaap's approach, we use CFA to test the construct validity of the theoretical framework used in California's TCAC/HCD 2021 Opportunity Map and assess whether the indicators used load strongly on the three specified opportunity domains: economic, environmental, and education.[3] We find that several conventional model fit measures used in the context of CFA indicate poor fit of the three-factor model (Appendix 1).

b. Simple quantitative proxy measures

Due to the potential pitfalls of composite quantitative proxy measures, simple quantitative proxy measures might serve as an alternative. Such measures were used in the early and influential residential mobility programs described above. Under the Gautreaux program, households that moved outside the City of Chicago were to be provided with location assistance and vouchers for neighborhoods where less than 30% of the population identified as Black or African American (Rubinowitz and Rosenbaum 2000, 40). As described above, the MTO program used a simple binary measure to identify tracts eligible for moves by the experimental group, as only tracts with a 1990 poverty rate under 10% were eligible.

Although scholars such as john a. powell (2003) and Edward G. Goetz (2017) have observed that such measures are obviously incomplete as indicators of a multi-faceted construct such as "opportunity," simple measures have at least four potentially valuable features. First, they are relatively easy to communicate to members of the public. Second, they may not require calculation beyond the work already conducted by a data collecting agency (e.g., the U.S. Census Bureau). Third, although – as with composite measures – the selection of a simple measure is a matter of judgment, the weighting is much more straightforward because the sole measure receives a weight of one. Fourth, if the measure is income-based, then it may capture multiple dimensions of opportunity (or other qualities of a neighborhood widely viewed as desirable), given that incomes and housing costs are strongly correlated and that "standard economic theory predicts that any amenity associated with a housing unit—including the 'quality' of the surrounding neighborhood—should be reflected in relatively higher monthly rents" (Sanbonmatsu et al. 2011, 44; see also, Marantz and Zheng 2020, 377–78). In Appendix 2, we sort tracts into five income categories (below 80%, 80-100%, 100-120%, 120-140%, and at and above 140% of the statewide median household income as of the 2015-19 American Community Survey (ACS) and find that tracts in a higher income category fare better in a wide range of opportunity indicators.

Simple measures have perhaps most widely been used as screening tools to promote goals such as racial desegregation and the prevention of poverty concentration, as was the case for both the Gautreaux program (with respect to racial desegregation) and the MTO program (with respect

[3] California's 2021 Opportunity Map first applies a filter for high-poverty, racially segregated tracts, which are defined as tracts with at least 30% of the population below the federal poverty line *and* with a location quotient (LQ) – a tract-level measure of relative segregation – higher than 1.25 for *either* Black or African American, Hispanic or Latino, Asian, or all people of color. Next, opportunity index scores are derived based on the three opportunity domains for tracts that are not identified as high-poverty, racially segregated. Consistent with this procedure, we conduct CFA to test the validity of the three-factor model for tracts that are not identified as high-poverty, racially segregated.

to poverty deconcentration). The guidelines adopted by the California Department of Housing & Community Development (HCD) to implement Assembly Bill (AB) 686 (2018) point both to potential benefits and to potential shortcomings of simple measures for these purposes. AB 686 established a mandate in state law "that expands the duty of all California's public agencies to affirmatively further fair housing … through deliberate action to explicitly address, combat, and relieve disparities resulting from past and current patterns of segregation to foster more inclusive communities" (California Department of Housing and Community Development 2021, 7). Under AB 686, municipalities and counties preparing the housing elements of their general plans must identify racially / ethnically concentrated areas of poverty (R/ECAPs) (AB 686, sec. 2, amending Cal. Gov. Code. s. 65583). HCD's guidelines provide two ways for jurisdictions to identify R/ECAPs (California Department of Housing and Community Development 2021, 33). One is a simple measure, created by the US Department of Housing and Urban Development (HUD), identifying census tracts within core-based statistical areas (CBSAs) as R/ECAPs if (1) at least 40% of the population lives at or below the federal poverty line or the poverty rate is three times the average poverty rate in the core-based statistical area, and (2) at least 50% of the population identifies as non-white. An alternative measure is the tract-level High Segregation & Poverty indicator from the TCAC/HCD Opportunity Maps. This indicator uses a simple threshold (30% poverty rate) to determine whether an area is characterized by "concentrated poverty." But, unlike the simple 50% non-white threshold that HUD uses to identify R/ECAPs in CBSAs, the TCAC/HCD Opportunity Maps uses a location quotient, which compares the level of segregation at a smaller geographic level (i.e., a census tract or – in rural areas – a block group) to the level of segregation at a larger geographic level (e.g., a county).[4] This decision is motivated by the theory that relative differences in segregation (between, for example, a tract and the county in which it is located) are more important for the purposes of the TCAC/HCD Opportunity Maps than absolute levels of segregation.

c. Outcome-based quantitative measures

Outcome-based measures rely on realized life outcomes rather than using neighborhood characteristics as a proxy for opportunity. A prominent example is the Opportunity Atlas (OA) developed by Chetty et al. (2020), which provides a range of outcomes of intergenerational mobility at the census tract level – such as adult earnings, incarceration, and teen pregnancy – based on the outcomes of the children who grew up in the same tracts decades ago, conditional on parental income, ethno-racial identity, and gender. In principle, an outcome-based measure should be more valid than a proxy measure, because it directly measures the outcomes of interest and links the outcomes to the residential context. By contrast, in the case of either composite or simple quantitative measures, one cannot be sure that the measured neighborhood characteristics contribute to better life outcomes independent of individual and household characteristics and that such relationships are properly modeled.

Nevertheless, recent analyses raise a variety of concerns about the validity and reliability of the OA. The first and perhaps the most critical concern is that the OA estimates are not derived in isolation from neighborhood sorting, a process in which parents choose neighborhoods based on their preferences and constraints (Aliprantis and Martin 2020). In the presence of neighborhood

[4] See note 3, above, for a more detailed discussion of the location quotient used in the TCAC/HCD Opportunity Maps.

sorting, the OA estimates are likely confounded by the unobserved influence parents have on children's outcomes. Furthermore, neighborhoods across the U.S. are highly segregated by income and race/ethnicity. Thus, some census tracts have very small sample sizes for some racial and ethnic groups, and statistical noise may obscure the OA estimates for members of underrepresented groups (Aliprantis and Martin 2020). The OA estimates are also less reliable in neighborhoods that experienced large changes over time, because past outcomes are used to predict future outcomes. Another concern about validity arises when tracts are ranked according to the OA estimates. As illustrated in Mogstad et al. (2021), when the margins of errors rather than simply the point estimates of an OA variable are considered, one cannot draw conclusive evidence about the ranking of locations in terms of intergenerational mobility.

d. Qualitative measures

Qualitative measures of opportunity would "account for the unique experiences of the various racial and ethnic groups that stem from economic status, language or cultural issues, current residential patterns, and so on" (powell 2003, 202). Such measures are derived from some combination of surveys, focus groups, interviews, and participant-observation. As discussed below, qualitative measures of opportunity may be particularly important for the design of programs that determine priority locations for the use of housing vouchers and the allocation of subsidies for below-market-rate housing. For the purposes of statewide analysis, however, qualitative measures present a challenge because such measures inevitably introduce "bias relative to the composition of the sample, their knowledge, and their desires" (Knaap 2017, 921). Even with sufficient resources, deriving a representative sample requires contestable research design decisions, and applying consistent methods across the entire sample would present significant challenges.

2. Data availability

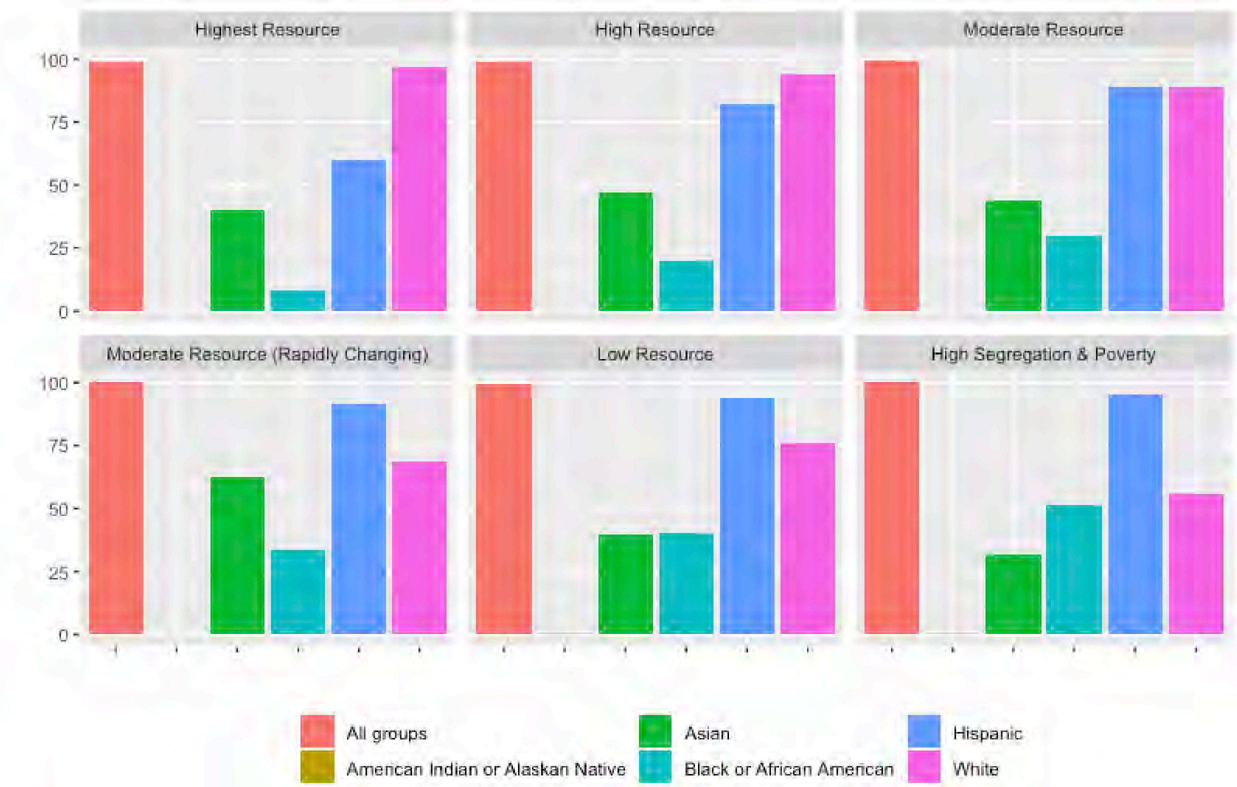
Another criterion for selecting measures of opportunity is the availability of consistent data across space and over time. Simple quantitative proxy measures, such as an income-based measure, are superior to other types of measures in terms of availability. Such measures are generally derived from data that have been collected and periodically updated by public agencies such as the U.S. Census Bureau. For example, the ACS – which is the most commonly used source of data in constructing quantitative measures for US metropolitan areas – provides demographic information at the census tract and block group level through yearly national surveys. Nonetheless, simple quantitative proxy measures can differ in the degree of availability. For example, in the ACS, the U.S. Census Bureau only determines median housing value for owner-occupied housing units, rendering the data unavailable for neighborhoods with few owner-occupied units, such as areas where renter-occupied units are concentrated. On the other hand, median household income is tabulated for all households (i.e., including both owner and renter households) in a given geographic area and thus has a relatively higher degree of availability.

Composite quantitative measures are limited in terms of availability for two reasons. First, in many cases, a composite measure is the product of combining numerous simple quantitative measures (i.e., indicators). The availability of the composite measure is thus determined by the availability of each indicator used for constructing the composite measure. As described above, some indicators may be derived from data with a lower degree of availability, and the resulting composite measures may be missing or less reliable for some geographic areas. Second, depending on the data and methodology used, a composite quantitative measure may be difficult to update over time. For example, the COI 2.0 (Noelke et al. 2020) is constructed using a large number of indicators drawn from both public sources and proprietary data, which may only be available for a limited timeframe.

The availability of outcome-based quantitative measures, such as the OA estimates, is generally lower than other types of quantitative measures. This is because measuring the outcomes of interest requires analysts to follow individuals over time and link measurable life outcomes to the residential context relevant to these individuals. Like other quantitative measures, outcome-based measures are constrained by the availability of the underlying data from which the outcomes of interest and measures of the residential context are derived. Obtaining data on the outcomes of interest, such as observing adult outcomes in tax records for children in a given birth cohort, is particularly challenging and may not be feasibly incorporated into periodic opportunity mapping practice. Furthermore, because statistical analysis is necessary for estimating the impact of residential context on life outcomes such as employment status and incomes, the sample size must be large enough to draw statistical inferences.

In the OA estimates described above, this is not always the case, especially when predicting outcomes for underrepresented ethnic and racial subgroups. We compare the OA estimates with California's TCAC/HCD 2021 Opportunity Map and find that for each opportunity/resource category in the Opportunity Map, OA measures disaggregated by race or ethnicity and gender are available for only a subset of tracts. Exhibit I-2, below, illustrates the comparison for a key OA indicator of income mobility – the mean household income for adults whose parents had incomes at the 25th percentile of the national distribution. In more than 90% of tracts identified as Highest Resource in the TCAC/HCD Opportunity Map, the OA measure of upward mobility is not available for Black and African American men (Exhibit I-2). Thus, while it is important to understand the heterogeneity of outcomes across race and gender, such analysis will be limited in geographic scope if analysts rely on the OA. On the other hand, the OA estimates for the pooled sample within a given gender group (i.e., not segmented by race) achieve a similar degree of availability as the Opportunity Map.

Exhibit I-2: Percentage of Tracts with Estimated Measure of Upward Income Mobility by Resource Category



Data source: Chetty et al. (2020), California Fair Housing Task Force Methodology for the 2021 TCAC/HCD Opportunity Map

D. Matching policy goals to methods for identifying "healthy, high-opportunity areas"

The previous section focused on the validity and availability of different measures of "healthy, high-opportunity" areas. Although it introduced various relevant policy applications (e.g., identifying residential relocation options for voucher recipients), it did not evaluate the suitability of different definitions of "healthy, high-opportunity areas" to different policy applications. There are at least four possible broad applications of opportunity indicators for housing policy: targeting housing vouchers (as in the MTO program); funding the development of below-market-rate (BMR) units; promoting fair housing in allocating housing needs; and targeting land-use regulation reforms. As described below, using opportunity indicators to target vouchers and fund BMR housing raises different issues than using opportunity indicators to promote fair housing allocations and target land-use regulation reforms.

1. Targeting housing vouchers

Housing vouchers subsidize rents for individuals and families with low incomes. As of 2020, approximately 677,780 Californians – roughly 1.7% of the state's population – lived in households receiving vouchers (US Department of Housing & Urban Development, n.d.-b). Because the number of eligible households significantly exceeds the supply of vouchers, vouchers are assigned to eligible households via lottery. Voucher recipients are among the poorest Californians – 81% of recipient households have incomes of less than 30% of the median for their area, and 95% have incomes of less than 50% of the area median income (AMI). Although housing vouchers are funded by the federal government, housing authorities have the ability to implement housing mobility programs and states can adopt laws to facilitate the use of vouchers, such as prohibitions on landlord discrimination against voucher holders. Voucher policy could be (and in some cases has been) used to encourage (or in some cases require) recipients to locate in areas identified as "low poverty" or "high opportunity." As discussed above, the available evidence indicates that such housing mobility programs can have positive effects on life outcomes, although critics have raised concerns about the impacts on participants' autonomy. In order to address concerns about autonomy and participants' preferences, the method for identifying "high opportunity" areas in the context of this policy could take these preferences into account, as discussed below.

Housing mobility programs oriented towards "high opportunity" (or low-poverty) areas may be important, because there is evidence that the large majority of households receiving vouchers do not relocate to tracts that are consistently low-poverty (i.e., tracts with poverty rates below 10%) (McClure, Schwartz, and Taghavi 2015). The reasons for this outcome include an insufficient supply of multifamily housing in low-poverty areas (McClure 2010), limited information provided to voucher recipients about different neighborhoods (Krysan and Crowder 2017), and landlord discrimination against voucher holders (Tighe, Hatch, and Mead 2017). In addition, as Krysan and Crowder (2017, 92) note, "the geographic locations that define our daily activities are likely to become important centers of gravity (or tethers) in our housing searches and residential decisions."

The Gautreaux and MTO housing mobility programs described above operated in connection with housing vouchers and counseling to promote relocation to areas designated by program designers: low-poverty areas (in the case of MTO) and areas where less than 30% of the population identified as Black or African American (in the case of Gautreaux). More recently, the Creating Moves to Opportunity (CMTO) program used the OA to facilitate moves by voucher holders to "high-opportunity" places in the Seattle, Washington area (Bergman et al. 2019). The Gautreaux and CMTO programs also both provided for outreach to landlords by program staff, in order to both identify willing landlords and potentially persuade landlords to accept participating households as tenants. None of these programs included any provision for increasing the supply of eligible housing units – they simply attempted to match voucher holders with existing units.

Housing mobility programs typically have at least one of two goals: improving life outcomes for members of participating households and promoting desegregation. There is limited data to assess which definition of "high opportunity" is associated with larger improvements in life outcomes, because – to date – only the MTO program has both employed an experimental design and tracked participants over a long period. (Eventually, the CMTO program may allow comparison of the effects of different opportunity metrics.) Aliprantis et al. (2020) provide evidence that the choice of an opportunity measure may have limited impact on desegregation, in comparison with other aspects of housing mobility program design. Using simulation-based models, they evaluate housing mobility programs "in terms of their ability to reduce the residential segregation of Black and white poor residents" (Aliprantis, Martin, and Tauber 2020, 2). They find that the most important features of program design are the spatial scale of the program, with regional programs more effectively serving the goal of desegregation than local programs, and the eligibility criteria for the program, with race-conscious designs being more effective than race-neutral designs. They also find that eliminating supply constraints on rental housing would have a larger impact on desegregation than either the spatial scale of the program or the implementation of a race-conscious design. Compared to these three program features, they find that the selection of an opportunity measure has a small impact on desegregation.

To the extent that housing mobility programs both define the areas where the vouchers can be used without input from voucher recipients and require voucher holders to reside in designated areas as a condition of receiving a voucher, they raise concerns about autonomy. For example, Goetz (2014, 141) contends that "[r]egarding mobility, policymakers should focus on enhancing choices, not forcing a particular choice on recipients of assisted housing." Notably, unlike the Gautreaux program and the MTO program, the more recent CMTO program did not require voucher recipients in its treatment group to live in tracts designated as appropriate by the program designers. Instead, the program provided "all families in the treatment group [with] the option to use their housing voucher in any neighborhood within the [participating] housing authorities' jurisdictions," but it only provided supplemental services to assist families in the treatment group that sought housing in areas designated by the program designers as "high-opportunity" (Bergman et al. 2019, 2). Such a program design may increase the autonomy of participants, relative to the MTO and Gautreaux program designs.

Providing participants with a role in defining "high-opportunity" areas could provide another means of promoting autonomy. For example, studies by Lung-Amam et al. (2018) and Reid (2019) provide preliminary evidence that residents of lower-income neighborhoods may value jobs accessibility when choosing a new neighborhood, as compared with residents of higher-income neighborhoods. Both studies rely on small (and potentially unrepresentative) samples, and the authors acknowledge the potential pitfalls of generalizing preferences based on these data. But the studies provide important evidence that perceptions of opportunity could differ based on socio-economic status and current residential location. As a result, voucher programs might provide counseling that could recognize and fulfill heterogeneous definitions of opportunity.

Importantly, in order to fulfill voucher recipients' heterogeneous preferences regarding housing, it is necessary for housing that satisfies the cost requirements of voucher programs to be available in heterogeneous neighborhoods. In that case, a broad definition of "opportunity" should be used in defining where additional housing supply (including housing supply that could fulfill the requirements of housing voucher programs) is needed. Such a broad definition would facilitate the construction of housing in areas satisfying many different definitions of "high-opportunity."

2. Targeting funding for below-market-rate units

Whereas housing vouchers subsidize people, other subsidy programs subsidize units, ensuring that subsidized units are affordable at a specified percentage of area median income (e.g., 30%, 50%, 80%) for a specified period of time (e.g., 30 years, 99 years, in perpetuity). Just as the Gautreaux, MTO, and CMTO programs attempted to direct voucher recipients to certain types of areas that may be associated with desegregation and beneficial life outcomes, some subsidized housing programs have also attempted to steer below-market-rate (BMR) housing to neighborhoods designated by program designers as "high-opportunity." These efforts mark a noteworthy shift from the frequently discriminatory approach to BMR housing siting that predominated in the middle of the twentieth century, described above. Rather than providing an exhaustive list of relevant programs, we focus on the federal Low Income Housing Tax Credit (LIHTC) program, funded by the federal government and administered jointly by state and federal agencies. As Exhibit I-3 indicates, the large majority of federally subsidized BMR units in California are funded via the federal Low Income Housing Tax Credit (LIHTC) program.

Exhibit I-3: Number of Federally Subsidized BMR Housing Units in California, by Subsidy Program

			% of households with incomes...		
Program	Units	People	< 50% of AMI	< 30% of AMI	Under $20,000
Housing Choice Vouchers	349,944	677,780	95	81	68
LIHTC	327,305	NA	63	50	44
Project Based Section 8	102,450	164,656	98	87	80
Public Housing	26,659	67,649	91	74	62
202/PRAC	13,523	16,069	99	89	90

Notes: This table includes only federal programs subsidizing more than 3,000 units; AMI is area median income; Low-Income Housing Tax Credit (LIHTC) data are from 2019 and all other program data are from 2020.
Data sources: US Department of Housing & Urban Development (n.d.-b; n.d.-a).

The LIHTC program illustrates how California state agencies have used opportunity metrics to guide developers' selection of BMR housing sites. The LIHTC program gives states authority to issue tax credits (allocated by the federal government) to fund the rehabilitation or construction of rental housing developments in which at least 40% are occupied by households with incomes under 60% of AMI or at least 20% of units are occupied by households with incomes under 50% of AMI (Ellen and Horn 2018, 729). In California, 63% of households in LIHTC units have incomes under 50% of AMI, and 50% have incomes under 30% of AMI (Exhibit I-3).

States adopt regulations governing the apportionment of tax credits to qualifying projects, and California's regulations rely on the TCAC/HCD Opportunity Maps to determine the suitability of each census tract in the state for BMR housing funded via the LIHTC program. Developers enter into a competitive process to receive one type of tax credit provided by the program, and they can raise their score for certain types of projects (e.g., those suitable for families with children) by locating the project in a tract designated by the TCAC/HCD Opportunity Maps as "Highest Resource" or "High Resource" (California Tax Credit Allocation Committee 2021, sec. 10315(h)).

Given the limited availability of tax credits, policy-makers designing plans to allocate the tax credits confront several tradeoffs. For example, although the evidence detailed above suggests that lower-income households can benefit from housing in areas designated as "high-opportunity," there is also evidence that LIHTC developments can have significant positive impacts on lower-income areas. Diamond & McQuade (2019, 1065) demonstrate that "LIHTC construction in neighborhoods with a median income below $26,000 increases local property values by approximately 6.5 percent within 0.1 mile of the development site," and that "LIHTC development causes declines in both violent and property crime within low-income areas." Moreover, some eligible households may prefer to remain in their current neighborhood (Reid 2019, 655). Thus, input from the potential occupants of LIHTC developments concerning the criteria for siting such developments may be particularly important.

3. Promoting fair housing in allocating housing needs

Opportunity indicators are used to advance the affirmatively furthering fair housing (AFFH) objective in the housing allocation process established under California law. This section first provides an overview of the housing allocation process in California. Next, we summarize how the TCAC/HCD Opportunity Map is used by each of the four largest council of governments (COGs): the Southern California Association of Governments (SCAG), the Association of Bay Area Governments (ABAG) in the San Francisco Bay Area, the Sacramento Area Council of Governments (SACOG), and the San Diego Association of Governments (SANDAG).

California has engaged in decades of state-led housing planning. A key component of the state's housing planning framework is the regional housing need assessment (RHNA) process. HCD provides every COG with a regional RHNA determination. Each COG is then tasked with developing a methodology to allocate this regional need to individual jurisdictions. COGs create their own allocation methodologies based on factors outlined in state law, including local jobs-housing relationships and opportunities to increase the use of public transit. The allocation methodology also distributes the regional housing needs in four income categories defined by HCD (very low, low, moderate, and above moderate).[5] Upon receiving their housing allocations, local governments must update the housing elements in their general plans to demonstrate land use capacity and strategies for accommodating the allocated targets over a statutorily specified planning period.

Each COG must develop an allocation methodology that advances the statutory objective of affirmatively furthering fair housing. This involves addressing patterns of segregation and disparities in housing needs and access to opportunity. The resulting housing allocations should improve housing opportunity for all economic segments in resource-rich areas and prevent the concentration of lower income housing in communities that already have a disproportionately high share of households in areas of low resource or high-poverty, racially segregated areas. The housing allocations should also balance disproportionate income distributions. In other words, if a jurisdiction already has a disproportionately high share of households in an income category, the jurisdiction should receive a lower proportion of housing allocation in that income category.

Opportunity indicators play a crucial role in advancing the AFFH objective. The state's TCAC/HCD Opportunity Map categorizes neighborhoods into different resource levels and identifies areas that are high-poverty and racially segregated. HCD assesses whether a COG's allocation methodology promotes fair housing, typically by assessing the housing allocations – particularly lower-income housing targets – to resource-rich jurisdictions (i.e., those concentrated

[5] Each income category is defined as a range of household incomes as a percentage of the area median income (AMI). Very low, low, moderate, and above moderate income categories are defined as less than 50%, 50-80%, 80-120%, and over 120% of the AMI.

with high resource neighborhoods, as defined in the Opportunity Map). Accordingly, COGs draw on the Opportunity Map when developing the housing allocations for their member jurisdictions.

The four larges COGs in the state use the Opportunity Map in allocating housing targets in various ways. As detailed below, the level of complexity varies across these intraregional allocation processes. With the exception of SANDAG, the Opportunity Map is used for developing allocation weights to emphasize access to opportunity. Although the Opportunity Map does not measure income, COGs also use it to balance disproportionate household income distributions. ABAG, SCAG, and SACOG, each with different methodologies, develop higher allocation weights for jurisdictions with a greater concentration of households living in high-resource areas. In SCAG, the Opportunity Map is also used for identifying high-poverty, racially segregated areas to avoid the concentration of lower-income units in such locations. SANDAG uses a relatively simple approach to address imbalance in income distribution. It directly compares local household income and regional income distributions to determine whether to make upward or downward adjustments to the allocations, and it uses the Opportunity Map to assess the final allocation outcome.

While HCD has approved the allocation methodology in all four COGs examined, citing evidence that the methodology promotes the various statutory objectives including AFFH, existing research has demonstrated limitations in these allocation processes. For example, Zheng et al. (2021) find that the redistribution of housing allocations from disadvantaged communities – identified based on the TCAC/HCD Opportunity Map – can create significant imbalances in housing allocations among jurisdictions with very similar socioeconomic characteristics. Additionally, balancing the disproportionate household income distributions based on the Opportunity Map, which does not directly measure income, does not ensure that more housing units are allocated to higher-income or transit-rich communities.

More broadly, the use of the Opportunity Map raises questions about geographic scales and outcome measures for AFFH analysis. The Opportunity Map ranks urban census tracts within regions based on a composite measure of a range of indicators such as school performance, jobs accessibility, and environmental quality. Drawing on the regionwide rankings from the Opportunity Map, COGs typically allocate relatively high shares of lower income housing units to high resource jurisdictions. However, regionwide rankings may obscure substantial variation within local jurisdictions. For places that are more homogeneously higher opportunity, even with a high housing allocation, the Opportunity Map does not necessarily promote integration across neighborhoods within a city (i.e., compelling local jurisdictions to allow housing for all income levels in all neighborhoods). The complexity of a composite opportunity measure makes it less scalable. In contrast, a simpler income-based measure can be easily addressed to different scales and evaluate opportunity distribution at various geographic levels. Thus, for example, Monkkonen et al. (2023) rely on income, rather than Opportunity Map designations, to assess whether housing allocations in the City of Santa Monica are furthering California's fair housing goals.

a. SCAG

SCAG allocates the regional housing needs by determining each local jurisdiction's projected and existing housing needs (Southern California Association of Governments (SCAG) 2020). The TCAC/HCD Opportunity Map is used for two purposes: (1) identifying disadvantaged communities (DACs) in the region, and (2) determining housing needs in the four income categories. For identifying DACs, SCAG uses the resource categories defined in the Opportunity Map to define DACs as jurisdictions with more than 50% of the population living in areas of high segregation and poverty or low resources. The housing needs allocated to DACs are capped at the household growth between 2020 and 2045, as determined by SCAG's 2020–2045 Regional Transportation Plan/Sustainable Communities Strategy. Therefore, if the calculated projected and existing need is higher than the projected household growth between 2020 and 2045 in a DAC, the housing need exceeding the projected household growth will be redistributed within the same county to the non-DAC jurisdictions.

In principle, the process described above could address disparities in housing needs and in access to opportunity by reducing the number of housing units that disadvantaged communities must accommodate. However, in practice, it creates significant imbalances in housing allocations among cities with similar socioeconomic characteristics and transit access. As discussed in Zheng et al. (2021), Fullerton and Orange, two cities with similar characteristics such as population size and access to high-quality transit, have received drastically different allocations: 13,180 units to Fullerton and only 3,927 units to Orange. This is because the share of population in Orange living in areas of high segregation and poverty or low resource exceeds the 0.5 threshold (57%), even though the median household income in Orange ($109,335 as of the 2022 5-year ACS) is roughly 10% higher than that in Fullerton. As this example illustrates, because the composite measure in the Opportunity Map does not measure income, it could mask the fact that certain jurisdictions are indeed high-income areas. As a result, some relatively high-income jurisdictions can receive lower allocations, as in the case of the City of Orange.

Additionally, SCAG uses the Opportunity Map to develop a social equity adjustment for determining the share of the housing need in each of the four income categories. The social equity adjustment is used to ensure that SCAG allocates a lower proportion of housing need to jurisdictions that already have a disproportionately high concentration of those households in comparison to the county distribution. For example, a jurisdiction where the share of very low income households is above the countywide share will receive a downward adjustment to the allocation of very low income housing units. For jurisdictions that have a high concentration of either very low or very high resource areas, as defined in the Opportunity Map, a larger social equity adjustment is applied.

The application of the social equity adjustment is fairly complex. Each jurisdiction is assigned a minimum of 150% social equity adjustment. For example, 26% of households in the Los Angeles County qualify as having very low incomes. The City of Pasadena, with 23% of households qualifying as having very low incomes, will receive an allocation of very low housing at 28% (calculated as 23% - (23% - 26%) × 150%). If a jurisdiction is considered a very low or very high resource area based on the Opportunity Map, the jurisdiction will receive an additional social equity adjustment of 10%-30%. For example, the City of Compton has 99% of its population within the lowest resource tracts and therefore receives a social equity adjustment of 180%. Thirty-one percent of households in Compton qualify as having very low incomes, whereas the countywide share of very low income households is 26%, so Compton is considered as having an overconcentration of very low income households compared to the county. As a result, the allocation of very low income housing for Compton will be reduced from 31% to 22% (calculated as 31% - (31% - 26%) × 180%).

b. SANDAG

SANDAG also uses equity adjustments to determine the share of the housing needs by income category. Unlike SCAG's approach, SANDAG derives its equity adjustments simply by comparing a jurisdiction's share of households in an income category to the region's share of households in the same income category (SANDAG 2021). If a jurisdiction's share of households within an income category is lower than the regionwide share, an upward adjustment is made to the allocation in that income category. (In contrast, a higher share of households within an income category relative to the region triggers a downward adjustment.) After applying the equity adjustments, the 2019 TCAC/HCD map is used to assess whether the final allocations advance the AFFH objective. SANDAG finds that the six jurisdictions that would receive the highest percentage of lower income housing allocations do not contain racially segregated, high-poverty areas or lowest resource census tracts but have the highest percentage of area in high or highest resource census tracts relative to the region. Conversely, in the jurisdictions with large amounts of area in low resource census tracts or segregated, high-poverty census tracts, the lower income housing allocations are generally lower than the regional average. As a result, SANDAG determines that the equity adjustments used in the methodology addresses the disparities in access to resource-rich areas and promotes equity and fair housing.

c. SACOG

SACOG devises an Affirmatively Furthering Fair Housing Adjustment factor based on the share of existing housing units that fall within high opportunity areas, which are defined as the high or highest resource census tracts in the TCAC/HCD Opportunity Map (SACOG 2020). Jurisdictions where the share of existing units in high opportunity areas exceeds the regional average receive an upward adjustment of lower income housing allocations, and jurisdictions with a lower than average share of units in high opportunity areas receive a downward adjustment. As a result, the top seven jurisdictions with the most homes in high opportunity areas receive the top seven largest shares of lower income housing allocations.

d. ABAG

The TCAC/HCD Opportunity Map is used in various different steps of ABAG's allocation mechanism (ABAG 2021a). To begin with, the baseline allocation in ABAG's methodology is based on each jurisdiction's share of the region's projected total households in 2050 from the Plan Bay Area 2050 Final Blueprint (ABAG 2020). The Opportunity Map is indirectly incorporated into the baseline allocation because it is used for identifying one of the growth geographies - High-Resource Areas - in the Final Blueprint. Growth geographies are areas where the plan's strategies would guide and support future growth in housing jobs (ABAG 2021b). Jurisdictions containing High-Resource Areas (all else equal) would have higher projected growth and therefore higher baseline allocations.

Drawing on the Opportunity Map, ABAG also defines an Access to High Opportunity Areas factor in devising its allocation methodology. This factor allocates more housing units to jurisdictions with a higher percentage of households living in areas labeled High Resource or Highest Resource on the Opportunity Map. The methodology allocates 70% of the region's very low- and low-income units and 40% of the region's moderate- and above moderate-income units based on the Access to High Opportunity Areas factor.

In summary, although Opportunity Map can promote balanced and integrated development patterns in the housing allocation process, there are also challenges associated with reliance on the Opportunity Map. First, while the housing allocation should balance disproportionate income distributions, the Opportunity Map does not measure income. The range of factors used for generating the composite measure in the Opportunity Map are not always positively correlated with income, or with each other. Perhaps the most significant mismatch involves jobs accessibility, which is negatively correlated with income and a variety of measures included in the Opportunity Map. As a result, when COGs primarily rely on the Opportunity Map to address imbalances in income distribution across the region, the resulting allocations may not achieve such AFFH goal. Second, because the Opportunity Map uses a relatively complex composite measure, it cannot be easily adjusted to different scales. To the extent that the Opportunity Map facilitates higher housing allocations to higher resource jurisdictions, it cannot usefully guide local land use plans in addressing segregated living pattens within municipalities (Monkkonen, Lens, et al. 2023).

4. Targeting land-use regulation reforms

Local land-use regulation affects the development of both market-rate and BMR housing, and it has been an enduring force in maintaining *de facto* segregation, as discussed above. Notably, regulatory constraints – often in the form of single-family zoning – have significantly limited the efficacy of the kinds of voucher-based and BMR housing development strategies described above. For example, "[g]aining sufficient access to appropriate housing proved to be one of the Gautreaux program's major challenges," in large part because "[s]uburban land-use laws limited apartment development and escalated development costs" (Rubinowitz and Rosenbaum 2000, 7, 40). McClure (2010) demonstrates that there would be limited potential to scale up the MTO program, due to the absence of neighborhoods that both fall below the 10% poverty rate threshold and have sufficient housing stock at costs eligible for housing vouchers.

In addition to constraining the production of BMR housing, restrictive land-use regulations – such as single-family zoning – limit the construction of multi-family market-rate housing, affecting housing affordability across the income spectrum (Been, Ellen, and O'Regan 2019). Market-rate housing units constitute virtually all of the housing available to households with incomes above 80% of AMI,[6] as well as the majority of units that have been added in recent decades to the stock of housing affordable to lower-income households in California's largest high-cost metro areas.[7] Moreover, at the regional scale, adding market-rate housing that is *not* affordable to lower-income households results in lower-quality housing becoming more affordable, through a chain of moves by which "[h]ouseholds who would have otherwise occupied cheaper units move into new units, reducing demand and prices for the housing they leave vacant" (Mast 2023, 1).

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[6] There are a handful of programs providing BMR housing for middle-income households (i.e., those with incomes between 80% and 120% of AMI).

[7] In the Greater Los Angeles area, consisting of the counties of Los Angeles, Orange, Ventura, Riverside, and San Bernardino, roughly 327,000 units were added between 1985 and 2013 to the stock of rental housing affordable to very low-income households (i.e., those with incomes at or below 50% of AMI). Of these 327,000 units, 69% were either ownership units that changed to rental units or rental units that had previously not been affordable to very low-income households (Weicher, Eggers, and Moumen 2017, 159). During the same period the Greater San Francisco area, consisting of the counties of Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Santa Cruz, and Sonoma, added roughly 265,000 units affordable to very low-income households, of which 73% were previously ownership units or higher-cost rental units (Weicher, Eggers, and Moumen 2017, 160).

Neighborhood opposition to multifamily housing can result from a variety of motives and, as discussed below, the context of neighborhood change may affect the appropriate regulatory response under California's Affirmatively Furthering Fair Housing law.

a. Sources of opposition to multifamily development

Proposals to loosen regulatory restrictions on multi-family development often fuel neighborhood opposition due to concerns about neighborhood change. Broadly speaking, there are at least three types of potential change: ***change in housing prices***, ***change in demographic composition***, and ***change in the congestion of resources*** (e.g., roads, schools, parks). The magnitude and direction of these changes may vary across neighborhoods, and – for the purpose of targeting policy interventions – it is therefore important to distinguish between neighborhoods confronting gentrification after decades of disinvestment and historically exclusionary neighborhoods, where most housing is owner-occupied and single-family zoning has long prevented multifamily development. Demand for housing can be strong enough to support multifamily development in both types of neighborhoods, but the impacts of such development may vary. California’s legal commitment to the project of affirmatively furthering fair housing, described below, suggests that opportunity metrics might be used to target efforts to loosen regulatory restrictions on multifamily housing in historically exclusionary neighborhoods that contribute to segregation.

i. Impacts of new multi-family development on prices of existing housing

Increased housing supply consistently improves housing affordability at the *regional* scale, but *localized* price effects can be more variable. As Phillips et al. (2021, 4) explain:

> [N]ew market-rate units … [can] make nearby housing more affordable by increasing availability and relieving pressure on the existing housing stock. This is known as the “supply effect.” An opposing view, however, is that new housing only attracts more wealthy households, brings new amenities to the neighborhood (including the housing itself), and sends a signal to existing landlords that they should raise their rents. This “amenity effect” or “demand effect” thus makes housing less affordable.
>
> It’s very likely that both supply and amenity effects are at play in many communities; the question isn’t which effect is real, but which is stronger. Does the supply effect lower rents or home prices by more than the amenity effect raises them, or is it the reverse? Put more simply: When a new building goes up, what happens to rents in the older buildings nearby?

Recent evidence from high-cost United States cities indicates that the supply effect of new market-rate construction decreases prices for nearby existing units, relative to trend (Asquith, Mast, and Reed 2021; Li 2019; Pennington 2021), although evidence from Montevideo, Uruguay suggests that localized prices may increase relative to trend due to new amenities associated with new multifamily construction (González-Pampillón 2022).[8]

[8] In a study of Minneapolis, Minnesota, Damiano and Frenier (2020) segment rents by market tier. They find that new construction was associated with decreased rents in middle-market and upper-market rents, but increased rents in the

Even when new housing reduces pressure on existing housing stock and decreases prices *relative to trend*, this relative decrease may be of little comfort or value for long-time, lower-income residents of neighborhoods confronting gentrification. From a practical perspective, it may make little difference to an economically precarious household if its rent increases by 5% rather than 10%, if both increases are unaffordable. And household members do not observe changes relative to trend – such changes can only be uncovered through the kinds of econometric analyses undertaken by researchers such as Asquith et al. (2021), Li (2019), Pennington (2021), and González-Pampillón (2022). Moreover, evictions preceding demolition for new construction can result in displacement.

In historically exclusionary neighborhoods, concerns about the impacts of new multifamily development on housing prices are typically the exact opposite – namely that it will result in *decreases* in the values of existing homes (Einstein, Glick, and Palmer 2019; Fischel 2001; Trounstine 2018). Such concerns, and the resulting regulatory restrictions, have been one of the primary obstacles to developing both market-rate and BMR multifamily in neighborhoods where single-family zoning predominates.

ii. Impacts of new multi-family development on demographic composition

As with concerns about the impacts of new development on prices, concerns about the impacts of new multi-family development on demographic composition can vary depending on the neighborhood. Such concerns have a different valence in gentrifying communities than in historically exclusionary communities. In gentrifying communities of color, new housing can "accelerate demographic change, and this change could in turn be unsettling or alienating for longtime residents. Such change can also be physically threatening when, for example, newer affluent white residents call the police to impose their own social norms on their neighbors" (Phillips, Manville, and Lens 2021, 15). The history of discrimination and disinvestment summarized above suggests that, in gentrifying communities of color, residents' concerns about such changes may deserve special solicitude.

By contrast, to the extent that predominantly white neighborhoods where single-family zoning predominates have avoided integration, California law suggests that the preferences of residents that result in the maintenance of segregated residential patterns via land-use regulation do *not* deserve special solicitude. That is because, under state law, California public agencies – including cities – must administer their "programs and activities relating to housing and community development in a manner to affirmatively further fair housing, and take no action that is materially inconsistent with its obligation to affirmatively further fair housing" (Cal. Gov. Code §8899.50(b)). Affirmatively furthering fair housing "means taking meaningful actions, in addition

lower-tier market. However, as Phillips et al. (2021, 11–12) note, "Damiano and Frenier do not adjust the rents in their study for inflation, which is an unusual decision, and one that makes the rent increases they report look much larger than they actually were.... [R]eal rents in the lower-tier submarket grew by only 0.2% (essentially, they didn't change). In the middle submarket they fell by 5.3%, and in the upper submarket they fell by double-digits (12.2%). Rents declined 7% overall." Both the stability of real rents in the lower-tier market and the decrease in rents in the middle and upper submarkets is noteworthy, because during the period covered by Damiano and Frenier's data, "in real terms, median gross rents in Minneapolis rose 25% over this period, while mean gross rents rose 30%" (Phillips, Manville, and Lens 2021, 12).

to combating discrimination, that overcome patterns of segregation and foster inclusive communities free from barriers that restrict access to opportunity based on protected characteristics. Specifically, affirmatively furthering fair housing means taking meaningful actions that, taken together, address significant disparities in housing needs and in access to opportunity, [and] replacing segregated living patterns with truly integrated and balanced living patterns" (Cal. Gov. Code §8899.50(a)(1)).

iii. Impacts of new multi-family development on resource congestion

At least in the short term, new housing development can increase the congestion of resources such as roads, schools, and parks. In some cases, resource congestion may be an unavoidable byproduct of adding housing. But, a less frequently acknowledged point about new housing development in California is that it can have positive effects in areas that are already relatively dense or could become dense, that these benefits may offset any harms from increased congestion, and that it is possible to mitigate increased congestion. As Elmendorf, Marantz, and Monkkonen (2022, 14) note:

> When more people are able to live near one another, this results in what economists call agglomeration effects: the generation of new ideas and innovations that power economic growth; dense labor markets that reward specialization and make it hard for employers to exploit their workers; and cultural amenities like restaurants, civic parks, and theaters (Bolter and Robey 2020). There are also beneficial climate impacts, as people living in dense urban environments have much smaller per-capita greenhouse gas emissions than people living in suburban and exurban settings (Jones, Wheeler, and Kammen 2018). Dense development that adds to road congestion in the short term makes public transit more viable in the longer term. And there are important socioeconomic mobility benefits, because when poor families move into middle-class communities, their children have much better long-run outcomes: higher incomes, lower unemployment, less incarceration (Chetty et al. 2020).

Thus, even though new housing development can increase congestion, it can also bring corresponding benefits.

A key policy question is *who* should decide whether the benefits from new housing development could offset the costs. With respect to historically exclusionary areas, HCD's Affirmatively Furthering Fair Housing (AFFH) guidance memo indicates:

> Over time, single-family zoning emerged and replaced race-based zoning as a tool for segregating communities by restricting more affordable housing options, such as apartments or condominiums. Exclusionary zoning policies have made it difficult for lower-income residents to access certain communities and in turn has had a discriminatory effect on protected characteristics such as race, disability, and familial status. Furthermore, federal, state, and local subsidized programs failed to construct affordable housing in high-resource neighborhoods, which are disproportionately white, thereby reinforcing the spatial segregation of low-income communities of color. (California Department of Housing and Community Development 2021, 6)

In order to overcome this legacy, it may be necessary for state law to limit the veto that exclusionary high-resource neighborhoods have typically exercised over multifamily development.

b. Using regulatory designations of "healthy, high-opportunity" areas to target land-use regulation reforms

In light of the goals of California's AFFH law, there is a strong case for targeting regulatory reforms to relatively affluent areas that provide a disproportionately small amount of regional housing stock. Such areas both exacerbate the problem of housing affordability, by limiting supply, and could provide more Californians with access to high quality resources – if they allowed more housing to be built.

As a metric for "high-opportunity" areas – for the purpose of targeting reforms aimed at densification – a measure that combines recent tract-level median household income and the historical OA measure of income mobility for children born in lower-income households may be optimal. Such a measure is flexible, because it can be used to target reforms in three ways: (1) based only on recent median income; (2) based only on historical income mobility for children born in lower income households; or (3) based on a combination of recent median income and historical income mobility. As noted above, income is a strong proxy for a wide variety of place-based resources that are associated with improved life outcomes. Median household income is also straightforward to interpret and, potentially, to verify via administrative data collected by the state.

Although income mobility is also an important attribute to attempt to measure, there is a significant caveat concerning its inclusion in the definition of "high opportunity" areas. The potential for a place to facilitate income mobility is less straightforward to measure than the recent median household income of a place, and – as discussed above – recent research raises concerns about the validity and reliability of the OA income mobility measure. The relevant statistical concerns can be partially mitigated by pooling across race, ethnicity, and gender. It is worth noting, however, that such pooling – while necessary for uniform statewide application of the OA – raises substantive concerns because the effects of place on income mobility may vary depending on children's race, ethnicity, and gender.

Healthy areas can be screened by reference to the pollution burden scores in CalEnviroScreen. These scores are derived for each census tract by combining averages of environmental exposure indicators (e.g., concentrations of ozone and particulate matter, children's exposure to lead from housing) and indicators of environmental effects (e.g., hazardous waste facilities and generators, impaired water bodies) (California Office of Environmental Health Hazard Assessment 2022).

II. Defining and Operationalizing "Transportation-Efficient" Areas

In order to identify policies, strategies, and investments that could help the State meet its housing and GHG-reduction goals, a definition of transportation efficiency must be susceptible to feasible operationalization and consistent measurement at the neighborhood scale (e.g., census tract or block group). The definition must also align with the goals of reducing VMT per capita, increasing transit and active transportation infrastructure and services, and equitably enhancing accessibility to jobs, high-quality schools, and amenities. For these reasons, our metric for identifying transportation-efficient areas is primarily informed by the literature on location efficiency, which examines the integration of land use and transportation infrastructure through a range of built environment variables. Location-efficient areas are characterized by good accessibility of everyday locations (e.g., jobs and shopping) via a multitude of travel modes and are associated with lower transportation costs. Many of the variables used for identifying location-efficient places are available at the neighborhood level and are empirically linked to lower VMT and increased transit use and walking.

The following sections (A) review the evidence regarding the influence of the built environment on travel behavior outcomes, especially vehicle use (e.g., VMT); (B) summarize the research on location efficiency and affordability; and (C) detail various methods for classifying neighborhood context in terms of location efficiency.

A. Travel behavior and the built environment

A large scholarly literature has examined the relationship between the built environment and travel behavior, in order to assess the impact of various built environment characteristics on the use of private vehicles. This literature indicates that changes in the built environment can impact travel behavior, particularly when complemented by other reforms, such as congestion pricing, reduction of parking requirements, and improvements in public transportation. The relevant characteristics of the built environment consist of land use patterns and transportation infrastructure, and they are typically measured by the "D" variables: density, diversity of land uses, design of street network, destination accessibility, and distance to transit (Cervero and Kockelman 1997; Ewing and Cervero 2001; 2010). Some studies also examine how the regulation and supply of parking affects travel behavior (Cervero and Kockelman 1997; Kavage et al. 2005; Manville and Pinski 2020).

Many studies have found that lower VMT, increased walking, and greater transit use are associated with more compact built environments, such as those characterized by higher density, land use diversity, destination accessibility, street network design connectivity, and closer proximity to transit (Brownstone 2008; Salon et al. 2012; Ewing and Cervero 2010). While most existing studies are cross-sectional and limited to specific geographic areas, some research has also addressed the internal and external validity of the association between the built environment and travel behavior. One potential threat to internal validity (i.e., causal inference) is the presence of residential self-selection, because people who wish to drive less choose to live in neighborhoods that fit their preferences. However, Cao et al. (2009) review 38 empirical studies, finding that all of the studies reviewed show a statistically significant relationship between the built environment and travel behavior, independent of self-selection influence.

On the issue of external validity, the focus on a single or a small number of regions and the use of different measures of the built environment will prevent generalization of the findings. Ewing et al. (2015) address concerns about external validity by using data from 15 diverse regions as well as consistently defined and measured built environment variables. They find that households living in highly accessible places – characterized by higher employment accessibility, land use diversity, and activity density – generate lower VMT than those living in less accessible places, controlling for household size, household income, and vehicle ownership. Overall, research on the relationship between the built environment and travel behavior provides strong evidence that travel behavior can be predicted by five D variables.

B. Location efficiency and housing affordability

In order to address environmental sustainability challenges, many scholars and planners have called for strategies that promote compact development (e.g., higher residential and job density) and increase the viability of non-motorized travel (e.g., higher network connectivity, transit service frequency, and levels of bicycle and pedestrian facilities) (A. L. Brown et al. 2021). Such strategies are widely discussed in the literature on location efficiency. Location-efficient places integrate transportation and land use in a way that supports convenient access to trip destinations and a multitude of travel modes, especially non-automotive modes (Adkins, Sanderford, and Pivo 2017; Clifton et al. 2018; Newmark and Haas 2015). Many measures of location efficiency are derived from built environment features that are empirically linked to lower VMT and increased transit use and walking (i.e., the five D variables described above).

Location efficiency is an important factor in determining transportation costs, which – for most households – are the second largest expense after housing (Haas et al. 2008). Residents of location-efficient places can potentially benefit from transportation cost savings brought about by the accessibility of employment, services, and different transportation options. Reina et al. (2019) find that lower-income minority households are relatively concentrated in location-efficient areas. Such lower-income households may be at risk of being priced out of walkable and transit accessible neighborhoods, although the research on this point is inconclusive (M. G. Boarnet et al. 2018; M. G. Boarnet and Burinskiy 2019; Chapple and Zuk 2020; Dawkins and Moeckel 2016; Delmelle, Nilsson, and Bryant 2021; Padeiro, Louro, and da Costa 2019). Some scholars have called for promoting location efficiency in the siting of BMR housing units by steering the units into neighborhoods deemed location-efficient (Adkins, Sanderford, and Pivo 2017). Newmark and Haas (2015) suggest that developing affordable housing in location-efficient areas would be an effective climate strategy. Drawing on the 2010-2012 California Household Travel Survey data, the authors find that (1) households living in location-efficient areas, regardless of income, generate lower VMT; and (2) lower-income households live more compactly in location-efficient areas, resulting in higher VMT reductions per land area. On the other hand, Chatman et al. (2019, 493) estimate regional VMT reductions of neighborhood change around rail stations, also based on the 2010-2012 California Household Travel Survey, and find evidence "either that rail access affects VMT about the same across households regardless of income, or that rail access reduces VMT *more* for the highest income households than the lowest income households" (emphasis added).

There are potential tradeoffs involved in promoting the development of BMR housing in location-efficient places. Several commonly used indicators of location efficiency, such as population density and jobs accessibility, may be negatively correlated with other measures of neighborhood resources. Chetty et al. (2020, 25) find that jobs accessibility is negatively associated with upward income mobility for children born into lower-income households. In examining indicators used for constructing opportunity and location efficiency metrics, we find that census block groups with the best access to jobs via transit – defined as block groups above the 75th percentile in the statewide distribution of the number of jobs within 45 minutes by public transit – have lower mean high school graduation rates relative to the rest of the state. Similar patterns are observed between access to jobs via automobile commute and high school graduation rates. Mean math proficiency levels – defined as the proportions of 4th graders who meet or exceed math proficiency standards – are lower in block groups with the worst and the best jobs accessibility (either by transit or car, defined as block groups in the bottom and top quartiles of the statewide distribution) relative to the rest of the state. Similar patterns are observed for 4th graders' reading proficiency levels. Because of the potential trade-offs between location efficiency (e.g., access to jobs) and other neighborhood resources (e.g., school performance), as Ellen et al. (2018, 582) note, "[i]n prioritizing neighborhoods for different types of investment, local policymakers may want to separate access to transportation from other measures of opportunity. (Access to jobs seems to follow a somewhat different pattern as well.)" This project follows this recommendation by separately assessing metrics for identifying healthy, high-opportunity, and transportation-efficient areas. The rest of this section details the different approaches to classifying transportation-efficient areas and describes their advantages and limitations.

C. Validity and availability of metrics for identifying transportation-efficient areas

Planning practitioners and scholars have used various metrics for identifying transportation-efficient areas. We first describe various regulatory designations used by California's Metropolitan Planning Organizations (MPOs). Next, we discuss different types of quantitative measures used in existing literature and assess the validity and availability of these metrics.

Under SB 375, California's MPOs are required to create a Sustainable Communities Strategy (SCS) that identifies the locations and types of development in order to meet greenhouse gas emission reduction targets. Some MPOs have adopted regulatory designations of transit-accessible, priority areas to facilitate housing development. These regulatory designations are generally based on a location's proximity to existing or planned transit infrastructure. For example, the Southern California Council of Government (SCAG) has defined High-Quality Transit Areas as places "within one half mile of an existing or planned fixed guideway transit stop or a bus transit corridor where buses pick up passengers at a frequency of every 15 minutes (or less) during peak commuting hours" (SCAG 2020, 51). Similarly, the Metropolitan Transportation Commission (MTC) for the nine-county Bay Area Region defines Transit-Rich Areas (TRAs) as locations where "at least 50% of the area is within 1/2 mile of either an existing rail station or ferry terminal (with bus or rail service), a bus stop with peak service frequency of 15 minutes or less, or a planned rail station or planned ferry terminal (with bus or rail service)" (MTC 2021, 20). These regulatory designations focus on one important aspect of the built environment – distance to transit. Kim and Li (2021) find that in the SCAG region, greater access to existing and planned high-quality transit infrastructure is associated with high probabilities of upzoning and densification. However, transit-accessible locations will likely only account for a subset of transportation-efficient places due to a number of other built environment aspects that can potentially contribute to lower VMT, as described above. Indeed, two meta-studies combining the findings of dozens of individual studies indicate that jobs accessibility via *automobile* has a far larger impact on VMT reduction than land-use mix, population density, or transit accessibility (Stevens 2017; Ewing and Cervero 2017). Metrics drawn from studies of location efficiency allow us to take into account a broader set of built environment features. Moreover, many such measures do not rely on data indicating the locations of transit stops and frequency of service, which are not uniformly available at the statewide level for California.

Studies have proposed different approaches to identifying neighborhoods for the purpose of promoting lower VMT, increasing residential density, siting BMR housing units, and improving transportation system performance (Adkins, Sanderford, and Pivo 2017; A. L. Brown et al. 2021; Moudon et al. 2011; Salon 2014). Some studies focus on transportation operations efficiency (e.g., vehicle utilization rate, calculated by dividing ridership by vehicle capacity) and/or transportation energy efficiency. But many such measures are not easily operationalized and are not appropriately measured at the neighborhood scale (Sullivan, Aultman-Hall, and Watts 2010). Our metric for identifying transportation-efficient areas is therefore primarily informed by the literature on location efficiency (i.e., the degree to which transportation and land use are integrated to support convenient access to trip destinations and a multitude of travel modes). There are two general categories of metrics:

- ***Quantitative composite proxy measures*** consider multiple built environment variables that are empirically linked to lower VMT and increased transit use and walking. Researchers combine these variables into a composite measure in order to assess and characterize a neighborhood (e.g., census tract or block group).
- ***Outcome-based quantitative measures*** directly represent the outcomes of interest, such as VMT and greenhouse gas emissions. Such measures are often used to test or verify the predictive validity of the quantitative proxy measures but less commonly as measures for characterizing neighborhoods.

Virtually all quantitative proxy measures that could be used for identifying transportation-efficient areas are subject to some validity concerns, due to the lack of longitudinal studies, the presence of residential self-selection, and the limited number of geographic areas studied in existing research. In some studies, correlations between the outcomes of interest (e.g., VMT) and the proxy measures are used to illustrate the predictive validity of the measures. The metrics reviewed also have varying technical and data requirements, with some being more methodologically complex and using data that may not be consistently available across space and over time. The rest of this section describes a number of existing quantitative proxy measures of location efficiency and outcome-based measures, assessing their practical utility for the purpose of identifying transportation-efficient areas at the census tract scale throughout California.

1. Quantitative composite proxy measures

In this section, we review four composite areal measures of transportation efficiency. First, we assess the Transportation-Efficient Land Use Mapping Index (TELUMI) developed by scholars and the Washington State Department of Transportation (Moudon et al. 2011), which incorporates a wide range of indicators related to transportation-efficient land use but requires extensive data collection and may not be operationalized at the neighborhood level for the entire state of California. Next, we review three metrics for characterizing location efficiency at the neighborhood level (e.g., census tracts or block groups): (1) the location-efficient sites defined in Adkins, Sanderford, and Pivo (2017), (2) the taxonomy of place types developed by Clifton et al. (2018), and (3) the taxonomy of place types developed by Salon (2014).[9] As detailed below, Salon's cluster analysis-based metric meaningfully distinguishes tracts with respect to VMT levels, can be updated in a relatively consistent manner, and identifies different types of transportation-efficient areas, which can help tailor housing policies and transportation investments. Therefore, we adapt from Salon (2014) and create a taxonomy of place type for the purpose of identifying transportation-efficient areas.

The purposes of the TELUMI (Kavage et al. 2005; Moudon et al. 2011) are to help policymakers and planners identify zones where land use supports multimodal travel and promote transportation system efficiency, which is defined by the availability of mode options beyond single-occupancy vehicle trips. The underlying conceptual framework is that various types of land use patterns are expected to locate people closer to needed services and destinations, decrease vehicle trip distance, and facilitate trips on more energy-efficient, lower-emission modes such as transit or biking. The TELUMI is developed using cartographic modeling techniques and spatial analysis in Geographic Information System (GIS) as well as a rich set of variables on land-use characteristics. The TELUMI provides a composite map that classifies a region into zones with different levels of transportation efficiency. Moudon et al. (2011) apply the TELUMI to Seattle and King County in Washington and show that transportation efficiency zones where residential units and employment are well concentrated only cover a small proportion of the region. However, a metric like the TELUMI may not be suitable for identifying transportation-efficient areas in California for three reasons. First, the lack of statewide parcel-level land use data will prevent us from developing a metric drawing on micro-scaled land use conditions. Second, zones in the TELUMI are developed by transforming vector-based parcel data into raster data in the cartographic modeling process and requires careful determination of the raster size. Given the spatial heterogeneity throughout California, it may be difficult to determine an appropriate raster size. Long computational time is also needed for statewide cartographic modeling. Finally, the threshold values that TELUMI uses to identify areas with higher transportation efficiency are not empirically derived but determined by experts. They are therefore subject to the pitfalls of expert-based composite indicators described above.

Adkins, Sanderford, and Pivo (2017) call for incorporating transportation costs in determining housing affordability and promoting location efficiency in affordable housing policy. Their national study uses seven indicators for defining location-efficient census block groups in order to assess the degree of location affordability of Low Income Housing Tax Credit (LIHTC) units. The seven indicators are selected based on studies of the relationship between the built environment, travel behavior, and transportation costs (Ewing and Cervero 2010; Haas et al. 2008),

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[9] There are also studies that include multiple variables as proxies for location efficiency but do not use these variables to explicitly define the degree of location efficiency for a given location (Newmark and Haas 2015; Holtzclaw et al. 2002). We do not review these studies in detail here, because we are interested in metrics for identifying location-efficient places. Moreover, most of these individually examined variables are incorporated in the various metrics reviewed in the main text.

including residential density, street network density, retail sufficiency, regional auto accessibility, transit ridership, half-mile to rail transit, and transportation costs. To determine whether a block group is location-efficient, thresholds are established for each indicator based on existing studies or the authors' judgment. Census block groups that meet at least three of the seven thresholds are considered location-efficient sites. This decision-rule is to ensure that each state would have at least some location-efficient sites and not be excluded from the national study. The simplicity of Adkins et al.'s approach facilitates the identification of location-efficient sites across the United States, but – as with any categorical approach – it may be sensitive to the thresholds used. Moreover, this metric treats a block group that meets three location efficiency thresholds as equally location-efficient to a block group that meets all seven thresholds. In other words, a binary metric for identifying location-efficient areas abstracts away the built environment context that contributes to the degree of location efficiency of a location, which may be of interest to policymakers and planners.

Unlike the ordinal metrics described above (e.g., low vs. high transportation efficiency zones or non-location-efficient vs. location-efficient block groups), several studies have developed taxonomies of place types to classify neighborhood context (CalTrans 2010; Clifton et al. 2018; Salon 2014). A place type symbolizes the collective performance of multiple built environment factors that are associated with travel behavior. Many of these factors overlap with those used by Adkins, Sanderford, and Pivo (2017), because increased accessibility and viability of non-motorized travel are likely associated with transportation cost savings. Clifton et al. (2018) consider two sets of indicators that contribute to location efficiency: (1) community design indicators including residential density, job density, housing stock mix, and street network connectivity; and (2) regional accessibility indicators including access to employment via transit and private vehicle.[10] They use an interval classification strategy to classify census block groups in urban areas in California, as defined by the United States Census Bureau.[11] For each indicator, each urban block group is assigned a score between one and four based on predetermined thresholds. For example, a block group with more than 100 jobs per acre as of 2014 is assigned a score of four for the indicator on employment density, while a block group with fewer than 10 jobs per acre is assigned a score of one. Based on the resulting scores, Clifton et al. divide the block groups into four mutually exclusive place types (urban core, urban district, urban neighborhood, and suburban neighborhood). Using data from the 2012 California Household Travel Survey, the authors show that, relative to urban core, the other three place types are associated with higher levels of household VMT, with the largest difference occurring between the urban core and suburban neighborhood place types.[12]

Salon (2014; 2015; 2016) also uses multiple built environment variables to categorize census tracts in California into different place types. Similar to other studies, the included variables describe residential density, housing stock, street network design, and access to employment. In

[10] Caltrans' 2010 Smart Mobility Framework first categorized place types based on the presence of community design and regional accessibility elements, but the taxonomy of place type in the Smart Mobility Framework was not empirically derived (CalTrans 2010).

[11] Some block groups are only partially urban areas, as classified by the Census Bureau. In these cases, Clifton et al. classify the block group as urban if at least 20% of its block group land is located within a census-defined urban area.

[12] The four place types differ in the means of the community design and regional accessibility indicators; however, it is unclear how the cut-points are determined in classifying the block groups into different place types.

addition, measures of access to nonwork destinations (e.g., restaurants) are included. Unlike the metrics developed by Adkins, Sanderford, and Pivo (2017) and Clifton et al. (2018), however, Salon's taxonomy of place types groups areas that share similarities in a range of built environment variables using factor-cluster analysis. Eight neighborhood types are developed for California census tracts based on 2000 census geography and labeled as: (1) Central City Urban, (2) Urban High Transit Use, (3) Suburb with Multifamily Housing (MFH), (4) Urban Low Transit Use, (5) Suburb with Single-Family Homes (SFH), (6) Rural-in-Urban, (7) Rural, and (8) Preserved Land. Brown et al. (2021) use a crosswalk procedure to calibrate these tract-level place types based on 2010 census geography and show that mean household VMT is the lowest in Central City Urban tracts, followed by the clusters of Urban High Transit Use, Suburb with Multifamily Housing, and Urban Low Transit Use. They recommend increasing residential density in these four clusters to promote VMT reductions.

The cluster analysis-based taxonomy of place types may be most appropriate for two main reasons. First, cluster analysis allows researchers to consider multiple built environment characteristics and generate groups of neighborhoods that are similar to each other based on these characteristics. For example, the cluster labeled as Urban High Transit Use in Salon (2014) is characterized by good accessibility and a high mean percentage of workers using public transit. In other words, we can define different types of transportation-efficient areas, such as places with good accessibility but different levels of transit use. Distinguishing *among* types of transportation-efficient areas can help tailor housing policies and transportation investments. Second, a cluster analysis-based taxonomy can be updated in a relatively consistent manner by applying the initial algorithm to new data sources. In contrast, updating the metrics developed by Adkins, Sanderford, and Pivo (2017) and Clifton et al. (2018) would require researchers to come up with new thresholds for each indicator. The approach taken by Salon is k-means clustering, which is a widely used procedure for classifying multivariate observations.[13] While analysts typically need to decide on what variables to include and how many clusters to create, they do not need to make such decisions for the purpose of updating the taxonomy with the latest data.

2. *Outcome-based quantitative measures*

Outcome-based quantitative measures, such as VMT, can also be used as metrics for identifying transportation-efficient locations. For example, guidelines from the California Governor's Office of Planning & Research advise jurisdictions to use maps created with VMT data to assess the VMT impacts of proposed development projects, reasoning that "[r]esidential and office projects that locate in areas with low VMT, and that incorporate similar features (i.e., density, mix of uses, transit accessibility), will tend to exhibit similarly low VMT" (State of California, Governor's Office of Planning and Research 2018, 12). Jones et al. (2018) estimate a consumption-based GHG emission inventory for all populated census block groups in California by calculating average household carbon footprints related to household consumption of energy, transportation fuels, water, waste, construction, goods and services. In other words, a consumption-based approach allocates emissions to consumers – those who generate the demand

[13] Specifically, it iteratively chooses a predetermined number (k) of cluster center points, calculates the multivariate Euclidean distance between each observation and the center points, and groups observations into clusters based on these distances. The final solution consists of clusters with the smallest within-cluster variation (i.e., the sum of squared distances Euclidean distances).

– regardless of where the emissions originate. It also provides a more comprehensive accounting framework for emissions by considering a full range of economic activities (instead of focusing on travel behavior). To derive their emissions measure, Jones et al. combine data from detailed local consumption data with measures derived from econometric models of household consumption using sampled data. They find that household income accounts for more than 60% of the variation in carbon footprints while residential density explains less than 7% of the variation. The authors further suggest that locations with below-average carbon footprints at all income levels would be good candidates for urban infill.

Although there can be compelling reasons to use outcome-based measures, there are at least two reasons for caution. First, direct measures of the outcomes of interest are not systematically collected and made available for research. For example, commonly used VMT data are derived from travel diary surveys or regional travel demand forecasting models. Other travel behavior outcomes, such as transit use and walking, also typically come from travel diary surveys or ridership data collected by public agencies (M. G. Boarnet 2008; Ryan and Frank 2009). The derived travel outcome measures are subject to sampling and measurement errors, not always available at the neighborhood level, not consistently updated, and may only cover a limited geographic area.

Second, different outcome-based approaches may point to distinct sets of locations where housing development should be prioritized. For example, a VMT-based measure will likely identify transportation-efficient areas that are relatively consistent with those identified by a composite built environment measure due to the well-established association between VMT and the D variables. However, this may not be the case under a consumption-based GHG emission measure due to its relatively weak correlation with residential density, as described above. The consumption-based GHG emission estimated by Jones et al. (2018) is strongly, positively correlated with household income and will likely identify a relatively small number of high-income neighborhoods for additional housing development.[14] As a result, using a consumption-based measure of GHG emissions could be misleading for the purpose of identifying transportation-efficient areas because it abstracts away the built environment context and is endogenous to household income and consumption levels. By contrast, a built environment proxy measure is relatively aligned with the State's AFFH and emission reduction goals (compared to a consumption-based GHG measure) and is more feasibly operationalized (compared to direct VMT measures).

[14] The high income neighborhoods identified for additional housing development would be those with lower carbon footprints than the predicted carbon footprints for the same income level (i.e., observations beneath the fitted regression line) (Jones, Wheeler, and Kammen 2018, 43).

III. Identifying Transportation-Efficient, Healthy, High-Opportunity Areas

Transportation-efficient, healthy, high-opportunity areas are census tracts that are both transportation-efficient (TE) and healthy, high-opportunity (HHO). The construction of the TE-HHO metric consists of four main steps. First, we collected and merged several datasets related to neighborhood resources, socio-economic mobility, environmental health, and location efficiency, including the TCAC/HCD 2021 Opportunity Map, the Opportunity Atlas developed by Chetty et al. (2020), the CalEnviroScreen 4.0 database, and demographic and built environment data from the US Census Bureau and other sources. Second, as detailed in Chapters I and II, we reviewed and evaluated existing metrics for identifying TE and HHO areas and determine the approach to developing the TE-HHO metric used in this project. Third, based on our literature review and stakeholder consultation, we constructed the HHO and TE metrics separately. The HHO metric first identifies high-opportunity areas based on an existing metric from the Opportunity Atlas and median household income from the American Community Survey (ACS) and then screens for healthy areas. The TE metric uses a set of demographic and built environment variables and is derived using a cluster analysis that classifies census tracts into different types of places, following Salon (2014).

The remainder of discusses the rationale for constructing HHO and TE metrics separately, describes the data sources and methods for developing the TE-HHO metric, and discusses extensions and applications of this metric. We show that the identified TE-HHO tracts are primarily concentrated in several coastal counties. Other areas of the state have areas that are either TE or HHO, but not both. To extend the geographic scale of the project and to include areas that may be most susceptible to becoming TE, we also identify TE-adjacent, HHO areas, which are present outside of coastal areas. In the last section, we explore several additional outcomes in TE-HHO and TE-adjacent, HHO areas, including racial and ethnic composition, walkability, and gentrification.

A. Measuring opportunity

An opportunity metric is essential to achieving many different policy goals – as discussed in Chapter I – including advancing the state's AFFH objective and targeting land-use regulatory reforms. Specifically relevant to this project is the use of opportunity metric in targeting land-used reforms aimed at densification. To this end, we believe it is necessary to distinguish measures of transportation efficiency from the assessment of opportunity.

Incorporating TE measures into an opportunity metric can yield misleading results. Many of the indicators of transportation efficiency, such as density and transit accessibility, tend to be negatively correlated with a variety of indicators of neighborhood resources and amenities, including school quality, adult educational attainment, home ownership, and income. When relying on such a metric, the meaning of the "high opportunity" (or "high resource") construct becomes unclear. For example, a neighborhood with good access to jobs and transit may have relatively low-quality resources such as lower-performing schools or relatively high pollution burdens, and a combined metric may not facilitate the relevant distinction.

To identify HHO areas, we first analyzed the metric created for the TCAC/HCD 2021 Opportunity Map (as described in Appendix 1). Based on this analysis, we determined that a different metric for identifying high-opportunity areas would be appropriate for the purposes of this project. We define high-opportunity areas as census tracts with relatively high income and/or high income mobility, compared to all tracts statewide. Accordingly, we combine a simple income measure and an outcome-based measure. We use this metric for identifying high-opportunity areas for three reasons. First, as illustrated in Appendix 2, tract-level median household income is positively correlated with multiple beneficial resources, many of which are plausibly related to opportunity. Second, as detailed in Chapter I, relatively affluent areas have long used regulatory constraints – often in the form of single-family zoning – to limit access to high quality resources (e.g., schools) and amenities (e.g., parks). In the early twentieth century, the relevant laws were explicitly linked to racial and ethnic exclusion, and they have continued to have ethno-racially exclusionary effects even as explicit discrimination based on race and ethnicity has become unlawful. Third, a measure based on income mobility outcomes is worth considering because it empirically identifies areas that are linked to improved life outcomes (e.g., earnings in adulthood). However, due to concerns about the validity and reliability of such measures, as described in Chapter I, we are reluctant to rely solely on an outcome-based measure.

1. Data and methods

The measure of high-opportunity areas draws on two data sources: (1) tract-level median household income as of the 2015-19 ACS, and (2) the measure of income mobility for children born in lower-income households (i.e., children born from 1978-1983 to parents at the 25th percentile of the national income distribution), which comes from the Opportunity Atlas developed by Chetty et al. (2020).[15] We use the ACS data to identify "highest income" tracts with median household incomes above 140% of the statewide median. We use the Opportunity Atlas data to identify "highest income mobility" tracts that are above the 80th percentile (statewide) for the mean percentile rank of adult household income (measured as of 2014-2015) for people born in lower-income households in that tract, relative to the adult income of other people born in lower-income households in the same year. Accordingly, there are three subcategories of high-opportunity tracts depending on whether a tract is identified as having: (1) both highest income and highest income mobility, (2) highest income only, and (3) highest income mobility only.

Tracts identified as high-opportunity fare better than other tracts on a range of indicators, including those related to education and employment (Exhibit III-1). Among the three high-opportunity subcategories, "highest income, highest income mobility" tracts fare the best in terms of the relevant indicators, followed by "highest income" tracts. Specifically, "highest income, highest income mobility" tracts have the highest mean percentages of fourth graders who meet or exceed math and reading proficiency standards, the highest percentage of high school graduates, and the lowest percentages of unemployed persons in the labor force, households receiving public assistance, households with incomes below the poverty level, and single-parent households.

[15] The income mobility measure is based on estimates of children's earnings distributions using de-identified longitudinal data from federal income tax returns.

Exhibit III-1: Selected Demographic and Socioeconomic Characteristics by Opportunity Category

High-opportunity category	Total tracts	Mean math proficiency	Mean reading proficiency	Mean % high school graduates	% college graduates	% owner households	% unemployed	% receiving public assistance	% income below poverty level	% single-parent households
Highest income, highest income mobility	951	67	69	94	67	74	2.6	1.2	4.7	6.2
Highest income	828	59	62	92	62	68	2.8	1.4	5.7	7.2
Highest income mobility	639	56	59	92	52	53	3.2	2.0	11.0	8.6
Not selected	5,515	38	44	90	32	49	4.3	4.1	16.4	15.5

Notes: Mean math proficiency is the mean percentage of fourth graders who meet or exceed math proficiency standards. Mean reading proficiency is the mean percentage of 4th graders who meet or exceed reading proficiency standards. Data on math and reading proficiency measures and on high school graduation rates come from the Othering & Belonging Institute at UC Berkeley and are used in creating the TCAC/HCD 2021 Opportunity Map. For rural areas, the data are provided at the block group level. We derive the tract-level math and reading proficiency measures as the average of the block group-level data, weighted by the number of students in kindergarten to fifth grade. The tract-level percentage of high school graduates are the average of the block group data weighted by the number of ninth to twelfth grade students. Other demographic and socioeconomic variables come from the 2015-19 ACS.

HHO tracts are high opportunity tracts that do not have high pollution burdens, based on data from CalEnviroScreen 4.0. CalEnviroScreen derives pollution burden scores for each census tract by combining averages of environmental exposure indicators (e.g., concentrations of ozone and particulate matter, children's exposure to lead from housing) and indicators of environmental effects (e.g., hazardous waste facilities and generators, impaired water bodies) (California Office of Environmental Health Hazard Assessment 2022). We define areas with high pollution burdens as tracts with pollution burden scores in the top 25% of the statewide distribution; that is, 75% of the tracts in California are identified as "healthy" tracts. High-opportunity tracts have a disproportionately high percentage of healthy tracts (88%).

The HHO tracts identified by our metric are different from the "High Resource" and "Highest Resource" tracts identified in the TCAC/HCD 2021 Opportunity Map, although there is substantial overlap. Exhibit III-2 shows that over three quarters of HHO tracts are also categorized as High or Highest Resource in the Opportunity Map. The overlap is most significant between the tracts in the "highest income, highest income mobility" subcategory and the High/Highest Resource tracts identified by the TCAC/HCD methodology. A small share of the HHO tracts are designated as "Low Resource" (4.6%) or "racially segregated and high-poverty" (0.2%) based on the TCAC/HCD methodology. This is in part because the subcategory "highest income mobility" focuses on children born in lower-income households and is more likely to identify tracts with fewer resources. Moreover, our approach is different from HCD's theoretical framework and method.

As discussed in Appendix 1, we used confirmatory factor analysis (CFA) to test the construct validity of the theoretical framework underlying the TCAC/HCD 2021 Opportunity Map designations. Under this framework, indicators representing a given opportunity dimension (i.e., economic, environment, or education) are assumed to be intercorrelated because they share the common influence of this dimension. If this holds true in reality, i.e., the theoretical model fits the data well, it can reproduce the relationships observed in the data (i.e., the observed covariance of the indicators). In our CFA analysis, several conventional measures of CFA model fit indicate that the intercorrelations of the indicators representing the same factor cannot be adequately captured by the factor structure specified in the model used in the Opportunity Map. For example, this could mean that although the five indicators of the economic domain (i.e., poverty, adult education, employment, job proximity, and median home value) are intercorrelated, they do not covary in a way that indicates a shared common influence by an unobserved "economic opportunity" variable.

Exhibit III-2: Comparison of HHO Tracts to Opportunity Map

HHO category	N	HCD-Identified High Resourced (HR)	% HR	HCD-Identified Moderate Resourced (MR)	% MR	HCD-Identified Low Resourced (LR)	% LR	HCD-Identified segregated and high-poverty (SP)	% SP	HCD-Identified as missing data	% missing data
Healthy, highest income, and highest income mobility	894	771	86	110	12	11	1.2	0	0.0	2	0.2
Healthy, highest income only	733	530	72	162	22	35	4.8	0	0.0	6	0.8
Healthy, highest income mobility only	506	325	64	122	24	52	10.3	4	0.8	3	0.6
All HHO Tracts	2133	1626	76	394	18	98	4.6	4	0.2	11	0.5

Note: High-resourced tracts include tracts categorized as High or Highest Resource in the Opportunity Map.

2. *Summary of HHO tracts*

A total of 2,131 HHO tracts are identified based on the above-described metric. Exhibit III-3 shows the number of HHO tracts by core-based statistical areas (CBSAs).[16] Approximately 70% of the identified HHO tracts are in the following three CBSAs:

- the Los Angeles-Long Beach-Anaheim CBSA (31%), consisting of Los Angeles County and Orange County;
- the San Francisco-Oakland-Hayward CBSA (26%), consisting of Alameda, Contra Costa, San Francisco, San Mateo, and Marin Counties; and
- the San Jose-Sunnyvale-Santa Clara CBSA (13%), consisting of Santa Clara County and San Benito County.

[16] A core-based statistical area includes an urban core of 10,000 population plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. CBSAs are defined in terms of whole counties or county equivalents.

Exhibit III-3: HHO Tracts by CBSA

CBSA Name	Total population	All tracts	HHO tracts
Los Angeles-Long Beach-Anaheim, CA	13,249,614	2,929	668
San Francisco-Oakland-Hayward, CA	4,701,332	980	577
San Jose-Sunnyvale-Santa Clara, CA	1,987,846	383	271
San Diego-Carlsbad, CA	3,316,073	628	167
Sacramento-Roseville-Arden-Arcade, CA	2,315,980	486	124
Riverside-San Bernardino-Ontario, CA	4,560,470	822	102
Oxnard-Thousand Oaks-Ventura, CA	847,263	174	53
Santa Rosa, CA	499,772	100	24
Santa Maria-Santa Barbara, CA	444,829	90	23
Fresno, CA	984,521	199	22
Vallejo-Fairfield, CA	441,829	96	21
Bakersfield, CA	887,641	151	15
Santa Cruz-Watsonville, CA	273,962	53	15
Napa, CA	139,623	40	14
Areas Not in CBSA	270,894	77	8
Salinas, CA	433,410	94	8
Stockton-Lodi, CA	742,603	139	5
San Luis Obispo-Paso Robles-Arroyo Grande, CA	282,165	54	4
Truckee-Grass Valley, CA	99,244	20	4
Chico, CA	225,817	51	2
Modesto, CA	543,194	94	2
El Centro, CA	180,701	31	1
Redding, CA	179,212	48	1
Susanville, CA	30,818	9	1
Yuba City, CA	172,469	35	1

B. Identifying transportation-efficient (TE) areas

Transportation-efficient tracts are identified using k-means clustering following Salon (2014). The cluster analysis-based metric identifies multiple neighborhood types where VMT levels are substantially lower than the rest of the state (Brown et al. 2021) and it can be updated in a relatively consistent manner. K-means clustering creates groups of observations that are similar to each other based on a range of characteristics.[17] Researchers choose the number of groups to create and the variables used as input data. These decisions are typically made based on substantive expertise and processes of testing different combinations of input variables and numbers of groups. In this project, we update the taxonomy of neighborhood types in Salon (2014) by using more recent data to derive relevant demographic and built environment variables.

Our cluster analysis for classifying census tracts into neighborhood types involves three steps. First, we derive a total of nine variables based on which tracts are classified into different groups. Each variable is standardized to have a mean of zero and a standard deviation of one. These variables are used in Salon (2014) and described in Exhibit III-4. To derive the job accessibility variable for each census tract, we use the Block Group Distance Database provided by the National Bureau of Economic Research (NBER) to identify block groups that are within a 50-mile radius of the densest block group in the tract (i.e., tract center) as well as their distance to the tract center. We then obtain the total job counts in each of the identified block groups using the 2019 Longitudinal Employer-Household Dynamics Workplace Area Characteristics file. Following Salon, a job accessibility measure is derived for each tract by calculating the distance-weighted sum of the jobs in each block group within the 50-mile radius. Thus, for example, jobs 50 miles away count for 1/50th as much as jobs one mile away. For the variables on restaurant access, we use the web-based Openrouteservice Tools Plugin to perform service area analysis in QGIS. We treat the densest block group in a tract as the tract center and use the Isochrones from Layer tool in QGIS to map a 10-minute walking distance polygon and a 10-minute driving distance polygon for each tract. We then count the number of restaurants (NAICS code: 72251) within the 10-minute walk and 10-minute drive polygons, respectively. The geocoded restaurant data comes from the ReferenceUSA Business Historical Data 2018 file, which is a proprietary database. To derive road density, we calculate the total length of roads in each tract, using the 2019 TIGER/Line All Lines shapefile, and divide it by total land area of the tract. The rest of variables used in the cluster analysis come from the 2015-19 ACS. Because the cluster analysis is expected to meaningfully distinguish tracts with respect to VMT levels, we exclude two variables that were used in Salon (2014) – median home value and the percentage of homes that are less than 10 years old – due to their weak correlations (<0.1) with per capita VMT.

The next step is to use principal component analysis to reduce the nine variables to five orthogonal (i.e., uncorrelated) factors. This step is performed because some neighborhood characteristics can be highly correlated (e.g., population density and road density), and each variable is weighted equally in cluster analysis. Including two highly correlated variables essentially means emphasizing certain neighborhood characteristics (e.g., density) over others (e.g., the percentage of housing units that are vacant). Principal component analysis removes the collinearity between variables by creating a set of orthogonal factors. Each factor is a weighted linear combination of the original nine variables. The five factors we extracted represent over 85% of the variation in the raw data.

[17] Groups are derived by iteratively calculating the Euclidean distance between each observation and the randomly selected cluster center points, grouping observations into a predetermined number (k) of clusters, and recalculating cluster center points until the cluster solution is stable.

Exhibit III-4: Variables Used in Neighborhood Type Classification

Variable	Definition	Data source
Population density	Population per land area in census tract	2015-19 ACS
Job accessibility	Inverse distance-weighted sum of jobs within 50 miles of the densest block group in each census tract	2019 Longitudinal Employer-Household Dynamics Workplace Area Characteristics (LEHD-WAC)
Restaurant access by walking	Number of restaurants within 10-minute walk of the densest census block in each census tract	ReferenceUSA Business Historical Data 2018 file
Restaurant access by driving	Number of restaurants within 10-minute drive of the densest census block in each census tract	ReferenceUSA Business Historical Data 2018 file
% workers using public transit	Percentage of workers (16 years and over) who use public transportation to work	2015-19 ACS
% single-family detached homes	Percentage of housing units that are detached single-family homes	2015-19 ACS
% vacant units	Percentage of housing units that are vacant	2015-19 ACS
% old housing units	Percentage of housing units that are more than 60 years old	2015-19 ACS
Road density	Total length of roads per land area in census tract	2019 TIGER/Line® Shapefiles: All Lines

Finally, we use these factors in k-means cluster analysis to derive six neighborhood types, after excluding tracts in the Preserved Land category identified by Salon (2014). We name the neighborhood types by examining the demographic and built environment characteristics of each cluster. As Exhibit III-5 indicates, four of the six neighborhood types have substantially lower mean per capita VMT compared to the rest of the state.[18] Tracts in these four categories are designated as TE tracts:

- Core Urban: Highest in population density and the percentage of workers commuting by transit, best jobs accessibility and restaurant accessibility within short walking and driving distances, highest road density, and lowest in the share of detached single family homes;

[18] Home-based VMT refers to vehicle miles traveled for home-based trip purposes by all households in a travel analysis zone estimated in the California Statewide Travel Demand Model (CSTDM) Version 2.0. Data come from the Northern California Section Institute of Transportation Engineers.

- Non-core Urban: High population density and percentage of workers commuting by transit, good jobs and restaurant accessibility, and high road density;
- Jobs Accessible Suburban: Good jobs accessibility (ranked third place among all neighborhood types), fairly high population density and good jobs/restaurant accessibility; and
- Higher Density Suburban: High population density (ranked third place among all neighborhood types) and low percentage of detached single-family homes, fairly good jobs/restaurant accessibility.

Exhibit III-5: VMT and Tract Variables by Neighborhood Type

Neighborhood type	N	Per capita VMT	Population density (/sq.mi)	Jobs access (/1000)	% commute by transit	% single-family homes	Road density (km/km2)	% vacant housing	Restaurants by 10-min walk (median)	Restaurants by 10-min drive (median)
Core Urban	160	5.6	44,420	748	35	5	23	10	103	2,449
Non-core Urban	924	9.6	20,837	531	15	26	20	7	21	1,028
Jobs Accessible Suburban	1836	11.8	9,198	397	5	71	16	5	6	516
Higher Density Suburban	1712	11.6	9,653	275	4	35	15	6	6	402
Lower Density Suburban	3008	14.0	3,222	129	2	78	8	6	0	149
Rural	297	17.4	740	49	1	69	5	40	0	11
Preserved Land	39	23.2	374	74	3	74	2	39	0	1

Notes: Means of VMT and other tract variables except for restaurant counts by walking and driving are shown in the table. Median restaurant counts within 10-minute walk and drive are shown because the two variables are skewed to the right. For example, some tracts along the coast that fall in the Rural category have relatively good restaurant access by driving. The tract in San Francisco where the Golden Gate Bridge is located is identified as Preserved Land and also has good restaurant access by driving.

C. Priority areas for housing development

The analytic processes described above result in a set of priority areas for housing development: TE-HHO tracts. The distribution of TE-HHO tracts is uneven across California, predominantly concentrated in coastal counties such as Los Angeles, Santa Clara, and San Francisco. Exhibit III-6 and Exhibit III-7 show the distribution of TE-HHO tracts in three primary CBSAs where TE-HHO tracts are concentrated. Additionally, our definition of TE-HHO tracts does not capture most affluent, relatively low-density neighborhoods, including those in close proximity to TE areas. These TE-adjacent places, although lower in density, will likely still facilitate convenient access to various trip destinations. Furthermore, historically, affluent, single-family dominant neighborhoods have provided only a disproportionately small amount of regional housing stock.

To address the limitations of TE-HHO tracts and extend the reach of priority areas for housing development, we further define TE-adjacent, HHO areas. Specifically, a TE-adjacent, HHO area is defined as a census tract meeting the criteria of being HHO but not TE, located within a 10-minute drive to a TE tract, and with at least 50% of the tract area falling within an urbanized area as of the 2010 census. To expand housing opportunities in California, policy efforts can target regulatory reforms to TE-adjacent, HHO areas and seek to improve the transportation efficiency of these areas.

Exhibit III-8 shows the number of TE-HHO and TE-adjacent, HHO tracts in selected counties in California. TE-HHO areas are primarily concentrated in coastal southern California such as Los Angeles and Orange counties, and in the San Francisco Bay Area, such as Santa Clara, San Francisco, Alameda, and San Mateo counties. The identification of TE-adjacent, HHO areas increases the territorial extent of priority areas in counties already with a significant number of TE-HHO tracts (except for San Francisco, where no TE-adjacent, HHO tract is identified). Furthermore, for places with relatively few TE-HHO tracts (e.g., Ventura County) and with no TE-HHO tract (e.g., Riverside, San Bernardino, and Fresno counties), TE-adjacent, HHO areas serve as promising locations for prioritizing housing development. As illustrated in Exhibit III-9, TE-adjacent, HHO areas identified have very high median household incomes and are predominantly single-family. These areas have good access to schools, hospitals, parks, and more. Similarly, as illustrated in Exhibit III-10, neighborhoods in Atherton – an affluent town located on the Peninsula in San Mateo County – are identified as TE-adjacent, HHO areas.

Exhibit III-6: TE-HHO Tracts in Los Angeles-Long Beach-Anaheim CBSA

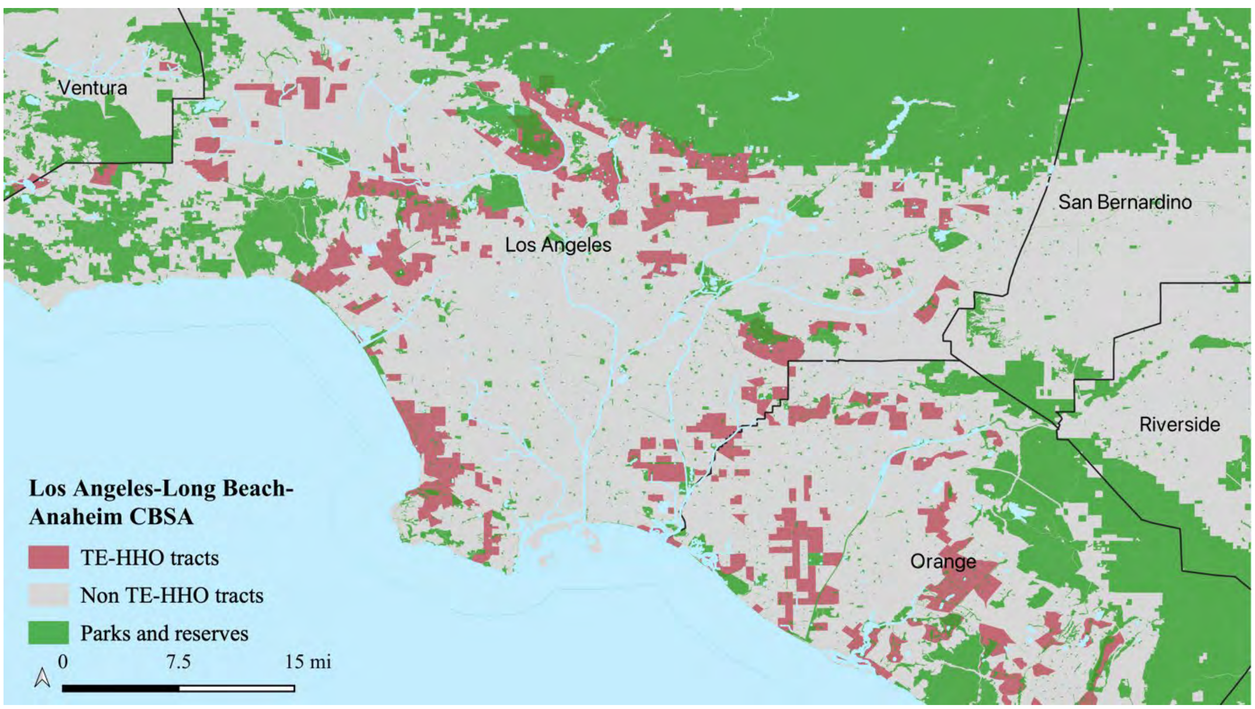


Exhibit III-7: TE-HHO Tracts in San Francisco-Oakland-Hayward CBSA and San Jose-Sunnyvale-Santa Clara CBSA

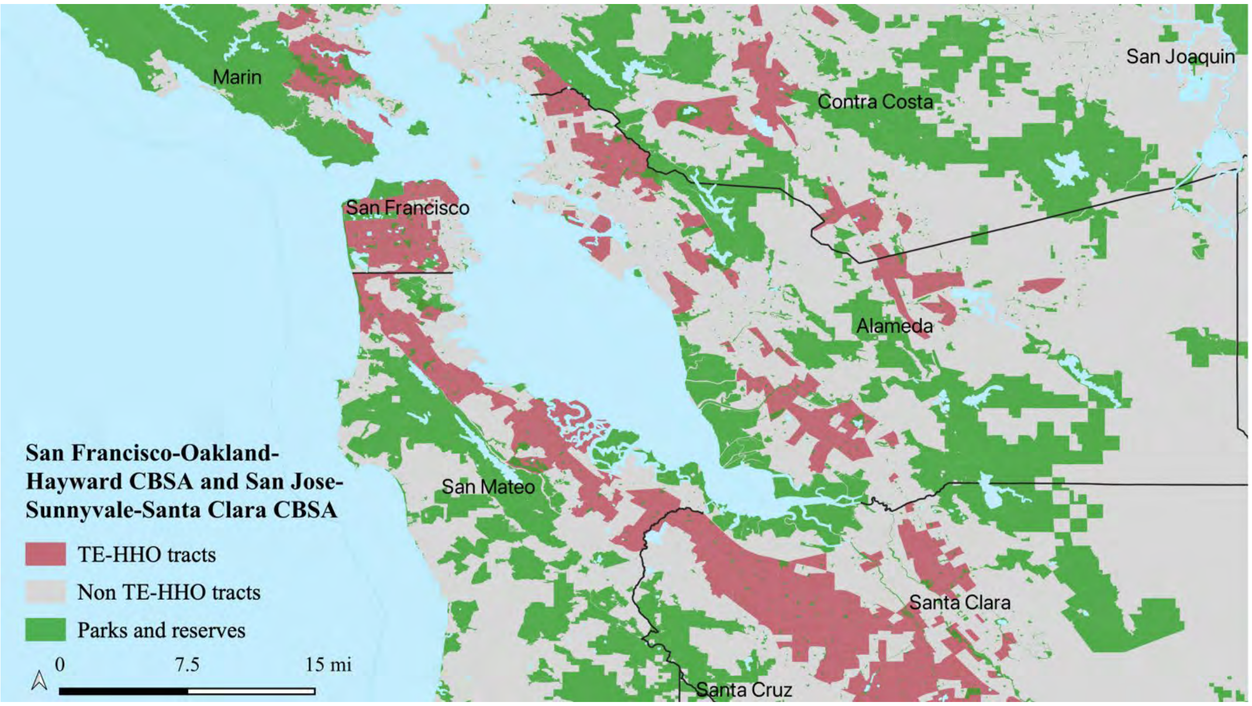


Exhibit III-8: Number of Priority Tracts in Selected Counties

County	Total	TE-HHO	TE-adjacent, HHO
Los Angeles County	2,346	285	103
Santa Clara County	372	182	68
San Francisco County	197	144	0
Orange County	583	135	87
Alameda County	361	115	42
San Mateo County	158	93	19
San Diego County	628	39	98
Contra Costa County	208	33	39
Marin County	56	15	9
Sacramento County	317	10	30
Yolo County	41	6	6
Ventura County	174	4	35
Placer County	85	3	20
Santa Barbara County	90	3	9
Kern County	151	2	10
Santa Cruz County	53	1	6
Riverside County	453	0	34
San Bernardino County	369	0	21
Fresno County	199	0	18
Solano County	96	0	12
Sonoma County	100	0	10
Napa County	40	0	7
Monterey County	94	0	3
San Joaquin County	139	0	3
Stanislaus County	94	0	2
El Dorado County	43	0	1
Imperial County	31	0	1

Exhibit III-9: TE-Adjacent, HHO Tracts in Fresno

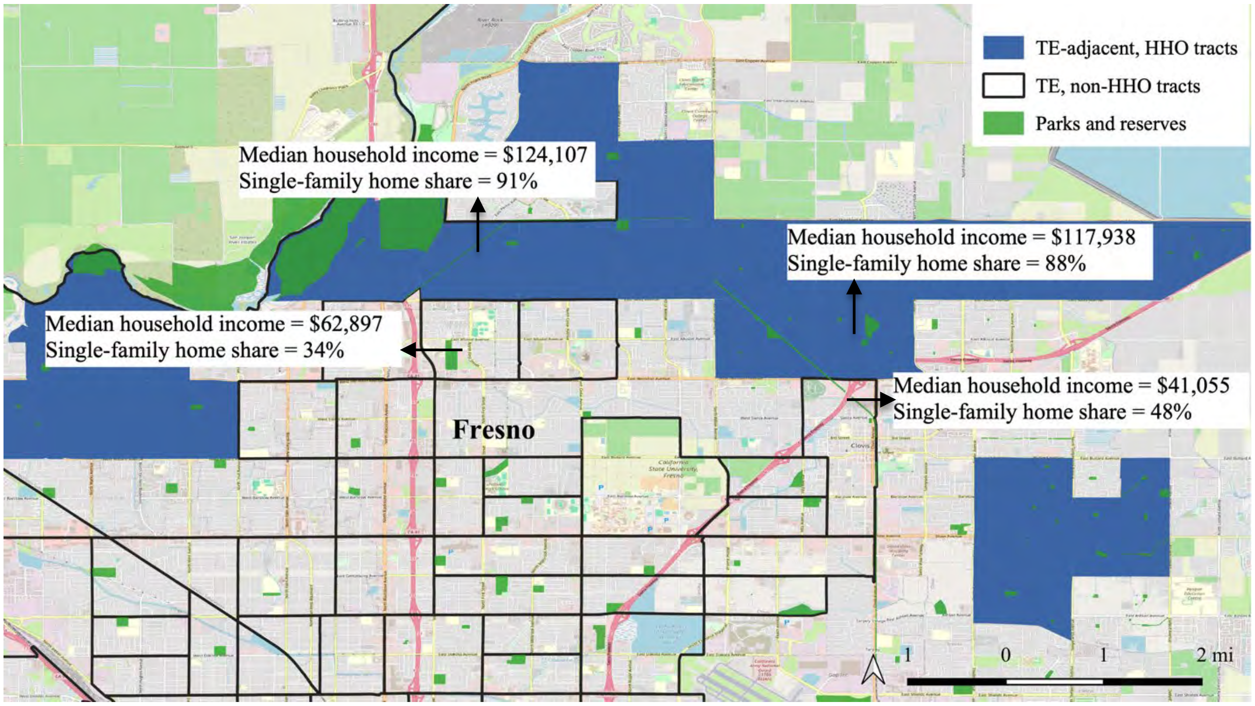
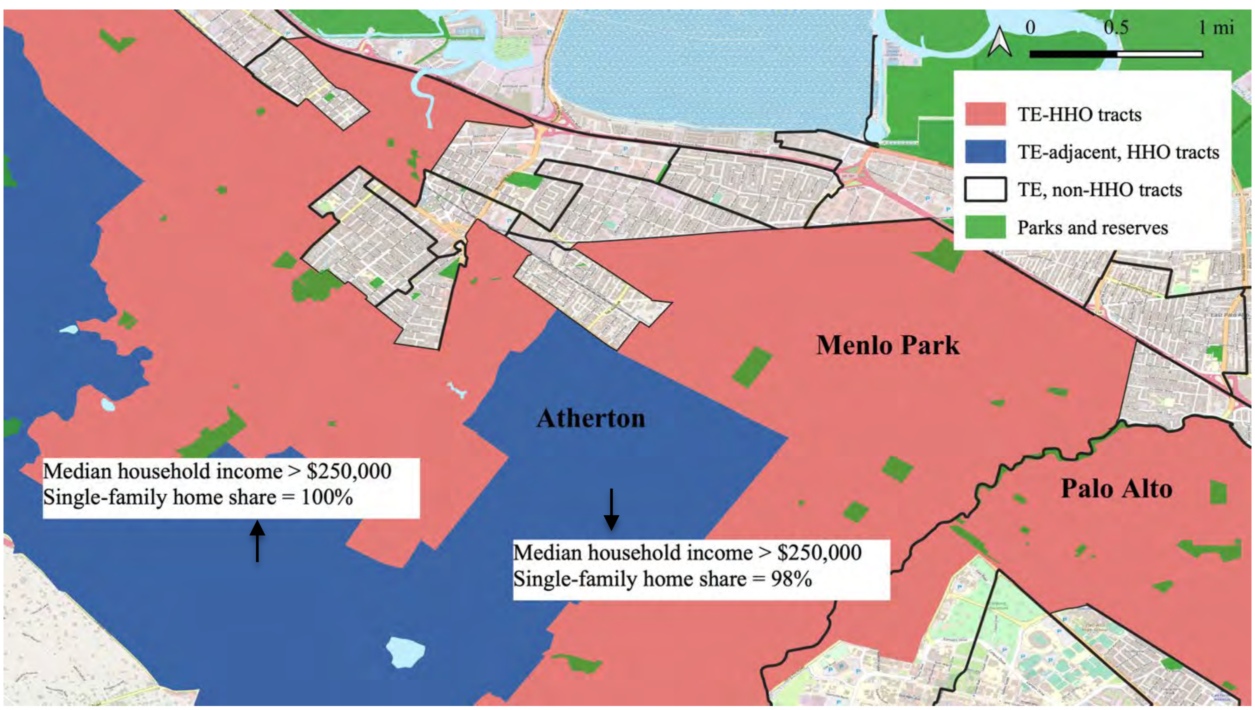


Exhibit III-10: TE-HHO and TE-adjacent, HHO Areas in Selected Residential Communities, San Francisco Bay Area



D. Additional characteristics of priority areas.

We identify two types of priority areas. TE-HHO areas are identified by their high income and/or high income mobility, absence of high pollution burdens, and transportation efficiency, characterized by higher population density, higher accessibility of jobs, and a higher percentage of workers commuting by transit. TE-adjacent, HHO tracts are healthy, high-opportunity tracts that, according to our methodology, are not TE but are in close proximity to TE areas. In this section, we explore several additional characteristics of these priority areas, including racial/ethnic composition, walkability, and the potential risk of gentrification.

1. Racial and Ethnic Composition and Segregation

Drawing on data from the 2019 5-year ACS, we compare the racial and ethnic composition across different tract types, including TE-HHO, TE-adjacent HHO, all other HHO, all other TE, and non-TE, non-HHO tracts. As shown in Exhibit III-11, compared to the statewide distribution, both TE-HHO and TE-adjacent, HHO areas have disproportionately high percentages of Asian and non-Hispanic white population. On the other hand, people identifying as Hispanic only account for 16% in TE-HHO areas and 17% in TE-adjacent, HHO areas, which is less than half of the Hispanic share statewide (39%). Similarly, people identifying as Black or African American compose 3% of the population of TE-HHO and TE-adjacent, HHO areas, which is half of their statewide share (6%).

Exhibit III-11: Racial and Ethnic Composition by Tract Type

Category	TE-HHO	TE-adjacent, HHO	All Other HHO	All Other TE	Non-TE, Non-HHO	State
% American Indian / Alaska Native	0.2	0.2	0.3	0.2	0.6	0.4
% Asian	30.6	20.0	16.8	12.8	7.5	14.3
% Black/African American	2.7	3.0	3.5	7.7	4.7	5.5
% Hispanic	16.1	17.0	17.6	50.8	42.2	39.0
% Other	4.4	4.0	4.3	2.8	3.1	3.3
% Pacific Islander	0.4	0.3	0.4	0.4	0.3	0.4
% White	45.6	55.4	57.2	25.3	41.5	37.2
Population	5,074,456	3,402,162	2,011,183	16,640,582	12,155,114	39,283,497

Note: The Hispanic category includes all people identifying as Hispanic or Latino, regardless of their racial identity. Other categories include only members of the specified racial groups identifying as not Hispanic or Latino.
Data source: 2015-2019 ACS

We further assess the degree of racial segregation in the identified priority areas. One metric of racial segregation is the share of Racially Concentrated Areas of Affluence (RCAA). This metric highlights relatively affluent white neighborhoods and serves as the counterpart to the Racially and Ethnically Concentrated Areas of Poverty (R/ECAPs) used by HUD in the 2015 AFFH rule. Given the notable presence of non-Hispanic white population in TE-HHO and TE-adjacent, HHO areas, the RCAA metric is particularly relevant to these locations. The RCAA metric used in this analysis is created by HCD to align with California's relative diversity and regional conditions, and to aid local jurisdictions in their analysis of racially concentrated areas of poverty and affluence as required by state laws. An RCAA is defined as a census tract where (1) the percentage of non-Hispanic white population is more than 1.25 times higher than the percentage of non-Hispanic white population in the region where the tract is located; and (2) median income is 1.5 times higher than the region's area median income (AMI) (or 1.5 times the state median income, whichever is lower).

As shown in Exhibit III-12, HHO tracts, regardless of their TE status, are much more likely to be racially concentrated areas of affluence. Over one-third of the TE-HHO tracts and 54% of the TE-adjacent, HHO tracts are identified as RCAAs. The concentration of affluent non-Hispanic white residents in these priority areas signals potential challenges in housing accessibility for people of color, as well as those with lower incomes, raising concerns about equitable housing opportunities.

Exhibit III-12: RCAA Tracts by Tract Type

Tract Type	N	RCAA	% RCAA
TE-HHO	1,070	360	33.6
TE-adjacent, HHO	693	375	54.1
All Other HHO	368	178	48.4
All Other TE	3,552	64	1.8
Non-TE, Non-HHO	2,374	59	2.5

2. Walkability

We assess walkability in the identified priority areas using the National Walkability Index (US EPA 2021). The National Walkability Index serves as a comprehensive geographic dataset that evaluates and categorizes block groups based on their relative levels of walkability across the nation. The assigned score, ranging from 1 to 20, represents the degree of walkability in a given block group, with 1 representing the lowest walkability and 20 denoting the highest. The walkability scores are categorized as follows: (1) 1-5.75: least walkable, (2) 5.76-10.5: below average walkable, (3) 10.51-15.25: above average walkable, and (4) 15.26-20: most walkable. Since we are interested in walkability at the tract level, we compute the population-weighted mean of block group scores to obtain the tract-level walkability score.

Exhibit III-13 compares walkability in different types of tracts broken down by MPOs. Compared to areas that are neither TE-HHO nor TE-adjacent, HHO, TE-HHO locations have a higher percentage of tracts that are considered most walkable in the National Walkability Index. Notably, in the ABAG region, 34.5% of the TE-HHO tracts are categorized as highly walkable. The share of above-average walkable tracts is similar across TE-HHO tracts and the non-priority areas. On the other hand, TE-adjacent, HHO tracts appear to be less walkable, with only 2-6.3% of tracts being among most walkable across the three regions examined.

Exhibit III-13: Walkability in Priority Tracts

Region / Tract Type	Most walkable tracts (%)	Above average walkable tracts (%)	Below average walkable tracts (%)	Least walkable tracts (%)	Number of tracts
ABAG					
TE-HHO	34.5	53.8	11.3	0.3	582
TE-adjacent, HHO	6.3	54.4	39.3	0.0	206
All Others	21.5	50.6	24.0	3.8	780
SANDAG					
TE-HHO	20.5	56.4	23.1	0.0	39
TE-adjacent, HHO	2.0	29.6	66.3	2.0	98
All Others	18.3	58.6	18.5	4.5	486
SCAG					
TE-HHO	26.0	60.0	13.9	0.0	423
TE-adjacent, HHO	4.3	37.4	56.6	1.8	281
All Others	21.3	58.9	16.5	3.3	3,212

3. *Gentrification*

Gentrification broadly refers to the transformation of neighborhoods initially characterized by lower socioeconomic status into higher socioeconomic status areas. While gentrification can bring about positive changes, such as enhanced infrastructure and increased economic activity, concerns arise from its potential adverse effects on existing communities including the displacement of lower-income residents. TE-HHO areas may undergo gentrification through substantial infrastructure investments that attract a large number of new high-income and/or educated residents, leading to potential increases in home prices and significant changes in neighborhood characteristics. However, given that the majority of identified priority areas are already high income neighborhoods, gentrification may not be a significant concern in these places.

It is important to note that neighborhood gentrification does not always lead to the displacement of existing lower-income residents. Policy efforts supporting the development of affordable housing and mixed-income housing, community engagement, and other regulatory measures aimed at stabilizing housing costs can help protect residents from rent increases and evictions. Therefore, it is important to employ a gentrification measure that avoids conflating gentrification with housing cost increases and displacement, as seen in many multi-indicator measures of gentrification in existing literature (e.g., Chapple and Zuk 2016; Freeman 2005). Such measures often assume that displacement will occur with neighborhood gentrification.

To identify gentrifying neighborhoods within the priority areas, we focus on low-income neighborhoods experiencing substantial in-migration of college educated individuals. Recent research has increasingly used education attainment as the primary indicator of gentrification (Brummet and Reed 2021; Dragan, Ellen, and Glied 2020). An influx of college-educated individuals, while not implying the displacement of existing residents, is considered an indicator of gentrification as it is associated with rising incomes and changing community demographics. In this analysis, a gentrifying neighborhood is defined as a census tract where:

- median household income as of the 2008-12 ACS was in the bottom 40% of the CBSA distribution and within 10 miles of a census-defined principal city; and
- the percentage increase in adults with college degrees or higher between the 2008-2012 and 2015–2019 ACS was in the top quartile of the distribution for the CBSA.

Relative to other tract types, HHO areas have a relatively small share of tracts that are gentrifying, characterized by a substantial increase in the presence of college-educated individuals. Across the five CBSAs examined, TE-HHO areas have a relatively small percentage of gentrifying tracts, and TE-adjacent, HHO tracts as well as other non-TE, HHO tracts have few gentrifying tracts (Exhibit III-14). Non-TE, non-HHO areas also have few tracts undergoing gentrification. In contrast, the percentage of gentrifying tracts is the highest among TE tracts that are not HHO, ranging from 10% in the Los Angeles-Long Beach-Anaheim CBSA to 21% to the San Francisco-Oakland-Hayward CBSA.

Further examining gentrification within TE-HHO areas indicates that gentrifying neighborhoods are primarily concentrated in tracts with “highest income mobility” but not “highest income” (Exhibit III-15). This is consistent with expectation because tracts in the highest income mobility category focus on children born in lower-income households and are likely to have lower socioeconomic status compared to other types of high-opportunity tracts. The share of gentrifying tracts among those labeled as “highest income” is slightly higher in the San Francisco-Oakland-Hayward CBSA and the San Jose-Sunnyvale-Santa Clara CBSA relative to other CBSAs examined. This pattern can be attributed to the relatively high household incomes in these two CBSAs compared to the state, resulting in more tracts being identified as “highest income” based on the statewide distribution used in the high-opportunity metric. However, some of these tracts will be considered lower-income based on regionwide ranking used in the gentrification metric.

Exhibit III-14: Gentrification by Tract Type

CBSA / Tract Type	N	Gentrifying	% gentrifying
Los Angeles-Long Beach-Anaheim, CA			
TE-HHO	420	20	5
TE-adjacent, HHO	190	0	0
All Other HHO	58	0	0
All Other TE	2080	216	10
Non-TE, Non-HHO	181	1	1
San Francisco-Oakland-Hayward, CA			
TE-HHO	400	28	7
TE-adjacent, HHO	109	0	0
All Other HHO	68	0	0
All Other TE	331	69	21
Non-TE, Non-HHO	72	2	3
San Diego-Carlsbad, CA			
TE-HHO	39	2	5
TE-adjacent, HHO	98	2	2
All Other HHO	30	0	0
All Other TE	301	37	12
Non-TE, Non-HHO	160	4	2
Sacramento-Roseville-Arden-Arcade, CA			
TE-HHO	19	2	11
TE-adjacent, HHO	57	0	0
All Other HHO	48	0	0
All Other TE	151	30	20
Non-TE, Non-HHO	211	8	4
San Jose-Sunnyvale-Santa Clara, CA			
TE-HHO	182	20	11
TE-adjacent, HHO	68	1	1
All Other HHO	21	0	0
All Other TE	87	17	20
Non-TE, Non-HHO	25	1	4

Exhibit III-15: Gentrification within TE-HHO Areas by Opportunity Category

CBSA / Opportunity Category	N	Gentrifying	% gentrifying
Los Angeles-Long Beach-Anaheim, CA - TE-HHO			
Highest income, highest income mobility	109	0	0
Highest income	110	0	0
Highest income mobility	201	20	10
San Francisco-Oakland-Hayward, CA - TE-HHO			
Highest income, highest income mobility	178	4	2
Highest income	142	10	7
Highest income mobility	80	14	18
San Jose-Sunnyvale-Santa Clara, CA - TE-HHO			
Highest income, highest income mobility	82	3	4
Highest income	76	10	13
Highest income mobility	24	7	29
San Diego-Carlsbad, CA - TE-HHO			
Highest income, highest income mobility	9	0	0
Highest income	18	1	6
Highest income mobility	12	1	8
Sacramento-Roseville-Arden-Arcade, CA - TE-HHO			
Highest income	7	0	0
Highest income mobility	12	2	17

IV. Assessing the Potential for Housing Development in TE-HHO and TE-Adjacent, HHO Areas in California

This chapter assesses the housing development potential for priority areas by estimating the maximum number of housing units nominally allowed on each parcel in TE-HHO and TE-adjacent, HHO areas. We estimate the potential buildout primarily based on the maximum allowable density provided in local general plans. This chapter first details the data sources and process for deriving nominal capacity. Next, we present our estimates and compare them with existing housing units. We conclude by discussing the implications of our findings.

The estimated potential buildout often significantly exceeds the existing number of housing units, even after accounting for fire and flood risks. The significant difference between potential buildout and existing units is in part due to cumulative constraints imposed from various regulatory restrictions beyond maximum allowable density. More importantly, this analysis underscores the need for policies that enable general plan density to be more reflective of realistic development potential.

A. Assessing nominal capacity in priority areas

We derive the maximum number of housing units nominally allowed on each parcel in priority areas (i.e., TE-HHO and TE-adjacent, HHO tracts) and compare the nominal capacity to the number of existing housing units. This analysis reveals the extent to which priority areas are built out based on existing land use plans.

The basic procedure for deriving tract-level nominal capacity involved five steps, detailed in the following sections. First, we identified parcels where residential use or commercial/residential mixed use is allowed. Second, we calculated the buildable area of each parcel by subtracting the area with slope greater than 15% from total parcel area. Third, we calculated the maximum density allowed (units per acre) based on the general plan and, where general plan data are unavailable, zoning or specific plan designations. We then multiplied the maximum density by buildable parcel area to obtain the nominal capacity for each parcel. Once we had the nominal capacity of each parcel, we performed validation exercises by analyzing parcels with unusually low and high derived capacities. In the fourth step, we considered fire and flood hazards by identifying areas located in zones with high fire or flood risk. We derived parcel-level nominal capacity for (1) buildable area net of high fire risk locations; (2) buildable area net of high flood risk locations; and (3) buildable area net of high fire and flood risk locations. Finally, we aggregate parcel capacity to the tract level for all TE-HHO and TE-adjacent, HHO tracts in SCAG and ABAG regions. We reproduced this analysis for local jurisdictions with TE-HHO or TE-adjacent, HHO tracts outside of the SCAG and ABAG. The data sources and analytic processes, as well as the rationale for using general plan densities, are described in detail below.

1. Land use and zoning data

We used harmonized land use data provided by the Association of Bay Area Governments (ABAG) and the Southern California Association of Governments (SCAG) to derive the nominal capacity in all TE-HHO tracts and TE-adjacent, HHO tracts in the two regions. In the SCAG region, we used data directly obtained from the city of Newport Beach instead of the SCAG data. This is because density information for Newport Beach is largely missing in the SCAG data, and the city has a large number of TE-HHO tracts. Outside the ABAG and SCAG regions, we searched for general plan land use and zoning data from 38 cities and 10 counties where we have identified TE-HHO tracts and TE-adjacent, HHO tracts. We were able to obtain planning and/or zoning data from 35 of these 38 cities and all 10 counties. Of the 45 cities and counties for which we obtained data, two (San Marcos and Poway) were missing planned and zoned densities, so we exclude these cities when estimating the buildout capacity.

For the SCAG region, we used the publicly available 2016 vintage of SCAG's land use data. This is because in the more recent version of the data (updated as of February 2021), SCAG removed the relevant variables for deriving nominal capacity. For the ABAG region, we used ABAG's parcel-level data furnished in December 2022. Both the ABAG and SCAG datasets include parcel-level characteristics on lot size, existing use, planned land use, and the maximum number of dwelling units per acre allowed by local general glans. Additionally, the zoning designations in the ABAG data include density information, but the zoning designations in the SCAG data do not. As a result, the general plan designations provide the only geographically consistent measure of allowable density. MPOs other than ABAG and SCAG either provide less consistent parcel-level data or none at all. As a result, we collected land use data for jurisdictions outside of these two regions by searching city data platforms and emailing local agencies if the information was not available online. Since general plan designations are available in both the ABAG and SCAG datasets, which are our primary sources of land use information, we collect general plan data for other local jurisdictions to maintain consistency. The sources are detailed in Appendix 3.

General plans have several advantages as tools for identifying buildout capacity, as well as some disadvantages. First, in principle, the land use element of a general plan should serve as a blueprint for future development (State of California, Governor's Office of Planning and Research 2017). Second, general plan maximum densities have come to assume substantial regulatory significance as a result of recent reforms. In 2018, the California legislature amended the Housing Accountability Act to stipulate that "a proposed housing development project is not inconsistent with the applicable zoning standards and criteria, and shall not require a rezoning, if the housing development project is consistent with the objective general plan standards and criteria but the zoning for the project site is inconsistent with the general plan" (Cal. Gov. Code, §65589.5(j)(4)). In some cases, this provision could require municipalities to approve housing projects at the maximum general plan density, notwithstanding more restrictive zoning. In 2023, the legislature amended the state's Density Bonus Law, which provides that the based density for a qualifying project is "the greatest number of units allowed under the zoning ordinance, specific plan, or land use element of the general plan, or, if a range of density is permitted, the greatest number of units allowed by the specific zoning range, specific plan, *or land use element of the general plan applicable to the project*" (AB 1287 (2023), §1, amending Cal. Gov. Code §65915(o)(6), emphasis added). (Projects qualify for the Density Bonus Law by including BMR units.) The impact of these reforms is discussed in section A.1 of Chapter VII. Third, as noted above, general plan data more uniformly includes data on densities than zoning data or specific plan data. On the other hand, as noted in a California Government & Finance Committee analysis, based on data collected by O'Neill-Hutson et al. (2022), some jurisdictions may "intentionally maintain inconsistencies to gain an additional measure of control over development. By maintaining low densities or height limits that are inconsistent with the general plan for the express purpose of requiring rezoning, even when projects are consistent with housing density and other objective standards contained in the city or county's general plan, local governments can ensure that they maintain discretionary approval over projects" (State of California, Senate Committee on Governance and Finance 2018, 3). This possibility motivated the amendment to the Housing Accountability Act, described above, but it may mean that some general plan densities do not function as aspirational blueprints for development.

Although general plan data has more comprehensive data on density than either specific plan data or zoning data, we use both of these sources to supplement the general plan data. For the ABAG region, we use general plan maximum density if it is available, and zoning if it is not. Unlike the SCAG data, specific plan standards are not available in the ABAG data. For the SCAG region, we use specific plan when available, and general plan when specific plan density is not available. We prioritize specific plan over general plan for the SCAG region since it implements the goals of general plan while featuring local characteristics of the jurisdiction. For jurisdictions outside of these regions, we use general plan density when it is available, specific plan when the general plan refers to the specific plan, and zoning density when the general plan density is not available.

We use general and specific plan data because zoning data with information on allowable densities is not consistently available across jurisdictions, but this decision influences the magnitude of our estimates. Although there are exceptions, general plan capacity tends to be greater than zoning capacity.

2. Identifying target parcels and deriving buildable parcel area

We begin our analysis by identifying parcels in the ABAG and SCAG data that meet either of the two conditions: (1) the parcel is designated for residential use or commercial/residential mixed-use in local general plan, specific plan, or zoning; or (2) the existing land use of the parcel is residential or commercial/residential mixed-use.

A subset of parcels satisfying the first condition have existing uses that render them inappropriate for redevelopment into housing. These include education institutions, transportation and communication facilities, water bodies, open space (except golf courses), and protected land. We treat the nominal capacity of such parcels as zero. The second criterion captures parcels that are already accommodating residential use or commercial/residential mixed-use, even though the general or specific plan does not reflect these uses. Such parcels may be designated in general plans or specific plans for retail stores, public facilities, parks, etc., or their planned land use codes may be missing in the data. We consider parcels that have existing land use as residential or mixed use as contributing to a tract's nominal housing capacity since they are used for housing, even if they are not planned as residential or mixed use.

For the ABAG dataset, we use the general plan and zoning designation to identify residential and mixed-use parcels. Once we identify the residential and mixed-use parcels, we use the maximum density (in dwelling units per acre) allowed by the general plan, or by the zoning ordinance if the density information on the general plan is missing, to compute the maximum number of units on the parcel. For the SCAG dataset, we used the general plan and, where applicable, specific plan designation to identify residential and mixed-use parcels, but did not need to use zoning district designations.

Next, we calculate the buildable area of each parcel. We use US Geological Survey 1/3 arc-second digital elevation map data to identify areas with steep slopes, which are greater than 15 percent, as these regions are less suitable for construction (Saiz 2010). We subtract the steep slope areas from the parcel area to obtain the buildable area.

3. Deriving and validating parcel nominal capacity

To calculate the nominal capacity for each parcel, we multiply the maximum density by the derived buildable area.[19] We use the maximum density since it sets an upper bound for the number of units that can be developed on a parcel.[20] For the ABAG region, the planned density equals general plan density, or zoning density if the general plan density is missing. Some parcels have general plan and zoning designations but are missing the allowable density information. In this case, if a parcel is planned for SFR, we set the nominal capacity equal to one. For parcels planned for MFR or mixed-use and with missing density data, we cannot derive the nominal capacity. In addition, we do not have density information for parcels that are not planned or zoned for residential or mixed purposes but are used for these purposes. For parcels where nominal capacity cannot be derived based on allowable density, we use the existing tract-level housing density from the 2015-19 ACS when we aggregate our estimates to the tract level.

For the SCAG region, the planned density equals the maximum specific plan density where available, and the maximum general plan density if the specific plan density is not available.[21] For parcels that are missing plan density standards, we treat the nominal capacity as 1 unit if the parcel is planned for SFR. For other parcels missing plan density standards, we use the average housing density, as we did for ABAG.

As described above, for parcels with existing use as education institutions, transportation and communication facilities, water bodies, open space (except golf courses), and undevelopable/protected land, we treat the nominal capacity as zero in both ABAG and SCAG regions.

Because ABAG and SCAG compile land-use designation and density information from local plans and ordinances, errors may occur due to variation in data quality and accuracy across jurisdictions. To validate the derived nominal capacity and resolve some of the potential

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[19] For ABAG, this process produces the nominal buildout capacity of 72 percent of the parcels in the Bay Area. The parcels with the missing capacity lack density information and are spread out in the region. For example, Oakland – the city with the largest number of parcels with missing density data – lacks the relevant information for 754 parcels (out of 32,146 parcels).

[20] We conduct sensitivity analyses using the minimum density and the midpoint to assess how these alternatives would alter our estimates. We find that using minimum density often leads to a nominal capacity lower than the number of existing units. This is due to the high proportion of residential parcels (close to 54 percent) that have a GP or zoning minimum density that equals zero. Using the midpoint between the minimum and maximum density when they are both available leads to nominal capacity estimates that are lower than the number of existing units in some cases, such as in the City and County of San Francisco.

[21] Approximately 6% of the parcels are located within a specific plan area but are missing specific plan density standards. For these parcels, we use the general plan density standards.

measurement errors, we further investigate the parcels with unusually low and unusually high derived capacities. Appendix 4 details the data validation process and findings.

4. Adjusting parcel buildable area by addressing fire and flood risk

Incorporating climate resilience into our nominal capacity estimates involves assessing areas with high sensitivity to both fire and flood hazards. For this assessment, we use the Fire Hazard Severity Zones Map (FHSZ) provided by CAL Fire, employing the State Responsibility Area (SRA) and Local Responsibility Area (LRA). High fire risk locations are areas in fire hazard severity zones rated as "High" or "Very High" in the FHSZ (CAL FIRE 2023).

High flood risk locations are areas subject to inundation by a flood that has a one percent or greater chance of being equaled or exceeded in any given year (Federal Emergency Management Agency, n.d.). We rely on data from the Federal Emergency Management Agency (FEMA) Flood Map Service Center. To identify locations with a high flood risk, we focus on Special Flood Hazard Areas (SFHAs), where the floodplain management laws of the National Flood Insurance Program (NFIP) must be adhered to and flood insurance is mandated. In accordance with FEMA's definition, we consider sites to be at high flood risk if they are within flood zone categories beginning with the letters "A" or "V" (A, AE, AH, AO, AR, A99, V, and VE).

After identifying areas with high fire and flood risks, we spatially join this data with our parcel level dataset. We then calculate the area falling within high fire and high flood risk areas respectively for each parcel. This area is then subtracted from a parcel's buildable area as described above.

For parcels where density information is missing, we treat density equal to total existing units divided by tract area net of steep area. This density measure ensures that the average density values remain reasonable because some tracts with significant existing development are entirely designated as high fire or flood risk zones. This density value is then multiplied by the adjusted buildable area (i.e., tract area net of steep area and of high environmental risk area) for parcels with missing density data.

5. Obtaining tract-level nominal capacity

After deriving parcel-level nominal capacities, we aggregate the data to the tract level to obtain the nominal capacity in each TE-HHO tract and TE-adjacent, HHO tract. A portion of the tracts may contain parcels designated or used for residential/mixed-use developments but missing the derived nominal capacity, due to missing density data. For these tracts, we first calculate the number of existing units per buildable area in a tract. Next, we multiply this density by the buildable area of the portion of the tract missing nominal capacity. This process ensures that we include parcels with missing density in our capacity estimates and it is particularly relevant for tracts where a large proportion of parcels are missing density information.

While the SCAG and ABAG regions contain 85% of TE-HHO and TE-adjacent, HHO tracts in the state, there are approximately 270 tracts outside of the two regions. In order to compute the nominal capacity of these tracts, we collected county- and jurisdiction-level general plan data (or zoning data if the general plan data is unavailable) and parcel data from 35 cities and 10 counties. Similar to the previous method described in the ABAG and SCAG methodologies, we also calculate the areas with steep slopes to determine the buildable area. We spatially merge these datasets to generate a parcel-level dataset containing land use and steep area information.

Once we have a parcel-level land use dataset, we filter for parcels in TE-HHO and TE-HHO adjacent tracts. For residential and mixed-use parcels in these tracts, the maximum allowable density (dwelling units per acre) is multiplied by the buildable area, which is equal to the parcel area minus the steep area, in order to determine the maximum number of units permitted on a parcel. The maximum allowed units are then aggregated at the tract level.[22]

B. Results of nominal capacity

In this section, we first present the nominal capacity estimates, aggregated at the county level, and compare our estimates to the number of existing housing units. We find that in most places the estimated potential buildout far exceeds the number of housing units, and that this pattern holds true even when we factor in fire and flood risks in estimating nominal capacity.

The nominal capacity estimates for TE-HHO tracts and TE-adjacent, HHO tracts are shown in

Exhibit IV-1 to Exhibit IV-3. The estimated nominal capacity unadjusted for fire and flood risks is markedly higher than the number of existing housing units as of the 2015-2019 ACS in priority areas in all places except Santa Barbara and Monterey Counties.

Incorporating fire and flood risks in the calculation yields more conservative estimates of potential buildout. However, the degree to which these risks diminish the potential for housing development in priority areas varies across locations. Considering both fire and flood risks reduces the nominal capacity in TE-HHO and TE-adjacent, HHO tracts to different extent in different counties. Notably, in Los Angeles County, nominal capacity estimates decrease by 28% (over 290 thousand units) after taking into account potential fire and flood threat.

After taking into account both fire and flood risks, the estimated nominal capacities in 23 of the 26 counties examined exceed the number of existing housing units. The ratio of nominal capacity to existing units varies widely across counties. Even with the more conservative estimates of nominal capacity, most places still have substantial capacity for additional housing

[22] To understand inconsistencies across jurisdictions, we examine tracts with significantly higher or lower unit to capacity ratios (less than 0.3 or greater than 1.5). First, we analyze tracts with high unit to capacity ratios. For instance, some tracts in San Diego (e.g., tract 170.37 and 83.37) have very small single-family parcels, which exceed the allowable density based on the general plan. The cities of Santa Barbara and Carlsbad also exhibit similar patterns. In the unincorporated region of Yolo County, tract 105.01 has a high unit to capacity ratio, with a large area zoned agriculturally but used for residential purposes. Additionally, tracts like 117.00 of Monterey County span multiple cities including Carmel by the Sea, but general plan information for Carmel by the Sea is unavailable. Conversely, we observe tracts with very small unit to capacity ratios in Sacramento County, attributed to high general plan densities. Many single-family residential parcels in the unincorporated part of Sacramento can have multiple units. Furthermore, large residential-zoned parcels in the City of Sacramento (e.g., tract 71.02) have significant capacity estimates but are used for agriculture.

development. However, in Ventura, Santa Barbara, and Monterey Counties, TE-HHO and TE-adjacent, HHO tracts appear to be built out when factoring in fire and flood risks. As discussed below, the more conservative estimates of nominal capacity should not be interpreted as a suggestion for allowing less housing in these locations. Upon examining the data, we find significant housing development in tracts that are entirely designated as high fire or flood risk zones.

Exhibit IV-1: Nominal Capacity Estimates by County, ABAG Region

County	TE-HHO tracts	TE-adjacent, HHO tracts	Total nominal capacity (units)	Total nominal capacity (units) considering fire risk	Total nominal capacity (units) considering flood risk	Total nominal capacity (units) considering fire and flood risk	Existing units
Santa Clara County	182	68	1,139,137	1,107,859	1,039,204	1,037,032	466,217
San Francisco County	144	0	333,057	315,634	315,283	315,283	302,435
Alameda County	115	42	499,201	472,705	458,853	452,986	269,647
San Mateo County	93	19	315,704	275,103	278,919	259,337	194,393
Contra Costa County	33	39	265,740	246,088	240,624	238,831	143,614
Marin County	15	9	89,038	69,163	71,215	59,321	53,823
Napa County	0	7	17,590	17,094	16,710	16,710	7,706
Solano County	0	12	30,124	26,823	26,720	26,720	19,257
Sonoma County	0	10	50,181	44,525	48,101	44,466	19,566

Exhibit IV-2: Nominal Capacity Estimates by County, SCAG Region

County	TE-HHO tracts	TE-adjacent, HHO tracts	Total nominal capacity (units)	Total nominal capacity (units) considering fire risk	Total nominal capacity (units) considering flood risk	Total nominal capacity (units) considering flood and fire risk	Existing units
Los Angeles County	285	103	1,038,130	748,918	981,628	744,936	662,358
Orange County	135	87	690,129	581,689	643,567	567,605	407,678
Ventura County	4	35	103,971	55,425	91,129	53,633	69,959
Imperial County	0	1	2,478	2,406	2,406	2,406	1,251
Riverside County	0	34	188,027	167,359	157,993	145,554	67,081
San Bernardino County	0	21	53,881	38,932	48,742	38,864	36,591

Exhibit IV-3: Nominal Capacity Estimates by County, Other Regions

	County	TE-HHO tracts	TE-adjacent, HHO tracts	Total nominal capacity (units)	Total nominal capacity (units) considering fire risk	Total nominal capacity (units) considering flood risk	Total nominal capacity (units) considering fire and flood risk	Existing units
SANDAG	San Diego	39	93	302,560	296,788	298,333	292,566	251,544
SACOG	Sacramento	10	29	139,038	139,000	116,017	115,979	71,401
	Yolo	6	5	17,687	17,687	16,597	16,597	16,257
	Placer	3	20	72,326	72,326	71,730	71,730	42,764
	El Dorado	0	1	1,097	1,097	1,097	1,097	966
SBCAG	Santa Barbara	3	9	18,632	16,595	17,731	15,766	19,818
KCOG	Kern	2	10	55,071	55,071	55,071	55,071	24,290
AMBAG	Santa Cruz	1	6	17,084	16,884	16,725	16,526	13,332
	Monterey	0	3	7,268	1,373	7,201	1,358	7,613
FCOG	Fresno	0	18	48,972	48,972	48,526	48,526	32,593
SJCOG	San Joaquin	0	2	6,234	6,234	5,949	5,949	4,222

The difference between the estimated potential buildout and existing units is in part because parcels with the highest nominal capacity estimates may not necessarily be utilized for high-density residential development. In Appendix 5, we examine the existing use on parcels with high nominal capacity estimates in the SCAG and ABAG regions. We find that a significant portion of the nominal capacity is contributed by parcels designated for mixed-use or multifamily purposes. In both regions, parcels used for SFR account for roughly two-thirds of the land area of the identified priority areas. These SFR parcels only contribute to 41% of the nominal capacity in the ABAG region and 56% in the SCAG region. Parcels with large nominal capacity usually fall into three key categories: (1) planned mixed-use/multifamily parcels used for various non-residential purposes; (2) planned mixed-use/family parcels used for low-density residential development; and (3) unsubdivided single-family parcels that are either vacant, used for non-residential purposes, or developed for residential purposes with a density lower than allowed in planning and zoning standards.

C. Cumulative Constraints Analysis

We further explore the possibility of analyzing the cumulative constraints imposed by the layering of different regulatory restrictions. The nominal capacity analysis is likely to overstate the maximum allowable buildout, in part, because a given parcel of land is typically subject to multiple restrictions. For example, a parcel may be subject to requirements governing dwelling units per acre, minimum lot size, maximum units per lot, minimum setbacks, maximum lot coverage and floor area ratio, maximum height, and minimum number of parking spaces per unit, among other restrictions. Each of these requirements can reduce the allowable density below the number specified in the measure of dwelling units per acre. The number and type of applicable restrictions typically varies among and within jurisdictions. The ABAG data includes variables that address several relevant restrictions, although the SCAG data does not. (In general, the local data that we have collected also does not include the relevant restrictions.)

Among the variables provided by ABAG are the maximum number of units per lot and the minimum lot size. In theory, combining these two variables with the maximum number of units per acre could facilitate a straightforward application of a cumulative constraints analysis. A stylized example illustrates how this analysis could work. If a lot is 0.25 acres and the maximum number of dwelling units (DU) per acre is 8, then – based on the DU/acre restriction – 2 units should be allowed on the lot (8 units/acre * 0.25 acre). If the maximum number of units per lot is one, then only one unit would be allowed. Further, if the minimum lot size is 0.3 acres, then zero units would be allowed (unless the owner combines the parcel with adjacent land). Given adequate data, the relevant constraints could be aggregated across a jurisdiction to determine an adjustment factor for the nominal capacity figures.

In practice, there are several challenges associated with conducting this analysis, some of which were expected and some of which were unexpected. As expected, there is a significant amount of missing data, because – as noted above – the nature of the relevant restrictions and the quality of the available data varies among and within jurisdictions. Nevertheless, there is sufficient data to merit further analysis. For example, 30 of the 101 Bay Area cities have both DU/acre and units per lot data for more than 50% of residential parcels.

Further analysis revealed idiosyncrasies that limit the viability of the cumulative constraints analysis. For example, in some jurisdictions that record both maximum DU/acre and maximum units/lot, it appears that the units/lot measure does not apply to existing unsubdivided lots, but to hypothetical subdivided lots of the minimum lot size. For example, an undivided 40-acre parcel in a San Jose R-1-5 zoning district has a maximum DU/acre of 5, a maximum units/lot of 1, and a minimum lot size of 8,000 square feet. Based on the DU/acre measure, 200 units would be permitted (5 DU/acre * 40 acres). Based on the units/lot measure, only one unit is allowed. Based on the minimum lot size, the 40-acre parcel could be subdivided into 217 parcels. Based on 217 parcels, the one unit/lot maximum yields 217 units, which is fairly close to the 200 units derived via the DU/acre measure. Based on this analysis, the DU/acre measure would be the binding constraint for this parcel. Unfortunately, this simple algorithm yields absurd results for some jurisdictions (and even for some parcels within jurisdictions where it yields otherwise sensible results), so it could not be applied without considerable further refinement.

A corollary problem runs in the opposite direction: Some jurisdictions assign subdivision densities to individual parcels within a subdivision. For example, a 435.6 sq. ft. parcel in the City of Hercules has a maximum units/lot measure of 12. This parcel is part of a larger condominium complex to which the 12 units/lot measure seemingly applies. It might be possible to create a multi-step algorithm that distinguishes between unsubdivided parcels and subdivided parcels and then performs the relevant aggregation (or disaggregation) of values. However, this is a more data-intensive procedure, and – as the number of required variables increases – so too does the number of potential data problems. For example, in Hercules, the minimum lot size measure for residential parcels takes one of three values (when not missing): 3 (2,088 observations), 6 (4,259 observations), and 21 (36 observations). Although the name of the relevant variable in the ABAG dataset is "zn_min_lot_sqft," it is clear that none of these three numbers (i.e., 3, 6, 21) represents square feet. It seems likely that – for the City of Hercules – the variable is denominated in thousands of square feet, although confirming this assumption would require significant additional investigation. Working backwards from this assumption for the parcel in question, we get a minimum of 3,000 sq. ft. / lot divided by a maximum of 12 units/lot, yielding a minimum of 250 sq. ft. / unit, which is a plausible figure since it is smaller than the actual parcel size (435.6 sq. ft.).

The above examples illustrate that the zoning measures have not yet been harmonized across (or in some cases within) jurisdictions in the ABAG dataset, so that the cumulative constraints analysis may require a large number of assumptions. Notably, the above examples also illustrate that the DU/acre measure, which we use for our nominal capacity analysis, is likely to be the most reliable measure across jurisdictions.

D. Implications of buildout estimates

We aim to understand the residential development potential in the identified priority areas by estimating the nominal capacity for parcels in these areas. Drawing on the available land use data, our analysis reveals that the number of housing units nominally permitted often exceeds the number of existing units. However, this finding does not necessarily imply that additional residential development can readily take place in these priority areas. Our finding raises questions about the degree to which land use and zoning standards accurately reflect practical development potential.

In practice, residential development is subject to cumulative constraints imposed by different regulatory restrictions. Therefore, our estimates of nominal capacity, primarily based on the maximum allowable density specified in local general plans and zoning ordinances, will likely overstate the allowable buildout. However, as demonstrated in the analysis of cumulative constraints, we are not able to quantify the impact of the cumulative constraints imposed by various other regulatory restrictions. The number and type of applicable restrictions typically varies among and within jurisdictions, and these measures have not yet been harmonized across (or in some cases within) jurisdictions.

Given the existing data, our nominal capacity analysis provides the most reliable measure across jurisdictions based on regulatory designations. The notable difference between the estimated buildout and existing units highlights the need for policies that better align planning and zoning standards with actual development potential. For example, as discussed in Chapter VII, state laws could establish presumptive densities, thereby ensuring that proposed projects consistent with density standards can be approved ministerially and developed on these sites. This approach could minimize the impact of other regulatory constraints being imposed on top of density standards.

V. Analysis of Housing Needs in Priority Areas

In this chapter, we assess whether the potential for housing development in priority areas can accommodate current and future housing needs through two methods: (1) the most recent regional housing needs assessments and allocations by HCD and California's COGs; and (2) the projected household growth in the Sustainable Communities Strategies (SCSs) prepared by regional planning agencies as required by Senate Bill 375. We provide an overview of each housing needs assessment approach and compare housing needs to the estimated buildout derived in Chapter IV.

We find that the share of RHNA targets that can be accommodated in TE-HHO and TE-adjacent, HHO areas vary significantly among these jurisdictions. However, the assessment of housing element sites – where local jurisdictions deem suitable for future housing development – shows that it is uncommon for cities to designate these TE-HHO and TE-adjacent, HHO areas as housing element sites.

Furthermore, our analysis of projected household growth in long-range regional planning indicates that the nominal capacity for additional housing in these TE-HHO and TE-adjacent, HHO areas generally far exceeds the projected household growth. However, in most cases, existing housing units and projected household growth are primarily concentrated in TE areas that are not identified as HHO and in non-TE, non-HHO areas. Under these regional growth forecasts, there is no expected increase in the concentration of household growth in TE-HHO or TE-adjacent, HHO areas. This is in part because regional growth forecasts extrapolate from past trends along with other demographic and economic assumptions.

A. California's regional housing needs assessment and allocation

In this section, we first describe California's regional housing needs assessment and allocation (RHNA) process, which determines housing needs for each local jurisdiction (i.e., cities and the unincorporated areas of counties). Local jurisdictions must identify and, if needed, rezone to ensure adequate land use capacity for meeting the RHNA target by providing an inventory of sites in their housing elements. We first assess the degree to which a jurisdiction's housing needs can be accommodated in TE-HHO and TE-adjacent, HHO tracts based on existing planning and zoning standards. Next, we assess the potential for increasing housing opportunities in these priority areas by examining the spatial distribution of housing element sites.

1. Overview of RHNA process

The Regional Housing Needs Assessment, or RHNA, is a planning process established by state law to determine existing and projected housing needs for every local jurisdiction in California. The California Department of Housing and Community Development (HCD) provides every council of governments (COG) a regional housing needs determination, and each COG is responsible for developing a methodology to allocate this regional need to individual jurisdictions. Each COG devises its own allocation methodology based on a list of factors outlined in state law, including local jobs-housing relationships and opportunities to increase the use of public transit. The assessed housing needs cover an 8-year period, and local governments must update the housing elements in their general plans to demonstrate land use capacity and strategies for accommodating the allocated housing needs over the planning period. Most local jurisdictions are currently in the sixth cycle of the RHNA process.

RHNA plays a central role in guiding and shaping local land use and housing policies to address regional housing needs. In particular, each local jurisdiction must plan to accommodate the housing needs in their housing elements through conducting analyses of suitable sites and implementing various programs, including rezoning. Furthermore, recently enacted legislation has strengthened HCD's ability to implement and enforce the state planning mandate; nevertheless, HCD faces various challenges in monitoring the progress and actions of local jurisdictions in implementing the policies and programs outlined in their housing elements (Zheng 2021).

Recent research has shown mixed results on the efficacy of California's planning system. An analysis of rezoning commitments in 209 municipalities in southern California by Monkkonen, Manville, et al. (2023) suggests that higher housing targets are associated with more rezoning; however, cities with more expensive housing and non-Hispanic white residents continued to receive lower targets relative to existing stock. Monkkonen, Lens, et al. (2023) examined the zoning and housing elements in three cities that vary in income diversity – one in Orange County and two in Los Angeles County – and found that housing element allocations exacerbated patterns of economic segregation.

2. Comparing potential buildout with RHNA targets

We assess the degree to which housing needs from RHNA can be accommodated in TE-HHO and TE-adjacent, HHO areas. Drawing on the nominal capacity derived in Chapter IV, we compare the remaining capacity for housing development (i.e., total nominal capacity minus existing units) in TE-HHO and TE-adjacent, HHO areas with RHNA for the ten jurisdictions with the highest sixth-cycle RHNA numbers. As shown in Exhibit V-1, the share of RHNA targets that can be accommodated in TE-HHO and TE-adjacent, HHO areas vary significantly among these jurisdictions, ranging from 17% in San Diego to 77% in Long Beach. San Jose appears to be an outlier, with a remaining capacity in these priority areas more than seven times the RHNA target. As illustrated in Appendix 5, this is in part due to certain parcels planned for mixed-use, having high nominal capacity but few existing residential units.

3. Potential for increasing housing opportunities in priority areas

To assess the potential for increasing housing opportunities in priority areas, we compiled housing element site inventory data submitted by local governments to HCD for five counties with a substantial number of TE-HHO tracts: Alameda, Los Angeles, Orange, San Diego, and Santa Clara. To verify the self-reported housing element site data,[23] we validate the data by comparing

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[23] We encountered two problems with the data. First, some cities submitted housing designations outside their boundaries. For example, the submissions of Irvine, Newport Beach, unincorporated San Diego County, Santa Clara, Lancaster, and Placentia, include units located in neighboring jurisdictions. Second, although the dataset provides total housing capacity and capacity broken down by income levels, the sum of the capacity by income level does not always equal the total capacity reported. This is an issue for cities such as Newport Beach, City of Los Angeles, Buena Park, Burbank, Monterey Park, and San Diego. In cases like San Diego, the issue arises from the double reporting of moderate and low-income unit capacities, two categories used interchangeably by the jurisdiction.

the total capacity of the reported sites in a local jurisdiction to the RHNA target it received. In theory, the housing element sites should provide adequate capacity to accommodate the RHNA target, with the site capacity-to-RHNA ratio ideally exceeding 1. Upon examining the data, we find instances where this criterion is not fulfilled. To address this issue without significantly reducing the number of observations, we dropped jurisdictions with a site capacity-to-RHNA ratio below 0.9 for this analysis. We then assessed whether Housing Element site capacity is proportionally allocated to TE-HHO tracts, given the proportion of such tracts citywide. Exhibit V-2 reports the results for six cities where TE-HHO tracts constitute at least 5% of the urban area and have large RHNA targets.

Exhibit V-1: Comparison of RHNA Targets to Nominal Capacity in Priority Areas

	Jurisdiction	TE-HHO tracts	TE-adjacent, HHO tracts	Additional units (derived capacity - existing units)	RHNA	Derived Capacity/RHNA Ratio (%)
ABAG	San Francisco	144	0	30,622	82,069	0.37
	San Jose	76	40	456,745	62,200	7.34
	Oakland	22	3	14,896	26,251	0.57
SCAG	Los Angeles	105	36	143,044	456,643	0.31
	Long Beach	10	0	20,492	26,502	0.77
	Irvine	21	0	11,361	23,610	0.48
SANDAG	San Diego	32	48	18,335	108,036	0.17
SACOG	Sacramento	7	5	14,749	45,580	0.32
KCOG	Bakersfield	2	8	22,992	37,461	0.61
FCOG	Fresno	0	9	12,437	36,866	0.34

Note: The nominal capacity is not adjusted for fire and flood risks.

Among the six cities under examination, each has at least a quarter of its urbanized area designated as TE-HHO or TE-adjacent, HHO; however, it is uncommon for cities to designate these priority areas as housing element sites. Los Angeles is the only city where the housing element site capacity is proportionately allocated to TE-HHO tracts, but the city's TE-adjacent, HHO tracts contribute to only 3% of the housing element site capacity. Most notably, in Santa Clara, despite over half of the urban land area being TE-HHO, sites identified by the city from these priority areas are expected to contribute only 3% of the total capacity for future housing.

Exhibit V-2: Housing Element Site (HES) Capacity by Tract Type

	Tract	Share of urban area (%)	Share of HES capacity (%)	HES capacity-to-RHNA ratio
Los Angeles - SCAG	TE-adjacent, HHO	13	3	3.01
	TE-HHO	14	15	3.01
	All others	73	82	3.01
San Diego - SANDAG	TE-adjacent, HHO	27	2	1.55
	TE-HHO	8	3	1.55
	All others	65	96	1.55
Santa Clara - ABAG	TE-HHO	54	3	1.36
	All others	46	97	1.36
Long Beach - SCAG	TE-HHO	12	1	1.07
	All others	88	99	1.07
Irvine - SCAG	TE-HHO	36	12	0.99
	All others	64	88	0.99
Mountain View - ABAG	TE-HHO	72	53	0.9
	All others	28	47	0.9

B. Projected household growth in regional sustainable community strategies

In this section, we compare the housing capacity estimates with projected household growth developed in regional sustainable community strategies (SCS). We first provide an overview of SCS and the associated regional growth forecasts. Then, we describe the data obtained from regional planning agencies and our analytic approach.

1. Overview of SCS growth forecasts

Under state law, California metropolitan planning organizations (MPOs) and COGs must develop a sustainable community strategy to meet state-mandated greenhouse gas reduction targets.[24] MPOs/COGs develop regional growth forecasts to support various mandated short- and long-range planning activities. The growth forecast reflects expected future conditions including population, housing and/or households, and employment, given a set of assumptions. The regional growth forecast also serves as a starting point for developing subregional growth forecasts. Examples of subregional geographies include cities, counties, and travel analysis zones. The primary purpose of subregional forecasts is to translate regional growth expectations into spatially disaggregated population, employment, and housing patterns that inform the regional transportation models.

Subregional growth forecasts are typically developed based on existing land use, expected development patterns, and the extrapolation of past growth trends in and near the subregion. The anticipated development patterns should align with SCS land use assumptions that aim to achieve greenhouse gas reduction targets. Therefore, household projections from regional growth forecasts serve a different purpose from the RHNA process discussed above. Specifically, a regional growth forecast reflects a long-term vision for future population, household, and employment growth. The projections horizon is longer than economic and business cycles, longer than the eight-year RHNA cycle for housing planning, and longer than the time horizon envisioned by many local land use plans.

It should be noted that regional growth forecasts are relevant to the RHNA process in various ways. For example, the population projection for the region often serves as a basis for determining the existing and projected housing need for the region for the purpose of RHNA. State law also requires that an SCS should "identify areas within the region sufficient to house an eight-year projection of the regional housing need for the region,"[25] implying that there should be alignment between the SCS and RHNA allocations. However, in practice, such alignment does not necessarily occur.

2. Data and method

We collected SCS projections from six MPOs: the Association of Bay Area Governments (ABAG), the Fresno Council of Governments (FCOG), the Sacramento Council of Governments (SACOG), the San Diego Association of Governments (SANDAG), the Santa Barbara County Association of Governments (SBCAG), and the Southern California Association of Governments (SCAG).[26]

Most of the datasets are only available at the travel analysis zone (TAZ) level, with the exception of FCOG (available at the tract level) and SANDAG (available at the parcel level). TAZs are geographic units extensively utilized in transportation planning to analyze and model travel patterns within a region. TAZs typically resemble census block groups. We spatially join the data on SCS projections to block-level population from the 2010 Census and aggregate TAZ-level projections to the tract level, weighted by block population. Next, we examine how projected household growth differs from existing development patterns with respect to the location of

[24] Cal. Gov't Code, §65080(b)(vii), also commonly referred to as SB 375.
[25] Cal. Gov't Code, §65080(b)(2)(B).
[26] The projection horizons for the six regional plans are as follows: 2015-2050 for ABAG, 2019-2046 for FCOG, 2016-2040 for SACOG, 2016-2050 for SANDAG, 2015-2050 for SBCAG, and 2019-2050 for SCAG.

priority areas. For TE-HHO and TE-adjacent, HHO tracts, we also compare the remaining housing capacity with the number of projected households.

3. Results

Our results are presented in Exhibit V-3. The first four columns provide a comparison of both the numbers and proportions of existing housing units and projected household growth across five area types: TE-HHO, TE-adjacent HHO, non-HHO TE, non-TE HHO, and non-TE non-HHO tracts. Housing units in TE-HHO and TE-adjacent, HHO areas generally account for a small percentage of the total units in the region. Among the six regions examined, only the ABAG region has a moderate share of housing units in TE-HHO tracts (36%) and TE-adjacent, HHO tracts (13%). In the remaining five regions, the shares of housing units in TE-HHO areas vary from 2% to 12%, while the shares of housing units in TE-adjacent, HHO areas range from 7% to 12%.

Under the regional growth forecasts examined, there is no expected increase in the concentration of household growth in TE-HHO or TE-adjacent, HHO areas. With the exception of the ABAG region, the majority of the projected household growth occurs in TE areas that are not identified as healthy, high-opportunity or in non-TE, non-HHO areas. In the ABAG region, the proportion of projected household growth remains at 36% in TE-HHO tracts but slightly declines to 7% in TE-adjacent, HHO areas compared to existing development patterns.

Lastly, for TE-HHO and TE-adjacent, HHO tracts, we compare the remaining housing capacity with the number of projected households. The capacity for additional housing generally far exceeds the projected household growth in these priority areas. The only exception is the TE-adjacent, HHO areas in the SBCAG region, where we find the nominal capacity for residential development, based on current planning and zoning standards, to be below the number of existing housing units. This is largely attributed to the prevalence of single-family zoning in Santa Barbara County – resulting in a small nominal capacity – and the relatively higher-density development patterns. This provides another example that the nominal capacity derived based on density standards may not accurately reflect practical development potential.

Exhibit V-3: Projected Household Growth by Tract Type

Region / Tract Type	Current Units	Current Units Share (%)	Projected Additional Units	Projected Additional Units Share (%)	Additional units (derived capacity - existing units)
ABAG					
TE-HHO	1,263,387	36	583,659	36	981,175
TE-adjacent HHO	439,925	13	120,491	7	281,940
All Other TE	933,950	27	591,044	36	
All Other HHO	403,742	12	134,259	8	
Non-TE, non-HHO	465,553	13	200,994	12	
SCAG					
TE-HHO	390,431	12	41,569	6	399,561
TE-adjacent HHO	241,617	7	39,851	6	432,137
All Other TE	1,946,139	59	401,185	60	
All Other HHO	117,591	4	19,158	3	
Non-TE, non-HHO	598,501	18	171,458	25	
SACOG					
TE-HHO	36,711	5	3,450	4	18,812
TE-adjacent HHO	82,047	12	10,055	12	79,949
All Other TE	205,296	30	24,149	28	
All Other HHO	67,519	10	10,407	12	
Non-TE, non-HHO	295,066	43	36,992	43	
SANDAG					
TE-HHO	6,926	6	1,190	8	14,156
TE-adjacent HHO	11,382	9	51	0	36,860
All Other TE	77,121	62	12,486	79	
All Other HHO	3,327	3	35	0	
Non-TE, non-HHO	25,615	21	2,005	13	
SBCAG					
TE-HHO	886	2	47	1	249
TE-adjacent HHO	3,785	9	303	5	-1,435
All Other TE	17,311	43	3,557	59	
All Other HHO	2,414	6	138	2	
Non-TE, non-HHO	15,554	39	1,939	32	
FCOG					
TE-adjacent HHO	34,951	10	325	1	16,379
All Other TE	123,745	37	21,807	34	
All Other HHO	9,615	3	8,426	13	

VI. Residential Mobility Patterns to and from TE-HHO Areas

Examining residential mobility patterns concerning the location of TE-HHO tracts can provide insights concerning the types of state policies and investments that might most effectively increase housing potential in these areas, which is the topic of Chapter VII. In this chapter, we address these questions by analyzing migration flow to and from TE-HHO tracts.

The rest of this chapter proceeds as follows. We first describe the data and methods for the analyses of migration patterns. Next, we present the results of our migration analysis examining the origins and destinations of households that stayed, relocated to, and left TE-HHO areas as well as the demographic and socioeconomic characteristics of these households. We find that a significant portion of households relocating to TE-HHO tracts originated from another TE-HHO tract, and similarly, a notable proportion of households leaving their origin TE-HHO tracts moved to another TE-HHO tract. Households that remained residing in TE-HHO areas are notably older, more affluent, and having a significantly higher homeownership rate compared to those relocating to or leaving TE-HHO areas.

A. Data and methods

We analyze consumer reference data purchased from DataAxle (previously InfoUSA). The raw micro-data files contain rich information for a large segment of the population in the U.S., although there are missing values and other issues that require data validation.[27] Notable features of the raw data include: (1) a unique identifier for each individual that allows one to trace the trajectory of an individual over time and conduct micro-level longitudinal analyses; (2) detailed location information that enables one to identify where the individual resided (in each data year) with a high level of precision; and (3) additional data columns offering an opportunity to extract demographic and economic characteristics of individuals and households.

Prior to the migration analysis, we conducted several validation exercises of the consumer reference data. As detailed Appendix 6, we assessed the accuracy of tract identifiers and addresses, and we compared the consumer reference data sample with the American Community Survey along various demographic and socioeconomic characteristics, such as race/ethnicity and median household income. Specifically, DataAxle imputes national origin primarily based on a name and surname analysis and provides an appendix with predicted race for each national origin. We used

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[27] The data are compiled using residential location data from the United States Postal Service's National Change of Address database, Locatable Address Coding database, and Delivery Point Verification database. DataAxle utilizes other public documents, such as deed transfer and tax assessor records, to compile demographic and socioeconomic data. Using a proprietary methodology, DataAxle derives individual and family attributes from these data sources. Kennel and Li (2009) estimate the aggregate national undercoverage rate for InfoUSA(now DataAxle) data to be 8.4 percent, while the undercoverage rate for California households is 14.3 percent, which is comparable to other consumer reference data sources which vary between 10 and 20 percent undercoverage (Asquith et al. (2021), Mast (2021)). Examples of papers that use the InfoUSA/DataAxle household dataset are Greenlee (2019), Pan et al. (2020), Baker et al. (2021), and Wang et al. (2021).

the ethnicity information provided by DataAxle to derive the race/ethnicity of householder for each household. Appendix 5 describes our process for validating the ethnicity information.

The purpose of the migration analysis is to understand more about migrants to and from TE-HHO tracts, including their origin and destination locations, as well as their demographic and socioeconomic characteristics. For the analysis, we look at migration patterns from 2015 to 2019.[28] Comparison of the DataAxle sample to American Community Survey data indicates that the DataAxle sample has become more representative over time, in particular after 2013. Selecting 2015 as the starting point ensures that the findings are not affected by less representative samples in earlier years. Using 2019 as the endpoint aligns with the data used to develop the TE-HHO tracts (e.g., the 2015-19 ACS) and avoids the influence of the COVID-19 pandemic.

To create our sample, we restrict the sample to individuals who lived in California in 2015 and 2019, and we drop individuals who only appear in one year in the dataset. These adjustments reduce potential sampling bias due to changes in sample collection. We opt not to include inter-state migration in our analysis because the reliability of the data is lower for inter-state migrants. For this analysis, we focus on the head of households because our analytical focus is household migration rather than individual migration. We choose the head of household to track migration since they are less likely to abruptly leave a household and since the decision of moving is likely to be heavily influenced by them. Additionally, if an individual leaves a house and becomes the head of household, we are still able to detect their previous household location through individual identifiers.

We begin with a tract-level analysis of migration patterns to examine the origins of those moving to TE-HHO tracts and the destinations of those leaving TE-HHO tracts. For this analysis, we are only interested in households that change tracts. In other words, migration is defined as households that change tracts between 2015 and 2019. Next, we examine the demographic and socioeconomic characteristics of households, such as race and ethnicity, age of head of household, and income.

B. Migration patterns by origin and destination tract type

We first categorize movers to TE-HHO tracts based on their origin tract type. This analysis focuses on households who relocated to TE-HHO tracts from another TE-HHO tract or other tract types (e.g., TE, non-HHO tracts) during the 2015-2019 period. As shown in Exhibit VI-1, statewide the majority of the households live in TE, non-HHO tracts (42%) and non-TE, non-HHO tracts (30%). Residents of TE-HHO tracts only accounted for 14% of all households.

A significant portion (44%) of households relocating to TE-HHO tracts originated from another TE-HHO tract. Additionally, a noteworthy share of in-migrant households (35%) originated from TE, non-HHO tracts. In contrast, those from non-TE, non-HHO tracts accounted for only 7% of all mover households to TE-HHO tracts. While the analysis does not provide insights into the motives behind these relocations, it indicates that living in TE-HHO locations may not be universally accessible across all demographic groups.

[28] We conduct the same analyses using the 2010-2019 period, which yield similar findings.

The migration patterns display both similarities and variations across regions (Exhibit VI-2). In the ABAG region, TE-HHO tracts accommodate the largest share of households (39%) relative to other tract types, whereas in the SCAG, SANDAG, and SACOG regions, households living in TE-HHO tracts account for only a small share of all households. In all four regions examined (ABAG, SCAG, SANDAG, and SACOG), the share of movers to TE-HHO tracts from another TE-HHO tract is notably higher than the share of households residing in TE-HHO tracts. In contrast, the share of movers to TE-HHO tracts originating from non-TE, non-HHO tract is disproportionately low. With the exception of the SACOG region, mover households to TE-HHO tracts originating from TE, non-HHO tracts – while accounting for a considerable share of in-migrant households – are disproportionately low given the distribution of households in the region.

Exhibit VI-1: Movers to TE-HHO Tracts by Origin Tract Type

Tract type	Percent of movers *to* TE-HHO tracts, by origin tract type (N = 246,169)	Percent of households statewide, by residence tract type (N = 13,044,266)
TE-HHO	44	14
TE, non-HHO	35	42
HHO, non-TE	14	14
non-TE, non-HHO	7	30

Exhibit VI-2: Percent of Movers to TE-HHO Tracts by Origin Tract Type by Region

	ABAG		SCAG		SANDAG		SACOG	
	% in-movers	% HHs	% in-movers	% HHs	% in-movers	% HHs	% in-movers	% HHs
TE-HHO	58	39	32	12	15	6	15	3
TE, non-HHO	23	29	50	57	42	47	39	30
HHO, non-TE,	14	20	12	11	28	22	19	22
non-TE, non-HHO	5	12	7	20	15	24	27	45

We next examine the destinations of households that have moved away from the TE-HHO tracts where they initially resided. We categorize movers from TE-HHO tracts based on their destination tract type. Movers from TE-HHO tracts include households that left TE-HHO tracts for another TE-HHO tract or other tract types.

As shown in Exhibit VI-3, similar to the patterns observed among households moving into TE-HHO tracts, a significant proportion of households leaving their origin TE-HHO tracts moved to another TE-HHO tract (38%) or to HHO, non-TE tracts (21%) in comparison to the statewide household distribution. We also observed that statewide 12% of the movers from TE-HHO tracts have relocated to non-TE, non-HHO tracts, raising concerns about potential displacement in TE-HHO areas as housing costs increase. Notably, this proportion is 19% in the SANDAG region and 29% in the SACOG region (Exhibit VI-4).

Exhibit VI-3: Movers from TE-HHO Tracts by Destination Tract Type

Tract type	Percent of movers *from* TE-HHO tracts, by origin tract type (N = 285,659)	Percent of households statewide, by residence tract type (N = 13,044,266)
TE-HHO	38	14
TE, non-HHO	30	42
HHO, non-TE	21	14
non-TE, non-HHO	12	30

Exhibit VI-4: Percent of Movers From TE-HHO Tracts by Destination Tract Type by Region

	ABAG		SCAG		SANDAG		SACOG	
	% out-movers	% HHs	% out-movers	% HHs	% out-movers	% HHs	% out-movers	% HHs
TE-HHO	47	39	29	12	13	6	14	3
TE, non-HHO	19	29	43	57	37	47	42	30
HHO, non-TE	22	20	17	11	31	22	14	22
non-TE, non-HHO	11	12	10	20	19	24	29	45

C. Characteristics of migrants

To better understand the potential factors influencing residential mobility, we examine the demographic and socioeconomic characteristics of three groups of households: (1) in-migrants to TE-HHO tracts originating from other tract types (hereinafter "in-migrants"); (2) out-migrants from TE-HHO tracts to other tract types (hereinafter "out-migrants"); and (3) residents of TE-HHO tracts, including those who either remain or relocate within TE-HHO tracts (hereinafter "TE-HHO stayers"). Exhibit VI-5 shows the demographic and socioeconomic characteristics of the TE-HHO mover and stayer households in the 2019 data sample (unless otherwise specified) and compares them to households statewide.

Households that remained in TE-HHO areas throughout the study period are notably older. As shown in Exhibit VI-5, the median age for the heads of households remaining in TE-HHO areas is 58, markedly higher than the median age of 50 for those moving to TE-HHO areas and 51 for those leaving TE-HHO areas – the same as the statewide median. Additionally, across the three household groups examined, TE-HHO stayers have the highest percentages of married households and households with children. In contrast, households who moved to TE-HHO areas from other tract types are younger and less likely to be married or have children. TE-HHO stayer and mover households, on average, have a smaller household size compared to households statewide.

Households with non-Hispanic white householders are notably predominant among TE-HHO stayer (64.9%), in-migrant (66.4%), and out-migrant households (68.2%) when compared to the statewide distribution, where 46.7% of households have non-Hispanic white householders.

Additionally, there is an overrepresentation of households with Asian or Pacific Islander (API) householders among TE-HHO stayer and mover households. In contrast, households with Black / African American householders are underrepresented, with only 1% among TE-HHO stayers and 1.3% among in-migrant households. Statewide, 6.2% of the households are headed by Black / African American householders.

TE-HHO stayers have the highest homeownership rate of all groups compared in Exhibit VI-5 (84% in 2019). In contrast, less than two-thirds of in-migrant and out-migrant households are homeowners, although this rate is still higher than the statewide figure of 54.9%. Interestingly, among the in-migrant households, the homeownership rate dropped from 64% in 2015 to 58% in 2019. This shift means that approximately 4,400 in-migrant households that were homeowners in 2015 became renters by 2019, raising the concern that people might have to forgo homeownership in order to live in TE-HHO areas.

Households relocating away from TE-HHO areas to other tract appear to be the least affluent among the three household groups. In 2019, the median household income is $82,000 for out-migrant households, slightly lower than those moving to TE-HHO areas from other tract types ($87,000) and significantly lower than those remaining in TE-HHO areas ($105,000). Similarly, the median home value is the highest for TE-HHO stayers ($684,000) and the lowest for out-migrant households ($542,000), below the statewide median of $569,000.

Exhibit VI-6 through Exhibit VI-9 show the characteristics of TE-HHO stayers and movers within the ABAG, SCAG, SANDAG, and SACOG regions. Households that remained in TE-HHO areas are notably older and have higher rates of homeownership compared to movers. In contrast, those relocating to TE-HHO areas from other tract types tend to be younger. The overrepresentation of non-Hispanic white householders and the underrepresentation of Black/African American householders persists among TE-HHO stayers and movers across the four regions. With the exception of the SCAG region, in-migrants to TE-HHO areas experienced a decline in homeownership rates, with the most significant decrease observed in the ABAG region (from 64.3% to 50.7%). Meanwhile, in both the ABAG and SACOG regions, households leaving TE-HHO areas saw notable increases in homeownership rates.

Exhibit VI-5: Demographic and Socioeconomic Characteristics by Migration Group

Variable	In-Migrant	Out-Migrant	TE-HHO Stayer	Households Statewide
Number of Households	139,219	178,612	1,564,617	13,157,873
Median Age of Householder	50	51	58	51
Married Households (%)	43.1	46.8	52.7	49.3
Share of Households with Children (%)	27.1	27.1	31.4	28.9
Average Household Size	2.1	2.1	2.4	2.9
Hispanic Householder (%)	14.2	12.6	12.0	29.7
API Householder (%)	18.1	17.3	22.0	14.7
Black / African American Householder (%)	1.3	1.8	1.0	6.2
White Householder (%)	66.4	68.2	64.9	46.7
Other Race Householder (%)	0.1	0.1	0.1	2.6
Owner Households (2015) (%)	63.7	64.9	83.6	53.6
Owner Households (%)	58.4	64.9	81.0	54.9
Median Household income, in thousands of 2019$	89	82	105	80
Median Home Value, in thousands of 2019$	600	542	684	569

Exhibit VI-6: Demographic and Socioeconomic Characteristics by Migration Group, ABAG Region

Variable	In-Migrant	Out-Migrant	TE-HHO Stayer
Number of Households	54,159	83,273	885,929
Median Age of Householder	49	50	57
Married Households (%)	39.1	48.0	49.3
Share of Households with Children (%)	24.6	26.5	29.7
Average Household Size	2.0	2.1	2.3
Hispanic Householder (%)	13.0	12.8	11.8
API Householder (%)	22.2	20.4	25.5
Black / African American Householder (%)	1.6	2.3	1.2
White Householder (%)	63.2	64.5	61.5
Other Race Householder (%)	0.1	0.1	0.1
Owner Households (2015) (%)	64.3	62.6	80.9
Owner Households (%)	50.7	70.1	78.5
Median Household income, in thousands of 2019$	82	83	102
Median Home Value, in thousands of 2019$	639	598	746

Exhibit VI-7: Demographic and Socioeconomic Characteristics by Migration Group, SCAG Region

Variable	In-Migrant	Out-Migrant	TE-HHO Stayer
Number of Households	70,416	80,126	598,271
Median Age of Householder	50	52	59
Married Households (%)	46.6	45.7	57.8
Share of Households with Children (%)	28.8	27.4	34.0
Average Household Size	2.2	2.2	2.5
Hispanic Householder (%)	15.8	12.9	12.7
API Householder (%)	16.9	15.7	18.5
Black / African American Householder (%)	1.0	1.4	0.8
White Householder (%)	66.2	69.9	67.8
Other Race Householder (%)	0.1	0.1	0.1
Owner Households (2015) (%)	62.7	67.5	86.9
Owner Households (%)	64.0	59.4	84.1
Median Household income, in thousands of 2019$	93	82	110
Median Home Value, in thousands of 2019$	597	512	612

Exhibit VI-8: Demographic and Socioeconomic Characteristics by Migration Group, SANDAG Region

Variable	In-Migrant	Out-Migrant	TE-HHO Stayer
Number of Households	8,847	9,886	49,345
Median Age of Householder	49	50	59
Married Households (%)	42.1	45.9	53.9
Share of Households with Children (%)	27.4	28.0	30.5
Average Household Size	2.1	2.1	2.3
Hispanic Householder (%)	11.0	10.4	9.0
API Householder (%)	10.5	10.6	9.6
Black / African American Householder (%)	1.3	0.9	0.8
White Householder (%)	77.1	77.9	80.5
Other Race Householder (%)	0.1	0.1	0.1
Owner Households (2015) (%)	62.2	61.9	87.2
Owner Households (%)	55.6	61.9	85.2
Median Household income, in thousands of 2019$	94	80	108
Median Home Value, in thousands of 2019$	578	505	654

Exhibit VI-9: Demographic and Socioeconomic Characteristics by Migration Group, SACOG Region

Variable	In-Migrant	Out-Migrant	TE-HHO Stayer
Number of Households	4,069	4,034	23,708
Median Age of Householder	51	51	60
Married Households (%)	37.6	43.9	48.6
Share of Households with Children (%)	29.0	30.3	29.8
Average Household Size	2.1	2.1	2.3
Hispanic Householder (%)	10.0	9.1	7.7
API Householder (%)	6.1	6.0	8.4
Black / African American Householder (%)	0.9	1.2	0.8
White Householder (%)	82.7	83.5	83.0
Other Race Householder (%)	0.2	0.1	0.1
Owner Households (2015) (%)	72.6	67.3	90.3
Owner Households (%)	64.1	74.4	81.3
Median Household income, in thousands of 2019$	72	68	92
Median Home Value, in thousands of 2019$	436	388	464

D. Summary

Our findings reveal challenges in creating inclusive communities in TE-HHO areas. TE-HHO areas are attractive residential locations, characterized by their high income and/or high income mobility, absence of high pollution burdens, and transportation efficiency. However, our migration analysis does not provide evidence of increased diversity within TE-HHO areas over time. Residents of TE-HHO areas tend to remain within this neighborhood type when they relocate. The high degree of internal mobility within TE-HHO areas could contribute to a lack of diversity in household composition. Indeed, we find that households staying within TE-HHO areas are generally older, wealthier, and that they have a significantly higher homeownership rate compared to those relocating to or away from TE-HHO areas.

Economically disadvantaged households and households of color face challenges in accessing TE-HHO areas. Households originating from non-TE, non-HHO tracts account for a minimal share of those relocating to TE-HHO areas, and the majority of the households remaining in TE-HHO areas are headed by non-Hispanic white householders. Furthermore, our analysis reveals a notable decline in homeownership rate among households that have moved to TE-HHO areas from other tract types. To the extent that these households are compelled to give up homeownership in order to live in a better neighborhood, such trade-off suggests the need for a variety of housing types that can accommodate different income levels.

VII. Facilitating Development in TE-HHO and TE-adjacent, HHO areas

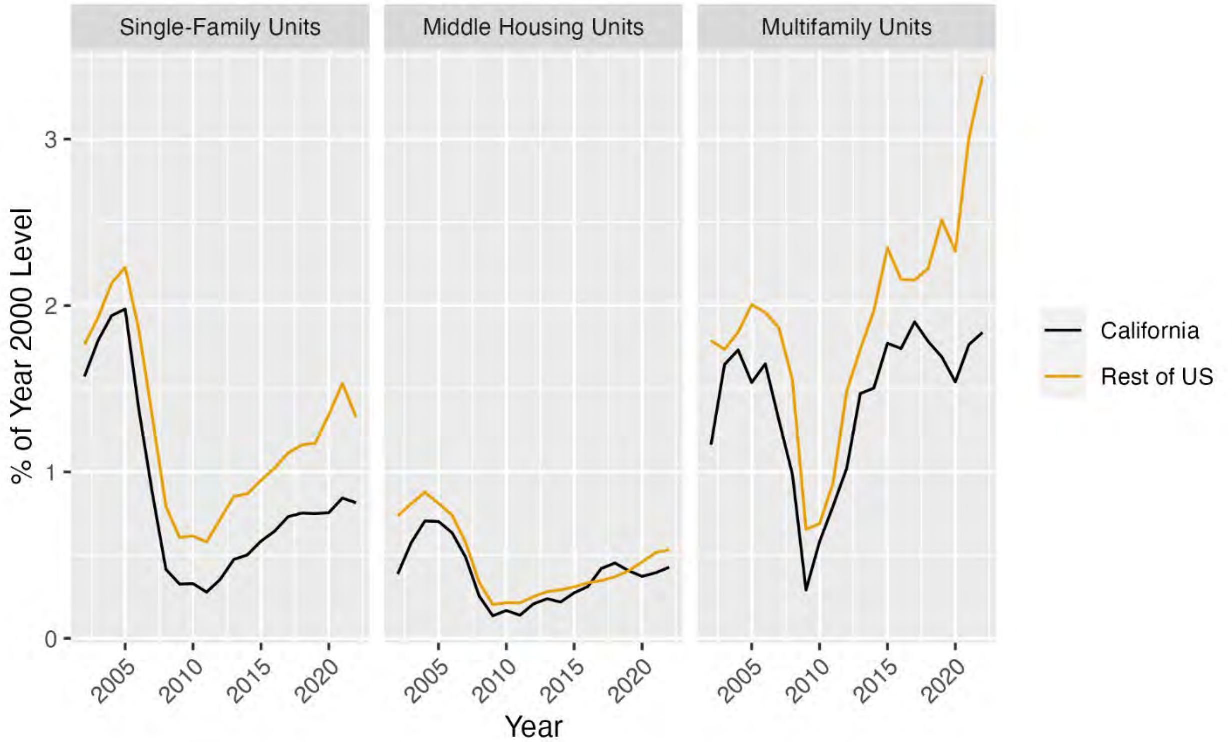
This chapter identifies policy levers to promote development in TE-HHO and TE-adjacent, HHO areas in ways that would promote racial equity and mitigate GHG emissions. As a baseline for considering future policy interventions, it is useful to understand the historical and comparative context for housing permitting in California. Exhibit VII-1 compares annual permitting in California over time (from 2002-2022) with the rest of the United States as a percentage of housing units in the year 2000, disaggregated by single-family units, middle housing units (i.e., units in duplexes, triplexes, and quadplexes), and multifamily units (i.e., units in structures with at least five units). This figure clearly illustrates several important features of the permitting landscape:

- All housing permitting plummeted during the Great Recession (December 2007-June 2009);
- From the trough of the Great Recession to 2021, single-family permitting (as a percentage of single-family housing stock in the year 2000) increased in California and the rest of the US at roughly similar rates, and remains well below its pre-Great Recession peak.
- Middle housing permitting rates were low even before the Great Recession and have not recovered to their pre-Great Recession levels;
- Multi-family permitting (as a percentage of multifamily housing stock in the year 2000) increased in California and the rest of the US at roughly similar rates from the trough of the Great Recession to 2015, but has accelerated in the rest of the US past its pre-Great Recession peak since 2015 while stagnating in California.

These permitting trends have troubling implications for housing affordability and access to TE-HHO areas.

As discussed below, there is abundant empirical evidence that more housing supply is necessary to moderate price increases in many of California's metropolitan areas. Nobody knows exactly how many new units are needed, but – using a variety of methods – different researchers have estimated the number to be between 1.1 million and 3.4 million. Elmendorf, Marantz, and Monkkonen (2022, 13) review the relevant studies and conclude that, while it not possible to determine which estimate is correct, "the most important takeaway is that every method supports the conclusion that California's present housing shortage is very large." As Exhibit VII-1 reveals, at its current rate of housing production, California would not reach even the low end of the estimates for a decade and would not attain the high end for at least three decades. Moreover, as Elmendorf, Marantz, and Monkkonen (2022, 13) note, "it doesn't really make sense to speak of the shortage of homes in California as a whole, as if it were a single quantity. There are, rather, shortages of homes in specific places in California." In general, the places where new housing is most needed are the places where single-family development is least feasible, because the large tracts of undeveloped land needed for such development are often unavailable. In such places, multi-unit infill development is the only feasible option, but – as Exhibit VII-1 indicates – multifamily development in California has been stagnating since 2018, particularly in comparison with the rest of the US, and middle housing development is stagnating nationwide.

Exhibit VII-1: Housing Units Permitted in California and The Rest Of The US, 2002-2022



Note: "Single-Family Units" includes detached units and attached units (i.e., townhomes); "Middle Housing Units" are units in structures with 2-4 units; "Multifamily Units" are units in structures with 5 or more units.
Data sources: U.S. Census Bureau Building Permit Survey (2002-2022); 2000 Census.

This stagnation occurred during a period when the California legislature adopted over 100 laws intended to promote infill development (Fulton et al. 2023). As described below, many of these laws do appear to have been somewhat effective and others will take time to yield results. Nevertheless, the currently available evidence suggests that the state is not on track to produce enough housing to significantly moderate price increases while addressing its GHG reduction goals.

This is perhaps not surprising. As documented in section D.4 of Chapter I, there are a variety of challenges associated with infill development in general, and development in TE-HHO and TE-adjacent, HHO areas in particular. Perhaps the most intractable of these challenges stem from resistance to changing entrenched regulatory regimes. Roughly half of the housing stock in TE-HHO areas consists of single-family detached housing, and local zoning ordinances have long immunized such neighborhoods from change, creating what Ellickson (2022) describes as a "zoning straitjacket." There are signs that this straitjacket is beginning to fray in several states, including California (Marantz and Wegmann in progress). But substantial challenges remain with respect both to allowing denser types of housing in predominantly single-family neighborhoods. The remainder of this chapter first discusses policies for opening TE-HHO and TE-adjacent, HHO areas to more housing. It then discusses policies to increase the transportation efficiency of TE-adjacent, HHO areas, so that they could become TE areas.

A. Opening up areas that are currently TE-HHO and TE-adjacent, HHO to more housing

There are four principal mechanisms for opening TE-HHO and TE-adjacent, HHO areas to more housing: reforms to zoning and housing element law, reforms to the laws authorizing impact fees, reforms to the California Environmental Quality Act, and incentives (such as funding for the production of BMR housing). In this portion of the report, we discuss existing regulatory programs, describe potential avenues for innovation by the state legislature, state agencies, and local governments, and identify challenges to reform. As noted above, California has adopted over 100 laws related to zoning reform, RHNA reform, and CEQA reform since 2017. The discussion below does not cover all of the relevant laws or programs. Rather, we focus on areas where further reform and innovation could yield the greatest benefits for opening TE-HHO and TE-adjacent, HHO areas to more housing.

1. Zoning and housing element reform

Although the state has adopted dozens of laws related to zoning and housing elements, all of these laws are variations on five basic goals:

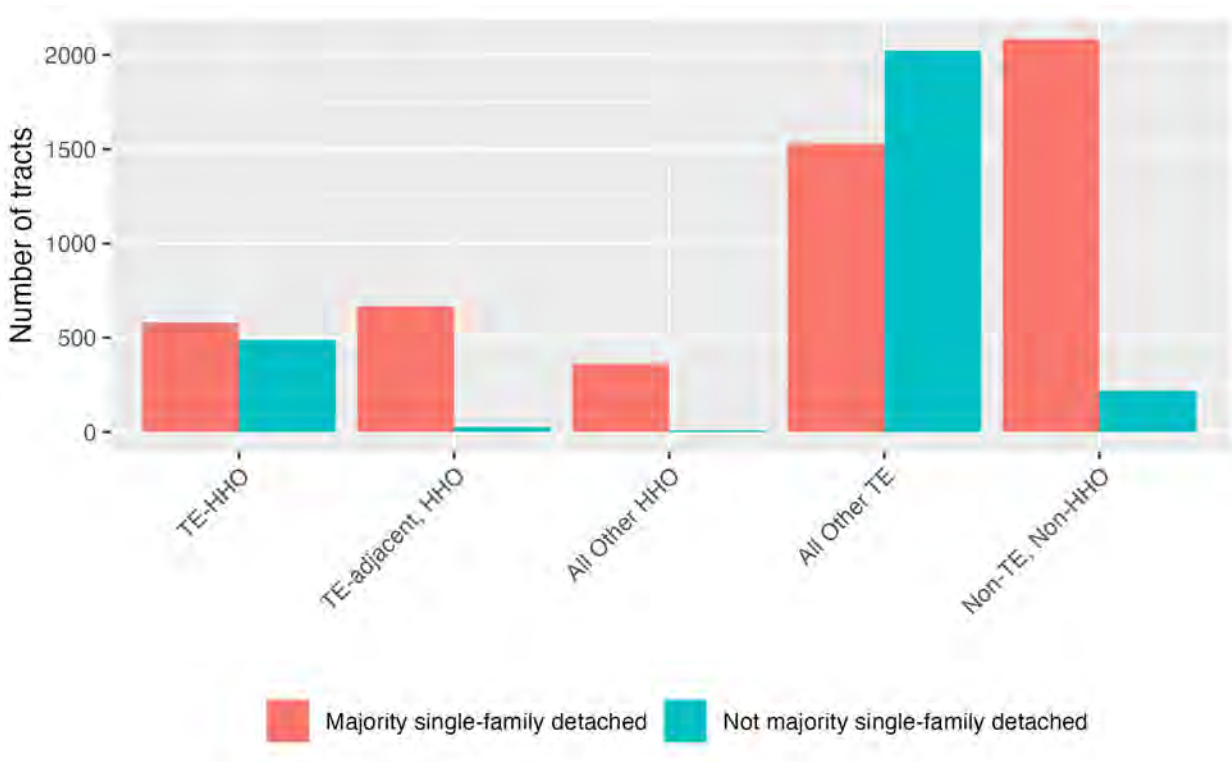
- Expediting housing project approvals for projects that comply with local zoning ordinances.
- Establishing liberalized statewide substantive default standards for certain kinds of projects, such as ADUs, that apply everywhere in the state.
- Liberalizing zoning in targeted areas for certain kinds of projects, such as allowing residential development buildings zoned for commercial uses along commercial corridors.
- Liberalizing substantive requirements, such as minimum densities for projects that include BMR units.
- Requiring local governments to plan and zone for more housing.

Several of the laws discussed below attempt to accomplish multiple goals.

Notably, the laws that have yielded the most tangible results (SB 35 and the ADU laws), entail the smallest intrusions into local zoning, which imposes substantive requirements such as maximum densities and minimum setbacks. SB 35 (along with its successor, SB 423) simply expedites and simplifies approvals for multifamily project in areas where local zoning *already allows* those projects. The numerous ADU laws adopted since 2016 facilitate housing development in neighborhoods where detached single-family housing predominates, but the kind of development facilitated (an additional unit typically located in a back yard or garage) is generally inconspicuous. This fact is particularly relevant for the purposes of this report, because detached single-family housing is the predominant housing type in about 65% of census tracts in the state. Moreover, as Exhibit VII-2 indicates, detached single-family housing predominates in most TE-HHO tracts, and in the large majority of TE-adjacent HHO tracts.

The remainder of this section describes several existing policies and addresses ways to modify these policies to promote housing development in TE-HHO areas. It first analyzes the SB 35 framework, which requires jurisdictions to apply objective standards and provide ministerial approvals for certain zoning-compliant housing projects. Because SB 35 has mainly proven effective for the development of multifamily housing outside of areas where detached single-family housing predominates, the second subsection analyzes efforts to provide ministerial approvals and default standards for ADUs and middle housing (e.g., townhomes, duplexes, triplexes, and quadplexes). The third subsection focuses on the state's Density Bonus Law, which provides added density and reduced regulatory burdens for below-market-rate and mixed-income projects. Recent revisions to this law may be particularly consequential, because the law now sets the base density for bonuses as the greatest of the applicable zoned density, specific plan density, or general plan density. As the analysis in Chapter IV reveals, general plan densities are often notably high in TE-HHO areas. The fourth section describes the application of the Housing Accountability Act, which ensures that jurisdictions approve zoning-compliant projects (whether or not they qualify under the SB 35 framework). The fifth subsection discusses potential improvements to the state's framework for ensuring that jurisdictions plan and zone for new housing. The sixth subsection describes how state agencies and the legislature can support local efforts to reform permitting to promote development in TE-HHO areas.

Exhibit VII-2: Census Tracts in California, Classified by The Predominance of Detached Single-Family Housing and TE-HHO Status



Note: A census tract is designated as "Majority single-family detached" if more than 50% of the housing units are detached single-family units.
Data source: ACS 2016 (5-Year Estimates).

a. Objective standards and ministerial approvals for zoning-compliant housing projects

SB 35, adopted in 2017 and extended in 2023 via SB 423, requires *no* change to existing zoning – it simply requires municipalities to apply only objective standards to projects that meet certain labor standards and would contribute to a shortfall of units from the prior Housing Element cycle. (The role of Housing Element cycles is described in Chapter V.) SB 35 has facilitated the development of BMR units because, in general, these are the kinds of units for which jurisdictions have shortfalls. Importantly, SB 35 also requires a ministerial approval process, which exempts covered projects from CEQA review.

According to data compiled by Manji & Finnegan (2023) and geocoded by the research team for this project, at least 131 projects including 15,028 units had been approved or entitled via SB 35 as of 2021,[29] of which more than 70% were BMR units.[30] Four-thousand and four of these 15,028 units (26.6%) were located in TE-HHO areas; 438 (2.9%) were located in TE-adjacent HHO areas; 8,712 (58.0%) were located in TE areas that are not classified as HHO; and 60 (0.4%) were located in HHO areas not classified as TE or TE-adjacent. As Exhibit VII-3 indicates, SB 35 projects tend to be mid-size to large multifamily developments.

Most approved and entitled SB 35 projects include more than 70 units, so it is perhaps not surprising that SB 35 units tend *not* to be located in single-family dominant neighborhoods (i.e., census tracts where more than 50% of the housing units consist of detached single-family homes, where local zoning typically prohibits multifamily development). As Exhibit VII-4 indicates, this is particularly true in TE-HHO areas, where 87.7% of SB 35 units are not in single-family dominant census tracts, even though – as Exhibit VII-2 indicates – the majority of TE-HHO census tracts are single-family dominant.[31]

In October 2023, California adopted SB 423, extending and revising SB 35, which was scheduled to expire in 2026. (The revised law will sunset in 2036.) Agencies including CARB and HCD could help to ensure that the framework introduced by SB 35 continues to generate housing in TE-HHO areas and TE-adjacent HHO areas by providing support for local governments and tribes. Interviews conducted by Manji and Finnigan (2023) reveal that, although some local

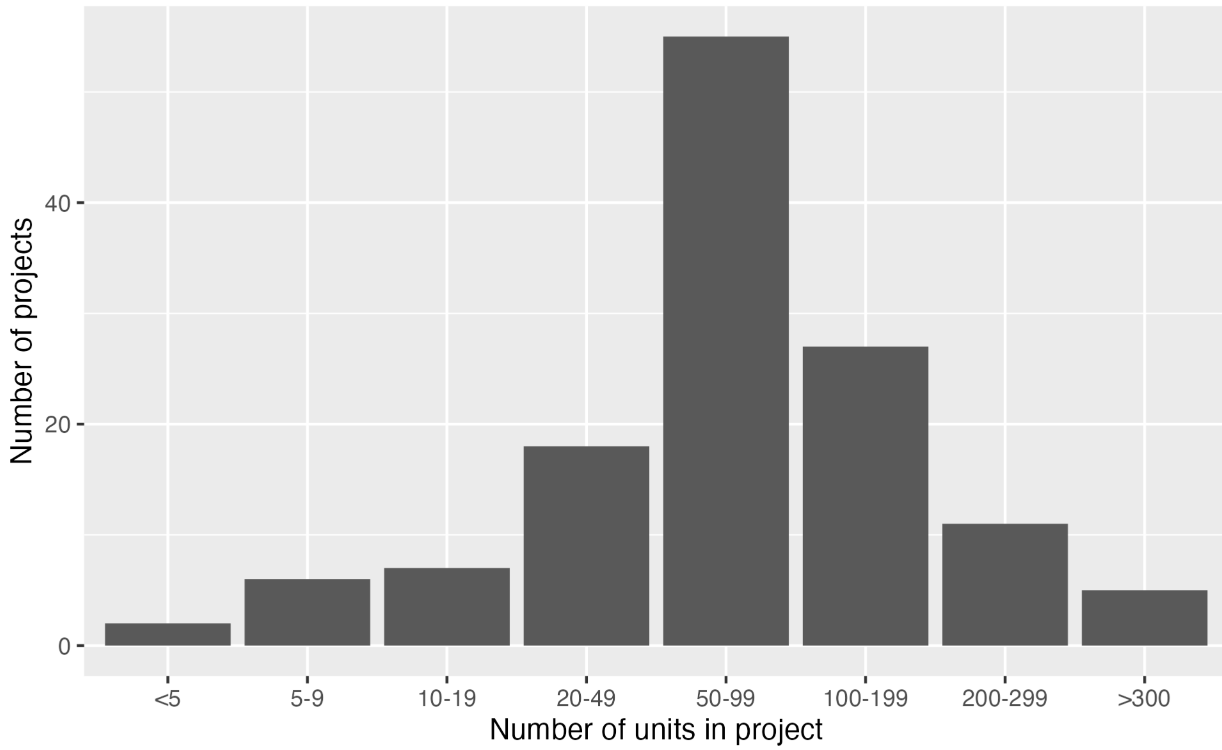
[29] The dataset compiled by the Terner Center includes two relevant columns: "SB 35 Application Status as of 2021 APR" and "Project Approved or Entitled as of 2021 APR." The count of 131 includes only projects with a value of "Approved" in the former column and "Yes" in the latter. The number of units approved may be substantially higher. For example, the final Senate Floor Analysis for SB 423, which extended and revised SB 35, indicates that between 2018 and 2021, the law "resulted in 19,239 units, 60% of which are affordable to lower-income households," and adds that the figure of 19,239 "is likely an undercount, as some cities have shared with the author and committee that more projects have been approved than HCD has data" (State of California, Senate Rules Committee, Office of Senate Floor Analyses 2023, 8).

[30] The proportion of BMR units depends on how BMR is defined. If moderate income units are included, then the total is 75.4%. If moderate income units are excluded, then the total is 71.6%.

[31] The proportion of SB 35 units that are BMR units is only slightly lower in single-family dominant TE-HHO tracts (56.8%) than in other TE-HHO tracts (64.6%).

governments have adapted well to the requirements of the SB 35 framework, many local governments still require better data to effectively implement the law.

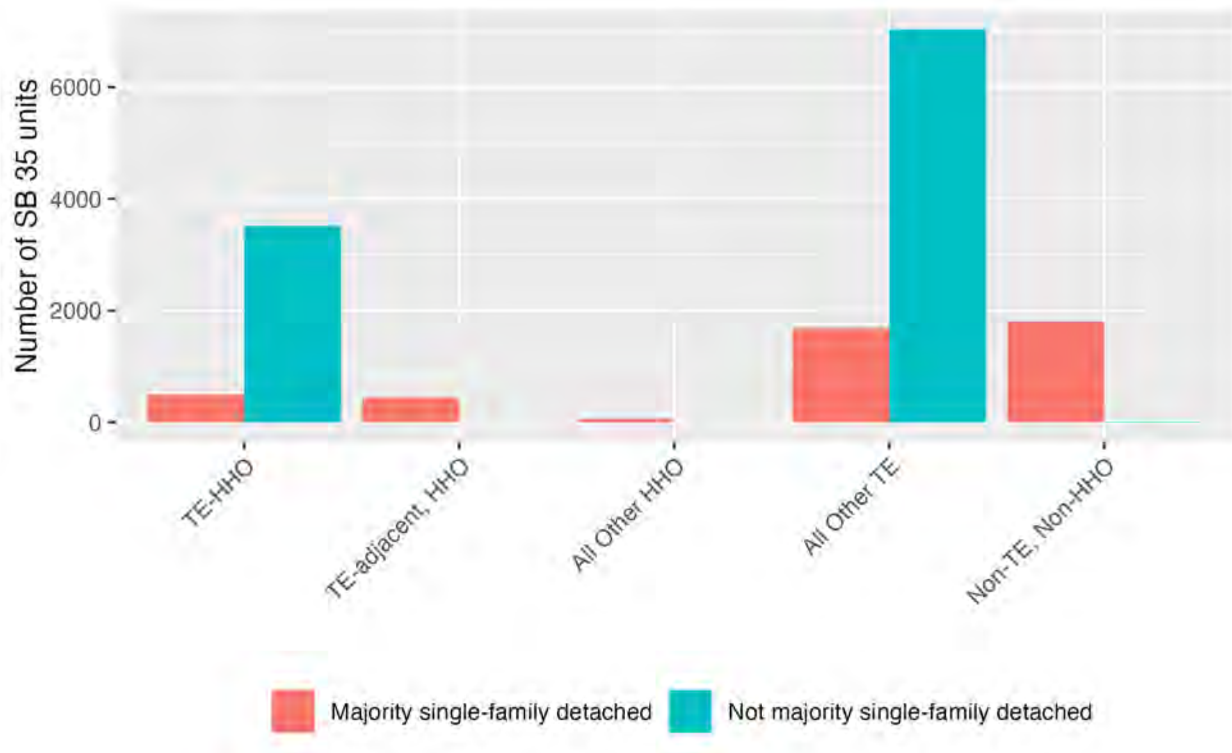
Exhibit VII-3: SB 35 Projects, by Project Size



Data source: Manji & Finnegan (2023).

One important resource would help local officials to identify areas that are excluded from the jurisdiction of the SB 35 framework due to the operation of Cal. Gov. Code 65913.4(a)(6). In principle, the SiteCheck tool provided by OPR could serve as such as resource, but in practice it does not yet. CARB, OPR, and HCD could all contribute to the improvement of SiteCheck. In addition, the annual progress report data currently collected by HCD is rife with inconsistencies and inaccuracies. Local governments would benefit from additional technical assistance in compiling these data. In addition, Manji and Finnigan (2023, 24) indicate that their interviewees "consistently described the need for additional guidance and capacity for effective tribal consultation about SB 35 projects," noting that "additional insight and research is needed—including tribes' perspectives—to identify best practices for tribal consultation within SB 35." Agencies including CARB, HCD, and OPR are in a position to provide resources for such research.

Exhibit VII-4: SB 35 Units by Census Tract Type and Prevalence of Detached Single-Family Housing



Data sources: Manji & Finnegan (2023); ACS 2016 (5-Year Estimates).

In sum, the SB 35 framework (sustained by SB 423) has been beneficial for BMR and mixed-income development projects in areas where demand for housing is strong and there is already existing multifamily housing. The substantial majority of SB 35 projects are in TE areas and a significant proportion of these projects are in TE-HHO areas. The law seems to be largely working as intended, and the modest changes described above could further strengthen the law. However, the SB 35 framework is unlikely to yield much larger increases in housing due to labor requirements and the requirements for BMR units, both of which limit the financial feasibility of projects. In addition, because SB 35 simply requires jurisdictions to apply their existing zoning to projects (rather than changing their zoning to accommodate denser projects), it is unlikely to yield much housing in areas where detached single-family housing predominates.

b. Ministerial approval and default standards for ADUs and Middle Housing

California's recent experience with ADU reform provides another example of housing reforms that have yielded material outcomes, and it points to future possibilities for densifying neighborhoods where detached single-family housing predominates. Between 1982 and 2002, the state legislature adopted several laws intended to promote ADU development that were largely ineffective (Brinig and Garnett 2013). But since 2016, the state legislature has repeatedly revised state law to facilitate ADU development, with much greater success. As Marantz et al. (2023b, 4) explain, the relevant laws have "capped the fees local governments could impose on ADUs, set dimensional standards[,]… established a stringent timeline for reviews of applications[,] strictly limited (and in many cases eliminated) the authority of local governments to impose parking requirements on ADUs[,] [and] prohibited municipalities from restricting the right to build ADUs to owner-occupiers." The legislature has also barred homeowners' associations from applying covenants, conditions, or restrictions that either "effectively prohibits or unreasonably restricts the construction or use of an accessory dwelling unit ... on a lot zoned for single-family residential use" (AB 670, 2019–2020, sec. 2), and it has prohibited HOAs from restricting the rental of ADUs (Cal. AB 3182, 2019–2020). As a result, ADUs are now essentially allowed as-of-right on single-family lots, so long as they are under 800 square feet, do not exceed 16 feet in height, and have 4-foot setbacks.

Far more units have been permitted under the ADU laws than under SB 35. From 2018 through 2021, 43,160 single-family parcels received ADU permits in the nine Bay Area counties and five large southern California counties (Los Angeles, Orange, Riverside, San Bernardino, and Ventura), (Marantz, Elmendorf, and Kim 2023c). By contrast, SB 35 yielded 13,537 approved and entitled units in these counties during the same time period, according to the Terner Center data.

As Marantz et al. (2023a; 2023c) document, many recently permitted ADUs are located in relatively jobs accessible areas, and thus it is not surprising that TE and TE-adjacent areas are very well represented. Using the data compiled by Marantz et al. (2023a; 2023c), the research team determined that, within the Bay Area and the five southern California counties mentioned in the preceding paragraph, 22.0% of permitted ADUs were in TE-HHO areas, 8.6% were in TE-adjacent HHO areas, and 63.4% were in TE areas that are not designated as HHO.

As with SB 35, precisely identifying the effect of the state's ADU reforms would require accurate estimates of the number of ADUs that would have been built in the absence of such reforms. Although we are not aware of any empirical studies providing such estimates, Garcia (2017) finds that ADU applications increased more than tenfold in a sample of seven large California cities between 2015 (before the first batch of major ADUs laws went into effect) and 2017 (after the laws went into effect). These results strongly suggest that a large proportion of newly permitted ADUs are attributable to state laws.

The available evidence indicates that, when ADUs are rented, they rent at levels affordable to lower-income households. Based on two surveys of ADU rentals in Los Angeles County, SCAG researchers concluded that over 50% of rented ADUs would be affordable to low-income or very-low income one- or two-person households (Southern California Association of Governments 2020). Based on additional surveys they concluded that 52% of rental ADUs in Ventura County would be affordable to one- or two-person low-income households, that 63% of rental units in Orange County would be affordable to one- or two-person low- or very-low income households, and that 50% of rental units in Riverside and San Bernardino Counties would be affordable to one- or two-person low- or very-low income households. Based on a statewide survey, Chapple et al. (2021, 4) conclude that about half of new ADUs are used as income-generating rental units, and that "a large portion of units are available to those making less than 80% of the area median income (AMI), though the overall affordability varies significantly by county." It is also worth noting that – even if ADUs are not rented – they could serve as an important source of housing supply. That is because California has the second-highest rate of multi-generational households in the US (after Hawaii), and ADUs can facilitate multi-generational living.

Because detached single-family housing predominates in TE-HHO areas and TE-adjacent HHO areas, and because ADUs are generally only viable options for one- and two-person households, additional types of infill will be necessary to densify TE-HHO areas in ways that accommodate larger households. Middle housing, consisting of townhomes, duplexes, triplexes, quadplexes, and other small-scale multifamily dwellings, could serve this role. Such housing is often described as “missing middle,” because its contribution to overall housing supply has waned substantially in recent decades (Kuhlmann and Rodnyansky 2023).

Although the California legislature has taken tentative steps towards expanding the supply of middle housing, these measures have not yet yielded significant results. Just as the state legislature had to iterate through many ADU reforms before landing on a formula that yielded a substantial increase in production, the state will likely have to make further adjustments to effectively spur middle housing. Evidence from Portland and Houston suggests that such reforms could yield meaningful increases in middle housing supply.

California’s SB 9, which went into effect in 2022, authorizes owner-occupiers of detached single-family housing to split their lot and construct up to four units. The law provides for ministerial review (thereby exempting projects from CEQA), imposes objective standards related to minimum building and lot sizes, and specifies both the maximum setbacks and parking requirements that local governments can impose. In theory the law could open up fourplex development on around 700,000 parcels statewide (Metcalf et al. 2021). In practice, however, the law has had very limited effect (Alameldin and Garcia 2022; Garcia et al. 2022). There are at least four reasons for this outcome.

First, unlike California’s ADU laws, SB 9 only applies to owner-occupied parcels. It is not legal for a current owner-occupier to sell a parcel to a builder, who would then use the law to build up to four units on the parcel (Marantz and Wegmann in progress). This restriction likely limits uptake, because owner-occupiers with no experience as builders may have difficulty obtaining financing for such projects, may be unwilling to bear the inconveniences associated with a significant construction project on the lot they are currently occupying, and may not wish to live on a significantly densified lot. Commercial builders would not face a similar calculus, but they are currently barred from using SB 9.

Second, even though SB 9 circumscribes some traditional local authority over the regulation of single-family lots, it still allows local governments to impose significant restrictions on affected parcels. For example, municipalities can impose “objective design standards, affordability requirements, or use of land requirements that would result in projects which are technically eligible under the law but are rendered economically infeasible by the requirements” (Alameldin and Garcia 2022). These substantive requirements themselves can themselves render development economically infeasible, and uncertainty about the standards’ applicability can also deter development (Garcia et al. 2022). By contrast, the state’s ADU laws now establish highly prescriptive criteria that strictly limit the scope of local discretion vis-à-vis substantive standards.

Third, SB 9 does not restrict the fees that jurisdictions can levy on developments covered by the law. Limiting local fees on ADUs was a pivotal component of California’s ADU reform. Imposing similar limits on fees for middle housing could help to spur development.

Fourth, there is currently a loophole for locally designated "landmark districts," a concept with no definition in state law.[32] Although it is unclear how many jurisdictions have availed themselves of this exemption, it could be used to limit middle housing development and, in any case, is likely to cause confusion.

Evidence from Houston, Texas and Portland, Oregon suggests that additional revisions to SB 9 could have salutary effects for improving access to TE-HHO areas.[33] The cities differ in many ways, but they are both pioneers of middle housing reform. Houston's major reform, applied to part of the city in 1998 and expanded citywide in 2013, reduced minimum lot sizes for townhouses to between 1,400 and 5,000 square feet (Gray and Millsap 2023). Wegmann et al. (2023) find that these reforms generated at least 25,000 units, and potentially as many as 39,000 new units – the largest surge of infill townhome development in the US so far this century. Based on a sample of townhomes built on single-family lots in Houston between 2007 and 2020, Wegmann et al. find that the median townhome built on a single-family parcel in Houston during this period had an assessed value of $340,000, as compared with a median value of $545,000 for single-family houses built during the same period.

In Portland, after Oregon adopted a law in 2019 requiring many cities in the state to expand middle housing opportunities, the city adopted an ordinance allowing for the by-right development of duplexes, triplexes, quadplexes, and BMR sixplexes. The Portland ordinance, called the Residential Infill Project (RIP) initially applied in only three categories of relatively dense single-family districts, but was subsequently expanded to other types of single-family districts (City of Portland, Oregon 2022). In addition to allowing for by-right approvals, the RIP also increased the allowable FAR for middle housing and decreased the allowable FAR for detached single-family housing. An early independent evaluation of the initial phase of the RIP program finds that, due a substantial expansion of duplex, triplex, and quadplex development that would not have been possible absent the RIP, "the average per-unit cost of middle housing within single-family neighborhoods dropped by approximately 35%," making the typical middle housing unit affordable to households with incomes slightly below the area median (Dong 2023, 18). By contrast, a typical detached-single family unit in these neighborhoods is affordable only to a household with an income over 170% of AMI.

California's experience, coupled with lessons from other states, makes clear that additional legislation is probably necessary to facilitate widespread development of middle housing in California, but that – even absent further state legislation – individual jurisdictions could do more to facilitate middle housing. In the remainder of this section, we discuss how the state legislature could promote middle housing, and how agencies such as CARB and HCD can support local governments to promote middle housing development.

California's experience with ADUs provides a clear template for future state middle housing legislation. In the case of ADUs, widespread development did not occur until the state created a set of broadly applicable prescriptive requirements. SB 9, California's first significant foray into middle housing, requires jurisdictions to establish objective design standards for middle

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[32] We thank Christopher Elmendorf for noting this loophole.

[33] This paragraph draws extensively from Marantz & Wegmann (in progress).

housing on single-family parcels, but leaves jurisdictions with broad discretion to determine the content of those standards. As documented by Alameldin and Garcia (2022) and Dubler (2022), these standards can include large front setbacks (which, unlike rear and side setbacks, are not covered by SB 9), detailed requirements governing the materials and architectural designs that may be used, open space requirements that prevent the clustering of units, and expensive landscaping requirements (such as mandates for multiple mature trees). In addition, “many cities explicitly forbid the sale of individual units in two-unit developments through condominium or tenancy in common agreements, which means a buyer must purchase both units.” (Dubler 2022, 21). Numerous cities also require affordability covenants to be recorded for middle housing, which can further limit the financial viability of such projects. The legislature could facilitate middle housing development by creating a set of standards similar to its ADU rules.

In addition, as described above, lifting owner-occupancy requirements is even more important in the case of spurring middle housing development than in the case of ADUs. The state can protect renters by requiring that a unit not have contained a tenant within some number of years, while enabling homeowners to sell their units to builders. This is precisely the policy that the state has adopted for the SB 35 framework, which cannot be used for projects that demolish housing units that have been occupied by tenants in the previous ten years.

Going beyond the SB 9 framework, the state might follow the lead of Portland’s RIP program, which reduces the allowable floor area ratio for detached single-family dwellings and increases the allowable FAR for duplexes, triplexes, quadplexes, and sixplexes. Such an approach may be particularly important, because – under the current rules – redevelopment for duplexes still might not be financially feasible on many parcels (Metcalf et al. 2021). Local governments in California are free to adopt ordinances along the lines of Portland’s RIP, and agencies such as CARB and HCD could provide valuable support and technical assistance. For example, Portland’s RIP was accompanied by detailed studies, including a detailed analysis of displacement risk, which concluded that the program would probably “*reduce* displacement of low-income renters in single-family homes across Portland … [by] allowing more units to be built on one lot,” thereby decreasing the total number of parcels in the city that would be redeveloped (City of Portland, Oregon, Bureau of Planning and Sustainability 2020, app. B, p. iii, emphasis original). (A one-year assessment of the program concluded that there had been a minimal impact in three neighborhoods identified as “at risk,” and that the program had had the intended effect of concentrating development in transit-proximate areas of the cities (City of Portland, Oregon 2023).) Such studies require substantial resources, which local governments may lack, but which state funding programs could provide.

In addition, both the legislature and agencies could take steps to ensure that some middle housing units will be offered for sale, and that they will be affordable to lower-income households. Subdividing parcels in order to build for-sale middle housing entails far more complicated legal procedures than simply building rental middle housing. State legislators could simplify the process for subdividing parcels in ways that facilitate “fee simple” development, which “allows buyers complete control over the home, its exterior, and land,” and could provide a more appropriate ownership structure for middle housing than the condominium model of homeownership (Garcia et al. 2022, 11). In addition, California’s construction liability defect regime deters development of ownership (as opposed to rental) units (Garcia and Alameldin 2023), and may be ripe for reform. These efforts are particularly important in light of AB 1095 (2021), which encourages the Strategic

Growth Council to increase home-ownership by low-income households via the Affordable Housing and Sustainable Communities Program.

c. Added density and reduced regulatory burdens for below-market-rate and mixed-income projects

Changes to the state's Density Bonus Law (DBL), which has been on the books since 1979, are both more recent and less well documented than SB 35 and ADU reforms, but may be quite consequential. Fulton et al. (2023, 6), indicate that recent changes to the DBL "have been helpful in making projects more financially feasible by increasing the number of units and by allowing housing developers to obtain incentives and waivers from development standards," although – unlike SB 35 and the ADU laws – lack of data about DBL projects limits the ability of researchers to track usage of the law (C. Elmendorf 2023a). As its name suggests, the DBL allows developers to increase the density of a project beyond the base density allowed by existing zoning, in exchange for the provision of BMR units. The DBL also provides at least three significant additional benefits to developers.

First, an amendment adopted in 2023 provides that the base density for DBL project is "the greatest number of units allowed under the zoning ordinance, specific plan, or land use element of the general plan, or, if a range of density is permitted, the greatest number of units allowed by the specific zoning range, specific plan, *or land use element of the general plan applicable to the project*" (AB 1287 (2023), §1, amending Cal. Gov. Code §65915(o)(6), emphasis added). Although this provision has not yet been interpreted by a court, it marks a potentially consequential shift, because – as suggested by the findings in Chapter IV, general plan densities are typically higher than zoned densities (in some cases much higher). Moreover, the "maximum allowable density" under the DBL is the *base density*. Depending on the proportion of BMR units included and the levels of affordability, the DBL permits an increase of up to 50% over the base density.

Second, the DBL requires local governments to provide up to five concessions or incentives to developers, with the number of incentives or concessions based on the proportion of BMR units and the levels of affordability. Concessions or incentives include:

- "A reduction in site development standards or a modification of zoning code requirements or architectural design requirements that exceed the minimum building standards approved by the California Building Standards Commission";
- "Approval of mixed-use zoning in conjunction with the housing project"; and
- "Other regulatory incentives or concessions … that result in identifiable and actual cost reductions" Cal. Gov. Code, §65915(k).

Thus, for example, developers can request parking waivers, height increases, or a variety of other changes that may increase the feasibility of a project.

Third, a jurisdiction is prohibited from applying "*any* development standard that will have the effect of physically precluding the construction of a development" meeting the DBL requirements for affordability (Cal Gov. Code, §65915(e)(1), emphasis added). As a guidebook written by practitioners specializing in DBL projects explains, there is no limit on the number waived development standards, which include height limits, setbacks, lot coverage requirements, and open space mandates (J. Goetz and Sakai 2023, 6). The authors note that the "ability to force the locality to modify its normal development standards is sometimes the most compelling reason for the developer to structure a project to qualify for the density bonus" (J. Goetz and Sakai 2023, 6). Elmendorf (2023b) describes this waiver provision as a "meat cleaver" that cuts through the accreted development standards which, cumulatively, can render projects infeasible. Notably, however, DBL projects are *not* exempt from CEQA by virtue of qualifying for the DBL, although they may be qualify for other exemptions, such as the Class 32 urban infill exemption discussed below in section 3 (J. Goetz and Sakai 2023, 11).

The DBL provides an important tool for permitting mixed-income housing in areas already zoned for multifamily development, but – due to the lack of relevant data – it is not clear whether the DBL is promoting development in TE-HHO areas, TE-adjacent areas, TE areas not designated as HHO, or any other areas that might be designated as priorities for residential development. Thus, a first step involves providing local governments with guidance and resources to include DBL permitting information in their annual progress reports. More fundamentally, the law may need to be revised in order to ensure that it does not promote development at the urban fringe in areas that are not TE and are unlikely to become TE in the near future (*See* C. Elmendorf 2023a).

In order to better assess the effects of the DBL, annual progress reporting requirements for local governments under the Housing Element Law should be expanded. Currently, annual progress reports must indicate the quantity of DBL waivers, concessions, and incentives. But, because the annual progress reports do not provide any information about the waivers beyond their quantity, policymakers cannot evaluate the impact of the DBL on the character of covered development projects (C. Elmendorf 2023b). Each APR should include a brief qualitative summary for every waiver, concession, or incentive for each DBL project. For example, if the project is allowed to exceed existing height limits, the APR should indicate (1) that the otherwise applicable height limit does not apply due to the operation of the DBL, (2) the otherwise applicable height limit, and (3) the height allowed due to operation of the DBL. Agencies such as HCD and CARB are well positioned to provide municipalities with the technical support and resources to improve data collection for the APRs via programs such as the Regional Early Action Planning (REAP 2.0) grant program.

While better data about the use of the DBL can be obtained through administrative action, legislation may be required to ensure that the DBL is targeted for infill development. Currently, the DBL "prohibits a local government from conditioning the submission, review, or approval of an application pursuant to the Density Bonus Law on the preparation of an additional report or study that is not otherwise required by state law" (Legis. Counsel's Dig., AB 1287, 2023). There is no geographical targeting for this provision, and – as a result – it could potentially be used to expedite greenfield development that would contravene the state's goals. One relatively simple resolution of this issue would be to limit application of the DBL to areas defined as urbanized under state law (Cal. Pub. Res. Code, §21071) or urban areas as defined by the US Census Bureau (87 Fed. Reg. 16706, 2022).

d. Ensuring that jurisdictions approve zoning-compliant projects

In addition to substantive requirements, such as those governing dimensional standards for ADUs, local governments are also subject to the procedural requirements of the Housing Accountability Act (HAA). Adopted in 1982 and substantially strengthened more recently, the HAA provides primarily procedural protections for housing developers. If a "reasonable person" could deem a housing project to comply with local standards in effect at the time that a complete application was submitted, then the locality must also deem the project to be compliant, with a narrow exception for projects that would endanger health and safety (Cal. Gov. Code, §65589.5(f)(4)). If a municipality fails to do so, a court can compel the municipality to take action within 60 days and, if the court finds that the municipality acted in bad faith, compel the local government to approve the project (Cal. Gov. Code, §65589.5(k)(1)(A)). Fulton et al. (2023) indicate that, in conjunction with changes to the Permit Streamlining Act (Cal. Gov. Code, §§65920 *et seq.*), the HAA has paved the way for zoning-compliant projects that might otherwise have been delayed or denied. AB 1633, adopted in 2023, closes a loophole that previously allowed cities to prevent operation of the HAA by delaying completion of environmental review under CEQA. Under the relevant revisions to the HAA, applicants for permits for infill projects of at least 15 dwelling units per acre can now compel the permitting jurisdictions to issue CEQA exemptions when applicable.[34] (The attributes of qualifying infill projects are discussed in more detail below.)

Beyond its procedural mandate for local governments to approve projects that comply with their zoning, the HAA also includes provisions governing conflicts between different regulatory designations (e.g., general plans and zoning ordinances). Perhaps the most sweeping example involves a provision added to the HAA in 2018, which stipulates that "a proposed housing development project is not inconsistent with the applicable zoning standards and criteria, and shall not require a rezoning, if the housing development project is consistent with the objective general plan standards and criteria but the zoning for the project site is inconsistent with the general plan" (Cal. Gov. Code, §65589.5(j)(4)). The legislature also amended the HAA to announce that the HAA should "be interpreted and implemented in a manner to afford the fullest possible weight to the interest of, and the approval and provision of, housing" (Cal. Gov. Code, §65589.5(a)(2)(L)). Commentators interpreted these changes to mean that "the traditional rule of deference to local governments on questions of consistency has been qualified such that, pursuant to the HAA, a local government must accommodate housing projects whose size and density are anywhere within the range contemplated by the general plan, notwithstanding more restrictive zoning" (Christopher S. Elmendorf et al. 2020, 1010–11).

In light of the high general plan densities documented in Chapter IV, this interpretation could have had a large effect on housing permitting if had it prevailed in court, but a 2023 judicial decision may give jurisdictions a way to circumvent the application of high general plan densities. A state appeals court's decision in *Snowball West Investments L.P. v. City of Los Angeles* (96 Cal.App.5th 1054 (2023)) involved the application of the HAA to a proposed housing development in a TE-adjacent HHO tract in the City of Los Angeles. The general plan designation for the parcel, a former golf course, allowed up to 244 homes, but the zoning district allowed only 19 homes.[35]

[34] If the project applicant concedes that the project is not exempt from CEQA review, then the applicant can still seek judicial review of the legal sufficiency of environmental review, although the timeline is more attenuated and the remedies are different than in the case of putatively exempt projects.

[35] The general plan for the City of Los Angeles "includes a Framework Element, which is a guide for communities to implement growth and development, and a Land Use Element, consisting of 35 community plans based on geographic location" (*Snowball West Investments L.P. v. City of Los Angeles*, 96 Cal.App.5th 1054, 1065 n.4 (2023), internal quotation omitted). For simplicity, we refer to the relevant community plan as a portion of the general plan.

After the city declined to alter the zoning, the developer sued, arguing that the HAA obviated rezoning due to the higher general plan density. The city argued that it was not obliged to approve the project without a rezoning, due to a footnote in the relevant portion of the general plan indicating that each relevant general plan land use category includes any zoning districts that are more restrictive. The court agreed with the city. Thus, any jurisdiction seeking to undercut the use of higher general plan densities under the HAA may be able to do so simply by adding a similar proviso to its general plan.[36] (As described above, DBL projects are subject to a differently worded provision governing conflicts between zoned density and planned density, which has not yet been litigated.) Changes to the state's requirements for housing elements, described in the next subsection, could limit the ability of local governments to exploit inconsistencies between their planning and zoning to avoid approving higher densities.

e. Ensuring that jurisdictions plan and zone for new housing

As described in section D.3 of Chapter I, California has an elaborate system for allocating needed housing units to individual jurisdictions and ensuring that jurisdictions plan and zone for the allocated units via the Housing Elements of their general plans. Over the past seven years, this Regional Housing Needs Assessment and Allocation (RHNA) process has been substantially reformed, resulting in a larger number of units assigned to entire regions and, within regions, more units assigned to places with larger numbers of TE-HHO tracts and TE-adjacent HHO tracts. Although these reforms will take time to yield housing units, planners and developers interviewed for a Terner Center report "expressed optimism that recent legislative changes would result in an increase in construction by requiring that cities plan and zone for more housing in ways that could be reasonably expected to facilitate actual housing growth" (Fulton et al. 2023, 4).

Notwithstanding the potential for RHNA to increase housing in TE-HHO and TE-adjacent HHO areas, our analysis of buildout capacity in Chapter IV reveals that general plans, which continue to underpin the RHNA process, often do not provide plausible estimates of the number of units likely to be built over an 8-year period (the typical amount of time in each RHNA cycle). This may be problematic, because general plan densities have come to play an increasingly important role in regulatory processes. For example, as noted above, the DBL now allows the maximum of the zoned density, general plan density, or specific plan density to prevail.

In addition, the RHNA process itself should be tied to general plan densities (or zoned densities), but often the link is opaque. Once a jurisdiction receives its RHNA allocation from a COG, the jurisdiction must identify sites that can accommodate this housing allocation. This site

[36] It is possible that adding such a proviso might violate a provision of the Housing Crisis Act of 2019, which prohibits jurisdictions from "[c]hanging the general plan land use designation, specific plan land use designation, or zoning of a parcel or parcels of property to a less intensive use or reducing the intensity of land use within an existing general plan land use designation, specific plan land use designation, or zoning" in place as of January 1, 2018 unless the change will not result in a net loss of residential development capacity (Cal. Gov. Code, §§66300(b)(1)(A), 66300(i)). However, the jurisdiction could argue that such a proviso does not represent a prohibited reduction in intensity, because on Jan. 1, 2018, the parcel could not have been developed at a higher density than what the zoning allowed (even if the general plan was more liberal), so imposing the same requirement in form of a general plan amendment today does not reduce allowable intensity relative to the Jan. 1, 2018 baseline. We thank Christopher Elmendorf for making this point.

inventory, described in more detail in Chapter V, piggybacks off of regulatory documents, such as general plans, specific plans, and zoning ordinances. A jurisdiction selects sites and must designate the housing unit capacity for these sites (Cal. Gov. Code, §65583.2(c)).

There are two ways to calculate a site's housing unit capacity.[37] If "the general plan or zoning … require[s] [a] specified minimum number of residential units on the identified sites regardless of overlay zones, zoning allowing nonresidential uses, or other factors potentially impacting the minimum density," then a jurisdiction can multiply the acreage by the minimum allowable density (California Department of Housing & Community Development 2020, 19). In other cases, jurisdictions must calculate housing unit capacity via an ad hoc methodology "based on … land use controls and site improvement[] requirement[s] …, the realistic development capacity for the site, typical densities of existing or approved residential developments at a similar affordability level in that jurisdiction, and … the current or planned availability and accessibility of sufficient water, sewer, and dry utilities" (Cal. Gov. Code, §65583.2(c)(2)).

In practice, nearly all site capacity analyses appear to use the ad hoc method, rather than the minimum density method. The California Department of General Services maintains a database of Housing Element inventory sites, including the minimum densities and the site capacities. As of January 14, 2024, there were 363,314 sites in the DGS database, of which 344,305 (94.8%) had minimum densities of zero. Of the remaining 19,009 sites, only 1,773 had a minimum density equal to the site capacity. In short, for 99.5% of all sites including in Housing Element site inventories, the capacity appears to be calculated using the ad hoc method, rather than the minimum density method.

This is a problem, because the ad hoc method collapses two analytically distinct questions into a single number, in ways that hinder assessment of development potential and may present problems for regulatory efforts. The first question is: What is the number of units that a jurisdiction wants on a particular parcel? The second question is: What is the number of units that a jurisdiction expects during the next planning cycle? The answers to these questions should be related, but it is helpful for both planning purposes and state oversight to answer them separately.

A straightforward amendment to the Housing Element law requiring jurisdictions to identify a *presumptive density* for each Housing Element site and an *expected yield* for each site

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[37] HCD's guidelines introduce some terminological confusion. Section 65583.2(c)(1) of the California Government Code refers to the "calculation of the total housing unit capacity" on a given site, and does not use the word "realistic." Section 65583.2(c)(2) indicates that the unit counts resulting from the analysis specified in section 65583.2(c)(1) "shall be adjusted as necessary," based on four factors including "realistic development capacity." However, HCD's guidelines describe the calculation of "total housing unit capacity" prescribed by 65583.2(c)(1) as one of two "options" for calculating the "realistic capacity of sites" (California Department of Housing & Community Development 2020, 19). The guidelines thus introduce circularity into the analysis, since the "realistic capacity" must be adjusted based on factors including the "realistic capacity." It is more accurate to say that, if the general plan or zoning does not "require [a] specified minimum number of residential units on the identified sites regardless of overlay zones, zoning allowing nonresidential uses, or other factors potentially impacting the minimum density," then the "total housing unit capacity" calculated pursuant to Cal. Gov. Code §65583.2(c)(1) must be adjusted by several factors including the "the realistic development capacity for the site," as specified in Cal. Gov. Code §65583.2(c)(2).

would distinguish these questions, thereby promoting a number of state goals.[38] The presumptive density is simply the number of units that a jurisdiction wants on a given site. The expected yield is the number of units in each income category from the RHNA (i.e., Very Low, Low, Moderate, and Above Moderate) that the jurisdiction expects to be built on the site during the next cycle, which should sum to a number that is less than or equal to the presumptive density. The sum of the expected yields for all sites within the jurisdiction should equal the RHNA allocation. (Los Angeles and San Francisco both adopted an expected yield approach for their sixth round Housing Elements.) The sum of the presumptive densities would provide a longer-term vision for development. This is an appropriate function for general plans, of which the Housing Element is a component. But, as the analysis in Chapter IV reveals, general plans currently do not typically provide plausible presumptive densities.

Beyond more accurately communicating jurisdictions' long-term goals, establishing a presumptive density for each site in a jurisdiction's Housing Element would have significant benefits for HAA enforcement. The need for such a baseline density standard is evident in the wake the *Snowball* decision, described above, which suggests that a local government may be able to undercut the use of higher general plan densities under the HAA by adding a proviso to its general plan indicating that each relevant general plan land use category is consistent with any zoning districts that are more restrictive.[39] If the legislature wishes to avoid such an outcome in the future, it has at least three options. First, it could amend subsection (j)(4) of the HAA to specify that– echoing the 2023 DBL revision – the applicable density is "the greatest number of units allowed by the specific zoning range, specific plan, or land use element of the general plan applicable to the project," and that no rezoning or general plan amendment is necessary to permit development of the greatest number of units. Although this might maximize allowable densities, it could be unduly permissive given the very high general plan densities revealed by the analysis in Chapter IV. Moreover, in light of the *Snowball* decision, it is plausible that a court could interpret even this language to allow a city to select the top of the range from any one of the three types of regulatory documents (i.e., the zoning ordinance, *or* a specific plan, *or* the general plan). A second approach would apply the DBL language to housing element sites only, although the same proviso about judicial interpretation applies in this case. A third approach would require cities to declare presumptive densities for each Housing Element site, and to establish these presumptive densities as prevailing against any zoning ordinance, general plan, or specific plan.

This last approach has three advantages. First, it involves less ambiguity, because there is only a single number involved, instead of multiple ranges of numbers. As a result, there are fewer ways for courts, which have often proved reluctant to meddle in the historically local matter of land-use regulation, to avoid a legislative intent to maximize density. Second, whereas many general plan densities are likely to be unintended by municipalities (for reasons described in Chapter IV), a presumptive density specified in a housing element would clearly be an announcement of local intent. Third, such an approach would facilitate the analytical distinction

[38] We thank Christopher Elmendorf for suggesting the concept of a presumptive density linked to enforcement of the Housing Accountability Act. The expected yield concept was introduced by Elmendorf et al. (2020) and is elaborated in Elmendorf, Marantz, and Monkonnen (2022).

[39] The site at issue in the *Snowball* case was not included in the city's Housing Element site inventory, but nothing in the logic of the court's decision restricts the holding to sites excluded from a site inventory.

between the number of units that a jurisdiction wants on a particular parcel and the number of units that a jurisdiction expects during the next planning cycle.

f. Supporting local permitting reform

The state laws described above require local permitting reform, but in addition to supporting mandatory local reforms, state agencies can also support local governments that are taking steps beyond those required by state law. There are numerous relevant examples. In the City of Los Angeles, the Transit Oriented Communities (TOC) program, which "was designed to encourage affordable and mixed-income development near transit," provides qualifying projects with greater density than otherwise allowed and can also provide a by-right approval process that avoids CEQA review (Manville et al. 2023, 337). Los Angeles County, the City of San Diego, and the City of Fresno have all adopted streamlining provisions for multifamily development that may provide a more cost effective path to approval than SB 35 (Manji and Finnigan 2023, 19–20).

CARB, HCD, OPR, and SGC have already committed substantial funding for local permitting improvement via the REAP 2.0 program (Kirkeby 2022). In addition, HCD awards a "prohousing" designation to cities that go above and beyond state requirements to facilitate housing development, which makes cities eligible for additional housing funds from a variety of existing sources, including AHSC, as well as a new funding source – the Prohousing Initiative Pilot Program. As a recent evaluation of the Prohousing Development Program concludes, "[p]rioritizing prohousing jurisdictions for a greater number of funding sources (such as those for transportation, infrastructure, or climate investments) would significantly increase the value of the designation" (Ramiller, Reid, and Metcalf 2023, 16). Future iterations of REAP and the Prohousing Designation Program should both require evidence that specified reforms are likely to yield results. Ramiller et al. (2023, 17) propose using metrics for effectiveness derived from modeling tools such as the Terner Housing Policy Dashboard, discussed in more detail below.

Given the uncertainty associated with the estimates derived from such modeling tools, it may also be advisable to base future funding on past performance, and to offer under-performing jurisdictions additional technical assistance. Marantz, Elmendorf, and Kim (2023b) provide a tool for such targeting of resources. As they note, "simply counting the number of relevant building permits that a municipality has issued—may not effectively target review because municipalities do not control many of the factors that drive demand for housing. As a result, production—standing alone—may be a poor proxy for compliance with state laws mandating local regulatory reforms" (Marantz, Elmendorf, and Kim 2023b, 4). They provide open source computer code that state agencies can use to statistically control for factors affecting production when targeting resources and enforcement for local governments (Marantz, Elmendorf, and Kim 2023d).

2. Impact fees

Impact fees (also called mitigation fees) can serve as both a necessity for housing development and an impediment to housing development. The California Constitution imposes a variety of limits on local taxation, such as Proposition 13, which constrains both the assessed value of real property and the rate of taxation, and Proposition 218, which limits the use of special-purpose assessments. As a result, new residential development often does not fund the infrastructure and public services that it necessitates (P. G. Lewis and Marantz 2023, 66).

Impact fees, paid by residential developers, provide a method of funding the infrastructure and public services needed to support new development, but they also deter some development. Mawhorter et al. (2018) indicate that "California's development fees were nearly three times the national average in 2015," and that "[f]rom 2008 to 2015, average development fees for new single family homes in the state grew by approximately 19 percent." There is substantial empirical evidence that impact fees drive up the cost of new housing at all price points in places (such as California) where fees are pervasive (Evans-Cowley and Lawhon 2003; Mathur, Waddell, and Blanco 2004; Mathur 2013). There is also some evidence that impact fees raise the resale price of higher-cost existing homes (Mathur 2007).

In California, impact fees come from a variety of sources. Many such fees are imposed pursuant to the Mitigation Fee Act (Cal. Gov't Code, §§66000 *et seq.*), which enables the imposition of fees related to a wide variety of impacts, so long as a jurisdiction identifies the "purpose of the fee," specifies the "use to which the fee is to be put," determines "how there is a reasonable relationship between the fee's use and the type of development project on which the fee is imposed," and determines "how there is a reasonable relationship between the need for the public facility and the type of development project on which the fee is imposed" (Cal. Gov. Code, §66001(a)). But, there are also other sources of impact fees, often (but not always) tied to impacts on specific resources or services (e.g., parks, schools) (Raetz, Garcia, and Decker 2019, 4–5).

There have been several legislative efforts to improve the administration of impact fees in California, and a pending US Supreme Court case could potentially upend the use of such fees. In 2017, the legislature tasked HCD with completing a study "to evaluate the reasonableness of local fees charged to new developments," and to make "findings and recommendations regarding potential amendments to the Mitigation Fee Act (MFA) to substantially reduce fees for residential development" (Legis. Counsel's Dig., AB 879, 2017). The resulting report included a large number of recommendations related to fee transparency, fee structure, fee design, and alternative financing mechanisms (Raetz, Garcia, and Decker 2019). A 2021 MFA amendment requires jurisdictions to account for cost data provided by members of the public when setting fees, to review the assumptions underpinning any nexus study that support the increase of an existing fee, to either ensure that fees are proportional to a project square footage or to make findings explaining why an alternative metric is more appropriate, and to publish nexus studies on the internet (AB 602, 2021). A 2023 MFA amendment requires local governments to account for delays related to project funded by impact fees and expands the scope of audits of local fees that project proponents may request under the MFA.

It is too early to determine whether these reforms have had an effect, and – in any case – it is possible that California's fee system will have to be thoroughly overhauled in response to a US Supreme Court case that is pending as of the completion of this draft report. *Sheetz v. County of El Dorado, California* (Docket No. 22-1074) involves a challenge to the MFA. The plaintiff contends that impact fees levied under the MFA are subject to a more stringent test than the "reasonable relationship" tests described above. The Court granted the plaintiff's petition for review in September 2023, the case was argued in January 2024, and a decision is likely by June 2024. Depending on how the Court rules, California may be required to substantially revise its system for levying impact fees.

3. *The California Environmental Quality Act* [40]

Although state law may limit a locality's ability to outright deny some types of housing development, local governments can stall approvals or functionally deny housing by making it infeasible to develop. One tactic involves demanding more intensive environmental review of new housing projects under CEQA than what the proposed development and state guidelines would suggest is required. More intensive environmental review can create substantial delay and uncertainty, increasing the costs for the construction of new housing.

The trigger for CEQA review is regulatory discretion, so local governments' choices about how to regulate land use and housing development – whether to apply a ministerial or discretionary process – also affect the reach of CEQA. As described above, the California legislature has increasingly sought to curtail local discretion to delay, deny, or downsize housing development projects that comply with applicable, objective local standards. But, with the important exception of the HAA as modified by AB 1633 (outlined above in section A.1.iv and discussed in more detail below), the keystone state statutes do not prevent cities from using discretionary review and requiring conditions of approval that do not reduce density, and the statutes do not foreclose CEQA review.

As a result, for projects that do not satisfy the requirements of AB 1633, CEQA offers a pathway when a local planning agency or city council would like to deny a project but finds itself hemmed in by state housing law. Rather than deny the project outright – which could expose the city to fines, attorneys fees, a court-ordered approval of the project, among other consequences – the city may delay the project by demanding environmental reviews that go far beyond what CEQA actually requires. There remains substantial uncertainty about which projects will be covered by AB 1633 and, for projects that are not covered by AB 1633, it can be difficult to establish when and whether exemptions apply. As a result, local governments retain considerable discretion concerning the scope and application of exemptions to CEQA. A clear, authoritative delineation of CEQA-exempt sites and AB 1633-eligible sites would close the relevant loopholes, but the present approach to determining CEQA exemptions falls far short of this goal.

If developers ascertain that AB 1633 *does not* apply to a particular potential project, then they may be unsure whether that is eligible for a particular CEQA exemption, or whether an exception to an exemption applies. And, in cases where AB 1633 does not apply, local governments have broad discretion to determine exceptions to the exemptions. Meanwhile, local officials operating in good faith to address the state's housing shortage have no clear way to determine how the various CEQA exemptions interact at a broad geographic scale, and they will often be subject to CEQA review when attempting to upzone for infill development.

Even when the areas qualifying for infill development are relatively clearly defined, those definitions vary substantially across exemptions, for reasons that are not always obvious. Some exemptions depend on the project being located in urban or urbanized areas, which apply to areas

[40] This section is adapted from an article co-authored by three authors of this report (Biber et al. forthcoming).

in or adjoining incorporated areas that have a minimum population size,[41] and there are different relevant definitions of such areas.[42] Others apply to projects that are close to high-quality transit or are in transit priority areas (Cal. Pub. Res. Code, §§21155.1, 21099).[43] Still others are limited to "infill" projects, which is defined by proximity to other parcels developed with urban uses.[44] These varying definitions may overlap, with multiple definitions and requirements applying to a single exception, as in Cal. Pub. Res. Code § 21159.24, which requires location proximate to transit, status as an infill site, and status as an urbanized area. In many cases, it seems plausible that a given project might qualify for several of these exemptions simultaneously, and a city will often rely on multiple overlapping CEQA exemptions for a project. On the other hand, it is also clear that some exceptions sweep more broadly than others. For instance, projects need not be in urbanized areas at all to fall within the scope of the Class 3 exemption for individual single-family houses (Cal. Code Regs., Tit. 14, §15303(a)).

If AB 1633 applies to a project, then the permit applicant may compel a permitting jurisdiction to issue applicable CEQA exemptions and, if the exemption is denied, seek speedy judicial review. As noted above, the law applies only to projects consisting of at least 15 dwelling units per acre. In addition, qualifying projects must be located in an urbanized area (as defined by the Public Resources Code) and must be covered by the HAA (Cal. Gov. Code, §65589.5(h)(6)). The site for a qualifying project must not be environmentally sensitive, as defined in Cal. Gov. Code §§65913.4(a)(6)(A)-(C) and 65913.4(a)(6)(E)-(K), and must not be located in a several kinds of fire hazard zones described in Cal. Gov. Code §65589.5(h)(6)(D)(*i*)(*I*)(*ib*).

Determining whether a project satisfies these conditions should generally be straightforward, but a qualifying project must *also* satisfy at least one of four infill criteria, and making this determination will often be less straightforward. The HAA, as amended by AB 1633, indicates that an infill housing development project can meet any one of the following criteria:

- The housing development project is located within one-half mile walking distance to either a high-quality transit corridor or a major transit stop.
- The housing development project is located in a very low vehicle travel area.
- The housing development project is proximal to six or more amenities.

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[41] *See* Cal. Pub. Res. Code §§21155, 21094.5, and 21071 for varying definitions of this concept. These requirements apply to the exemptions in Cal. Pub. Res. Code §§ 21159.24 and 21094.5, and to some Class 3 exemptions under Guideline 15303. Class 32 exemptions require that a project be located in an incorporated city.

[42] For example, according to a technical advisory from the California Governor's Office of Planning & Research, one exemption for transit-proximate infill housing requires the project to be located in an "urbanized area" as defined by Cal. Pub. Res. Code §21071, while another exemption for transit-proximate infill housing relies on a slightly different definition of "urban area" governing project location (State of California, Governor's Office of Planning and Research 2020, A-1).

[43] The definition of transit priority areas is in Cal. Pub. Res. Code §21099, and generally requires the project be close to transit. The transit requirements also apply to projects under 21159.24 and to at least some projects under 21094.5

[44] The exceptions in Cal. Pub. Res. Code §§ 21095.4 and 21159.25 have this requirement, which is defined in Cal. Pub. Res. Code § 21072. The Class 32 exemption in the Guidelines similarly requires that a project be "substantially surrounded by urban uses."

- Parcels that are developed with urban uses adjoin at least 75 percent of the perimeter of the project site or at least three sides of a foursided [sic] project site. (Cal. Gov. Code §65589.5(h)(6)(D)(*i*)(*II*))

In many cases, determining whether a project meets one or more of these criteria will require the exercise of local discretion, particularly when a project relies on its proximity to six or more amenities to qualify.

In the case of housing development projects that are not covered by AB 1633, state-developed CEQA exemptions allow local governments to determine whether they apply. For example, a local government can disqualify any project from a categorical exemption by naming some purported "unusual circumstance" or "cumulative impact" (Cal. Code Regs., Tit. 14, §15300.2). Such decisions are judicially unreviewable. Overall, under many of the state reform laws the decision about whether to advance infill housing development still generally lies with local governments that may not have strong incentives to do so.

Finally, few of the statewide exemptions apply to local government efforts to upzone and increase housing capacity under existing zoning ordinances. Upzoning is at the core of what the state expects local governments to do through housing element law to facilitate increases in housing production. And upzoning over entire communities or neighborhoods can be far more efficient in terms of increasing overall housing capacity in infill areas then than project-specific changes. But only SB 10, adopted in 2021, authorizes a CEQA exemption for upzoning, and the covered upzoning is capped at ten units per parcel (Cal. Gov't Code § 65913.5).

The uncertainty, confusion, and complexity around the scope of many of the state-level reform efforts creates significant obstacles to advancing infill housing production in California. First, it creates barriers for project proponents and developers to understand which projects might qualify for which exemptions. The complicated framework, particularly for CEQA exemptions, interacts with a local regulatory process that is itself highly complicated and varies significantly from jurisdiction to jurisdiction. The result is a high set of informational barriers for understanding where and when more streamlined approval processes are available, and in turn, which projects are and are not feasible.

One of the purposes of these state provisions providing for reduced or eliminated CEQA analysis and upzoning is to reduce the informational analysis costs of CEQA and local land-use regulation for projects that, on net, will have significant environmental, economic, and social benefits. But if it is difficult to understand exactly which projects qualify and when, then fewer project proponents, and fewer projects, will take advantage of those reduced informational analysis burdens – fewer than required to achieve the state's ambitious climate goals and ameliorate its considerable housing affordability problem (Mawhorter, Martin, and Galante 2018; Volker et al. forthcoming). In other words, in many ways the state has offset the informational analysis benefits of its streamlining laws by setting up other informational barriers to determine when they apply.

Even when a particular CEQA exemption unambiguously applies to a housing project, the benefits it might provide in terms of reducing CEQA analytic burdens may not be as great as expected, given the complexity of the exceptions and, when AB 1633 does not apply, local governments' largely unreviewable discretion about whether to honor them. This variability has two important implications. First, for project proponents and developers, it adds to the costs of trying to understand where and when to use the streamlining provisions. Project proponents now must also understand how a particular local government will interpret the criteria of AB 1633 and apply the CEQA exemptions in practice – further increasing informational burdens on proposed projects by requiring knowledge of the particular practices of individual local governments, something that may often be only available to developers with long-standing connections to a particular local government. This in turn can create real barriers to entry for development, increasing the costs of development further.

Second, the complexity of the exemptions constrains the ability of the state to monitor local governments to determine whether they are truly complying with the letter and spirit of state law, and advancing state housing policy. Because the scope of the geographic and substantive applicability of the exemptions is ambiguous, effective state oversight requires close understanding of the context of specific projects to know whether a locality has properly applied those exemptions. But the state agencies charged with oversight currently have little capacity for such close review of local government application of law to individual projects on a state-wide level.

Exacerbating this problem is the absence of a complete registry of which projects are using which CEQA exemptions. The state does require that government agencies submit CEQA documentation for EIRs and Negative Declarations to OPR, which maintains a central database of those documents (Cal. Code Regs., Tit. 14, §§15075, 15094). However, state law does not require submission to OPR of a determination by an agency that a project is exempt from CEQA, although the agency can do so if it wishes (Cal. Code Regs., Tit. 14, §§15061, 15062).

It is difficult for the state or anyone else to assess how well the system is working overall to advance infill development, and whether local governments are using the exemptions at all – including whether local governments are using the exemptions appropriately. But there is some evidence that these exemptions are underutilized. For instance, several studies have found that few jurisdictions were taking advantage of CEQA streamlining provisions that apply to projects consistent with regional plans intended to reduce VMT (Mawhorter, Martin, and Galante 2018; Volker et al. forthcoming).

So far we have highlighted how the complexity of the current system likely means that the application of state efforts to advance housing production are underinclusive, excluding too many projects that should be eligible. But there is also some evidence that some of the CEQA exemptions might be *overinclusive*, facilitating development that does not help to reduce VMT or achieve other key state policy goals. As depicted in Exhibit VII-5, recent data from a study of how selected California cities and counties approve housing projects finds that the CEQA exemption specifically targeted for infill development (the Class 32 exemption) is not producing significantly more housing in areas with lower VMT than other projects that do not use the exemption. Thirteen percent of housing projects included in the study that used the exemption were located in neighborhoods with household-based VMT levels above the regional average; 15% of projects that did not use the exemption were located in neighborhoods with household-based VMT levels above the regional average.

Exhibit VII-5: CEQA Class 32 Exemption and Neighborhood Household-Based VMT Levels

Project located in TAZ with VMT above MPO Average?	**Project used Class 32 exemption?**			
	Yes		**No**	
Yes	57	(13%)	220	(15%)
No	377	(87%)	1237	(85%)
Total	434	(100%)	1457	(100%)

Note: This table identifies housing projects included in the CALES dataset (O'Neill-Hutson et al. 2022), based on whether they use the Class 32 exemption under CEQA, which is intended to advance infill development with lower VMT. "Above MPO VMT Average" indicates that the transportation analysis zone (TAZ) that contains the project is located in a TAZ with household-based VMT above the average for the territory covered by the relevant metropolitan planning organization.
Data: California Statewide Travel Demand Model (2016); O'Neill-Hutson et al. (2022).

Overall, while CEQA exemptions in theory might provide a solution to the challenges that CEQA poses to urban infill development, in practice those exemptions have been limited in their effectiveness. Exemptions are not complete; they have substantial carve-outs; there is often significant ambiguity about whether they actually apply to a given project; and, their coverage is inconsistent and conflicting. As a results, the informational costs of determining whether a particular exemption applies to a given project and how its applicability might affect the approvals process can be very high. This increases costs and uncertainties for project proponents. These factors also empower local governments that seek to deter housing construction, because local governments determine whether exemptions apply to development projects that do not qualify for the protections of AB 1633. Uncertainty and ambiguity gives those local governments the power to make many judgment calls about whether CEQA exemptions should apply, and local governments may often have reasons not to encourage infill development even if that development advances state-wide goals. It may be very difficult for the state or other actors to observe whether local governments are accurately implementing the CEQA exemptions, especially given the lack of a central registry for the use of those exemptions. Finally, there appear to be a range of circumstances where the CEQA exemptions are overinclusive, facilitating non-infill development that may not advance statewide goals to reduce sprawl or VMT.

One solution would be to rely on clear lines on a map to specifically and precisely articulate where ex ante evaluation of where development can be presumed to be economically, environmentally, and socially beneficial. Allowing easy reference to a map that can quickly and clearly delineate such infill priority areas (IPAs) reduces the informational costs for project proponents to identify the projects and locations eligible for streamlined consideration. Likewise, by allowing state officials to quickly identify which projects qualify for streamlined processes, mapping can facilitate supervision of local government compliance with state housing laws.

By reducing or eliminating detailed project-specific review for infill residential development, a map-based system would address the high informational costs of environmental review and local land-use regulation by clearly identifying where the state has concluded that the benefits of development outweigh the costs. It can also eliminate or reduce opportunities for local governments to use their discretion over land-use regulation and environmental review to stymie infill housing projects or other state efforts to advance housing like the HAA. Finally, by undertaking large-scale ex ante determinations of where significant environmental benefits from development would occur, and where significant environmental costs would occur, a map-based system would reduce unnecessary, inefficient, and duplicative evaluation of large-scale environmental impacts. In fact, the map-based approach can be understood as a basic, large-scale environmental review intended to identify where additional environmental review is unnecessary.

A map-based approach is in fact not a break from historic practice in land-use law and regulation. Most local government zoning ordinances include maps as a central part of their regulatory structure, identifying what kinds of uses and development are permissible in which locations. In fact, it is precisely because of the informational benefits of maps that local zoning ordinances rely so heavily on them. As the state increasingly guides local land-use regulation in order to advance housing development, it should rely on the informational benefits of maps as well.

It is beyond the scope of this report to specify what, precisely, should be included within the lines of IPAs. Three of the authors of this report have co-authored an article with Christopher Elmendorf, from which this section of the report is derived, laying out the options in more detail (Biber et al. forthcoming). One option would involve drawing on the state's own definition of an urbanized area (from the Public Resources Code) or the census definition of urbanized areas. Alternatively, the legislature could direct OPR to synthesize the provisions of the various CEQA infill exemptions to create a single, coherent definition of where urban infill development generally should occur. Yet another option would use the measure of developed land in the National Land Cover Database, which is a very high-resolution dataset that can be used to classify land at the parcel level, combined with some threshold for a minimum area of nearby developed land. High levels of development intensity would be mapped within the IPAs.[45] In all cases, legislators may want to require that any system of lines and urban/infill definitions be validated with VMT estimates for development in different locations (see, e.g., Barbour et al. 2019, 29–38; see also, Salon 2014; A. L. Brown et al. 2021). This would help ensure that the ultimate IPA does advance the state's goals to reduce automobile use.

Whatever tool is used to articulate the basic urban and contiguous urban areas that should fall within the IPA, the second step we propose is to use additional resource data to identify areas that initially fall within the IPA, but should be excluded from it because of important resource impacts. Again, the goal here is to undertake this up front, to minimize the informational and analytic burdens for local jurisdictions making planning, zoning, and project-level decisions.

We propose excluding the following areas from any IPA: federally and state protected wetlands, habitat for state and federally listed endangered and sensitive species, prime agricultural lands, and very high fire hazard severity zones. These are resources that the state has consistently sought to protect and thus exclusions for these resources would align the IPA with overall state land-use policy. Many of these resources already have detailed statewide maps available for them

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[45] The National Land Cover Database has categories for Developed High Intensity, Developed Medium Intensity, and Developed Low Intensity. An initial option would be to designate all Developed High Intensity and Developed Medium Intensity parcels in IPAs, and include Developed Low Intensity parcels as within IPAs if more than 50% of the area within a half mile radius are Developed High Intensity or Developed Medium Intensity.

as well as tractable regulatory definitions in other parts of state law, allowing inclusion of them in any overall IPA system.[46]

There are two additional issues that would require resolution for preparing any IPA – whether to include historic resources within an IPA, and how to address equity concerns about where development is located within an IPA. With respect to historic resources, many local governments in California designate landmarks or historic districts where development is restricted. Although such designations can protect important cultural and historical resources, there is also evidence that historic preservation can be a proxy for generic opposition to development, and that historic preservation can be a contributor to exclusionary zoning (see, e.g., Los Angeles Times Editorial Board 2022). One way to protect important historical resources while also preventing local governments from using historical resources as a strategic tool to obstruct infill development would be to exclude only state-designated historical resources from IPAs.

Potential concerns about equity can be addressed in a number of ways. Planning and rezoning proposals within the IPA could still be required to go through a public participation process that emphasizes engagement with all members of the community, even without detailed CEQA review. This would facilitate consideration of important equity issues in the local government decision-making process. State fair housing law – specifically state law requiring local governments to affirmatively further fair housing – should apply to local government planning, zoning, and project-level decision-making (Cal. Gov't Code §§ 8899.50(a)(1), 8890). This can push local governments away from concentrating development in particular neighborhoods, and particularly away from concentrating affordable housing in particular neighborhoods. State legal protections for tenants could still be applied to projects within an IPA as well.[47] Recent amendments to state law have significantly increased the minimum protections that all tenants within the state receive.[48]

Finally, facilitating infill development in and of itself should generally advance equity goals. Promotion of infill development can facilitate the development of below market rate units

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[46] Wetlands and wildlife habitat present more significant data obstacles for our proposal. OPR's Sitecheck tool provides data on whether individual parcels are located within wetlands or sensitive wildlife habitat, but with the caveat that such information is tentative, and site-specific review of the parcel for wetlands or wildlife habitat is required. However, because certainty is an important goal of our proposal, requiring additional site-specific reviews for all parcels within IPAs for wetlands and wildlife habitat would be problematic.

One possible solution to this challenge would be to identify two categories of parcels within the IPA. One category would be already-developed parcels, such as parking lots, existing commercial or residential development. These parcels are extremely unlikely to contain protected wetlands or sensitive wildlife habitat, and thus can be included within the IPA without any additional review requirements. A second category would be parcels that contain undeveloped land. For these parcels, the IPA exemption would be predicated on a review of the parcel for wetlands habitat or sensitive species habitat.

[47] For instance, SB 330 has a "right of return" provision that allows low-income renters displaced by new construction to be able to rent affordable units in the new housing. Cal. Gov't Code, §66300(d).

[48] *See* Cal. Civ. Code, §1946.2 (imposing rent caps and just cause eviction protections); Cal. Civ. Code, §706.050 (limiting the use of wage garnishment in the collection of rent and other debts); Cal. Civ. Code, §1946.7 (increasing domestic violence protections for renters).

through inclusionary zoning requirements, which would directly advance housing affordability. In addition, as discussed in the following section, it would reduce pressures on existing lower-rent housing stock by creating additional market-rate units that would be available for higher income tenants or residents. Moreover, as detailed in Chapter VI, development in TE-HHO areas should lower housing costs regionwide without posing risks of gentrification or displacement.

Even if the state does not pursue the IPA proposal, agencies such as CARB, HCD, and the SGC should support local efforts to identify and map parcels that are eligible for AB 1633, and the legislature should consider requiring such mapping as part of the housing element. Importantly, AB 1633 does not exempt covered parcels from CEQA. It simply enables project proponents to expeditiously obtain a definitive answer about whether a particular CEQA exemption applies. However, as noted above, it may often be difficult to determine whether AB 1633 applies to a particular project. Authoritative maps created by localities would alleviate this burden. State agencies could provide technical assistance for the creation of such maps, and the legislature should consider requiring local governments to specify whether sites included in a housing element satisfy the infill requirements of AB 1633.

4. Subsidies for BMR housing

In addition to the kinds of regulatory actions described above, California's state and local governments can promote housing development by providing subsidies for the development of BMR housing. For reasons described below, it is beyond the scope of this report to advise *whether* such subsidies should be allocated to projects in TE-HHO areas. Instead, we outline relevant considerations for policymakers and community members in making decisions about the geographic allocation of housing subsidies and the relationship between subsidies and the kinds of regulatory measures described in the preceding sections of this report.

This analysis is underpinned by the available empirical evidence concerning the impacts of housing supply on housing affordability, with a particular focus on affordability for lower-income households. It is important to note that unsubsidized housing (i.e., market-rate housing) *can be* affordable to lower-income households and *is* often affordable to lower-income households in areas where overall housing supply is not constrained. For example, Weicher et al. (2017) find that, from 1985 through 2013, over 93% of the national increase in units affordable to lower-income households[49] was attributable older market-rate rental units that became less costly due to depreciation and the conversion of existing owner-occupied housing to market-rate rental housing.

While such downward "filtering" of older units is thus crucial to affordability, it often does not occur in supply-constrained housing markets, such as those existing in many of California's metropolitan areas. Using the same dataset as Weicher et al. (the U.S. Census Bureau's American Housing Survey), Spader (2023, 2) finds that from 2015 through 2021, "downward filtering of housing units stalled or reversed in many areas as housing markets tightened," and that the "extent of downward filtering [was] significantly weaker in high-appreciation metropolitan areas like San Francisco and Los Angeles compared to lower-appreciation areas." This finding is consistent with

[49] Weicher et al. (2017, 28) define a rental unit as affordable if "the sum of rent plus utilities and other related costs, adjusted for the number of bedrooms, is less than or equal to 30 percent of 50 percent of local area median income."

research by Liu, McManus, and Yannopoulous (2022), based on different data and covering 1993-2018, which finds substantial variation in filtering rates, with substantial downward filtering in some markets (e.g., Chicago and Detroit) and significant upward filtering in others (e.g., Los Angeles and San Francisco). They find that "[m]arkets with high levels of regulatory restrictions on new construction tend to have upward filtering," whereas "markets with lower regulatory restrictions on new construction tend to have faster than average downward filtering rates" (Liu, McManus, and Yannopoulos 2022, 2).

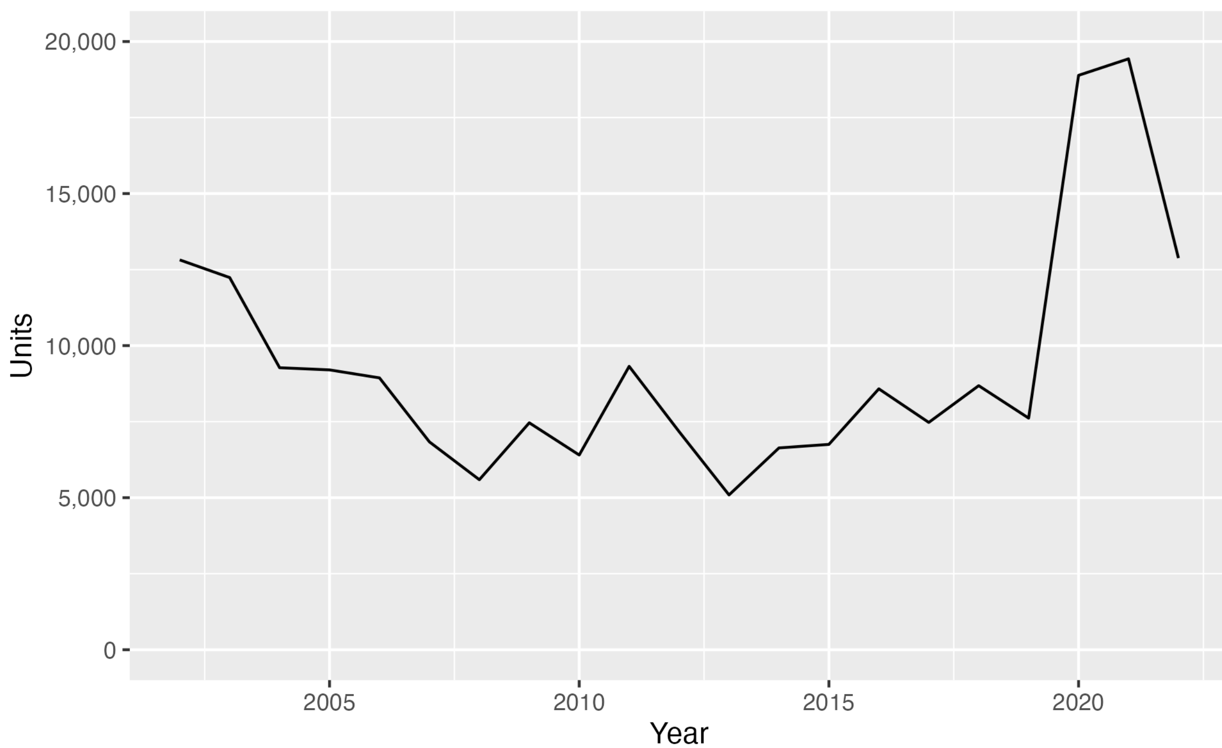
Although downward filtering is less common in supply-constrained regions with high demand for housing, empirical evidence suggests that adding market-rate housing in supply-constrained regions improves housing affordability for lower-income households, even if the added housing is not itself affordable to lower-income households. As Elmendorf, Marantz, and Monkkonen explain (2022, 8), "When a new building comes onto the market, many of the people who buy or rent units in the building then vacate other units within the region. The newly vacated units in turn are occupied by people who vacate other units, and so forth." Mast (2023) empirically demonstrates this phenomenon, drawing on data from twelve metropolitan areas, including San Francisco. Using address history data, which traces individuals and households as they change residences, Mast identified the units vacated by residents of new market-rate multifamily buildings. He then determined who moved into these vacated units, determined which units these households vacated, and so on for six rounds. Based on these chains of moves triggered by new construction, Mast finds that, on average, the construction of 100 new units in a high-income census tract results in a chain of moves that releases 45 to 70 units in census tracts with a median income below the area median and 17 to 39 units in census tracts with median incomes in the bottom quintile of the region. This research does not assess changes in affordability in the high-income neighborhoods where market rate housing is built. Rather, it assesses changes in the availability of lower-cost housing in lower-income neighborhoods where units are vacated as a direct result of new construction in higher-income neighborhoods, and it demonstrates how – even in supply-constrained, high-cost markets – adding new housing in high-income areas frees up lower-cost units in lower-income areas.

The potential for new market-rate housing supply to moderate rents for lower-income households is important, because there is not nearly enough funding to provide BMR housing to all lower-income households. The California Housing Partnership calculates the "Affordable Homes Shortfall" for the state, by comparing "the number of lower income renter households who cannot find an affordable home in the current market" to "the number of renter households with the number of rental homes affordable and available to them" (California Housing Partnership 2023, 4).[50] As of 2021, that shortfall was 1,315,784 units (California Housing Partnership, n.d.). The research team was unable to locate an authoritative tabulation of the number of BMR units built each year through federal, state, and local programs, but annual data on new LIHTC units provides a sense of the scale of construction. (Many LIHTC units are partially subsidized by state programs, because it is typical for BMR projects to combine multiple sources of subsidy.) As

[50] A rental home is defined as "affordable and available" if "a household spends (or would need to spend) no more than 30 percent of its income on rent and utilities and is either vacant or occupied by a household at or below the income group threshold" for the metropolitan area in which the household resides (California Housing Partnership 2023, 4).

Exhibit VII-6 indicates, from 2002 through 2022, annual LIHTC construction ranged from a low of 5,090 units to a high of 19,431 units, with average annual construction of 9,394 units, for a total of 197,278 new units. At this rate, it would take over 100 years to build enough units to make up for the Affordable Homes Shortfall with subsidized units (assuming that all currently subsidized units remain BMR units in perpetuity).[51]

Exhibit VII-6: New Low Income Housing Tax Credit Units in California, 2002-2022



Data source: California Housing Partnership

Although increasing the amount of market-rate development would improve affordability at the regional level (by freeing up lower-cost units for lower-income households), its effects at the *neighborhood scale* are more ambiguous. As discussed in Chapter I, "new market-rate units … [can] make nearby housing more affordable by increasing availability and relieving pressure on the existing housing stock" (Phillips, Manville, and Lens 2021, 4). This "supply effect" can be undermined, however, if "new housing only attracts more wealthy households, brings new amenities to the neighborhood (including the housing itself), and sends a signal to existing landlords that they should raise their rents" (Phillips, Manville, and Lens 2021, 4). Based on a

[51] Many deed-restricted BMR units have time-limited affordability. During the same period (2002-2022), the LIHTC program funded the acquisition and rehabilitation of 144,160 units. Some of these units were likely already deed-restricted BMR housing, in which case LIHTC funding would extend the deed restrictions. Many others were likely lower-cost market-rate rental housing. As a result, it is unclear what proportion of these units represent an increase in the stock of "affordable and available" housing.

review of the available empirical evidence, Been, Ellen, and O'Regan (2023, 44) conclude that "at least in some circumstances, new construction also reduces rents or the rate of growth in rents in the surrounding neighborhood," although they note that the evidence on this point is "somewhat mixed" with respect to lower-income neighborhoods.

Importantly, unlike new development in lower-income neighborhoods, new development in TE-HHO and TE-adjacent, HHO areas does *not* raise concerns about either neighborhood-level price increases or displacement, as described in section I.D.4 of Chapter I and as indicated by the evidence in Chapter VI. As a result, increasing both BMR and market-rate development in TE-HHO areas would have unambiguous benefits with respect to affordability and could yield per capita VMT reductions even without further policy interventions. Development TE-adjacent, HHO areas would also have clear affordability benefits, and could also yield VMT reductions with additional policy interventions. In light of these characteristics of development in TE-HHO and TE-adjacent, HHO areas, it is important to consider whether to allocate subsidies for BMR units to these areas, and whether to impose BMR mandates for new development in these areas. In the remainder of this section, we consider each of these questions in turn.

a. The allocation of subsidies for BMR housing in TE-HHO and TE-adjacent, HHO areas

As detailed in Chapter I, there are valid arguments both in favor of allocating the limited available BMR housing subsidies to TE-HHO areas and TE-adjacent, HHO areas, but there are also valid argument for allocating such subsidies to other areas. A substantial body of evidence points to benefits to lower-income households from living in higher-income, lower-poverty areas, as well as in areas that have historically been associated with income mobility. On the other hand, there is also evidence that LIHTC construction generally reduces property crime and violent crime in low-income neighborhoods and increases property values in such neighborhoods (Diamond and McQuade 2019). In addition, households eligible for subsidized units may prefer to live in lower-income neighborhoods, in order to maintain connections to their existing social networks and, potentially, better jobs accessibility (Reid 2019). Moreover, relying on the TE-HHO designation alone would skew the allocation of resources substantially to coastal regions.

Whether or not project-based subsidies are targeted specifically to TE-HHO areas and TE-adjacent, HHO areas, agencies should consider targeting subsidies to housing types that could be developed in these areas. Portland's RIP program provides a compelling example for how such an approach might work. As noted above, that program allows duplexes, triplexes, quadplexes, and BMR sixplexes by right in single-family zoning districts, and the allowable FAR increases with the number of units. Such projects could be particularly suitable vehicles for BMR homeownership projects funded by AHSC.

Tenant-based subsidies (i.e., housing vouchers) provide another mechanism to enable lower-income households to relocate to TE-HHO and TE-adjacent, HHO areas, but only to the extent that suitable units exist in those areas. As described in Chapter I, housing vouchers provide rent subsidies to individuals and families with low incomes. As Exhibit I-1 in Chapter I indicates, housing vouchers subsidize more households in California than any other federal program. The use of housing vouchers is constrained by the cost and availability of rental units, and expanding market-rate rental housing options in TE-HHO areas could facilitate the deployment of vouchers in these areas.

The introduction of Small Area Fair Market Rents (SAFMRs) for the federal voucher program improves the chances that households would be able to use vouchers in TE-HHO areas, but only if there are appropriate units. Prior to the introduction of SAFMRs in 2011, HUD would set a single "Fair Market Rent" level for each household size in each metropolitan area (or rural county). Voucher recipients were limited to units with rents below this level, which was generally well below rent levels in higher-opportunity, higher-resource areas. The SAFMR program was designed specifically to enable voucher holders to access high-opportunity areas, by calibrating the maximum rent by zip code area. The program started in the Dallas area, but has since been expanded nationwide (Center on Budget and Policy Priorities and Poverty & Race Research Action Council 2018; Mazzara and Gartland 2022).

Even with the higher rents authorized by the SAFMR program, detached single-family housing in TE-HHO and TE-adjacent, HHO areas is unlikely to be available for rent and, when it is available to rent, the rent is likely to be higher than the SAFMR. As noted above, in many TE-HHO census tracts (and in the large majority of TE-adjacent HHO tracts), detached single-family housing predominates. And the large majority of detached single-family housing is owner occupied (83.3% in TE-HHO tracts and 86.9% in TE-adjacent HHO tracts, as of the 2016 5-year ACS). Thus, increasing the stock of rental housing in these tracts is necessary, but not sufficient, for enabling voucher utilization. In addition to increasing the stock of rental housing, the units must satisfy the SAFMR requirements. Middle housing (e.g., townhomes, duplexes, etc.) is more likely than detached single-family housing to satisfy these requirements. As noted in Chapter I of this report, an equity-oriented housing strategy would not only expand supply, but would also "expand[] housing voucher programs, ensur[e] inclusive marketing strategies for new housing development projects, and creat[e] counseling programs to help homeseekers identify and secure housing."

b. BMR mandates and incentives for new housing development projects

In addition to federal, state, and local subsidies for BMR units, another strategy involves either mandating the inclusion of BMR units in new housing development projects (i.e., mandatory inclusionary requirements) or providing incentives for the inclusion of BMR units (i.e., voluntary inclusionary programs). Under these arrangements, the market-rate units in a project cross-subsidize the BMR units.

Although it is clear that mandatory inclusionary programs can produce BMR units, it is also clear that mandatory inclusionary requirements can preclude development of some projects that might otherwise have been built. In perhaps the most rigorous study on this question, Krimmel and Wang (2023) analyze the effects of the Mandatory Housing Affordability (MHA) program adopted by Seattle, Washington. The MHA authorized denser development in certain neighborhoods, but paired the increased density with BMR housing mandates (developers were required to either reserve units in each project for BMR housing or to pay into a fund for BMR housing). Krimmel and Wang use difference-in-differences estimation to compare areas covered by the MHA with areas just outside the MHA areas. Their findings reveal that, in spite of the upzoning on parcels subject to the MHA program, developers instead generally selected otherwise similar nearby parcels that were not subject to the BMR requirements of the MHA program. Thus, while the MHA program did yield some BMR units (since development did not completely grind to a halt in MHA program areas), it yielded less market-rate development than would otherwise have occurred and perhaps less BMR development that would have occurred if different requirements had applied.

Voluntary inclusionary programs also must be precisely calibrated to spur development. As Chatman et al. (2023, 14) observe, “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.” As with mandatory inclusionary programs, the design of voluntary inclusionary programs can have a significant effect on development outcomes. In both cases, the impact of requirements and incentives will vary among jurisdictions and among sites within jurisdictions.

Modeling tools such as the Terner Center’s Housing Policy Dashboard can help policymakers to estimate the impact of different inclusionary requirements and incentives. This dashboard combines parcel level financial models assessing the financial feasibility of different development options with land-use and regulatory data, enabling users to assess the possible effects of a variety of different policy interventions (Casey et al. 2022). As of January 2023, the Terner Housing Policy Dashboard applies only to the City of Los Angeles, and the published report assessing the effects of different policies does not focus on the impact of BMR requirements or incentives (Casey et al. 2022).

Given the uncertainty concerning the impact of BMR requirements and incentives on housing production, state agencies should continue to devote resources to modeling efforts such as the Terner Dashboard as well as the development and maintenance of the data underlying these efforts. As the analyses in Chapters IV and V reveal, extending the model beyond the City of Los Angeles will require substantial improvements in data collection concerning regulatory designations. MPOs remain best positioned to collect the relevant data, but they should have more uniform guidance concerning data standards and quality control. If the legislature requires cities to declare presumptive densities, as proposed in section A.1.v above, that could substantially aid in relevant modeling exercises. In addition CARB, HCD, and the SGC should support the development of uniform standards for data collection and technical assistance for MPOs to adopt those standards and collect the relevant data. As documented in Chapter IV, significant idiosyncrasies in zoning measures can limit the ability of policymakers to assess local regulatory requirements. Therefore, in addition to compiling data on allowable density, the standards for data collection should include regulatory constraints such as minimum lot size, floor area ratio, and height restrictions.

B. Improving transportation efficiency in TE-adjacent, HHO areas

As Exhibit VII-2 illustrates, detached single-family housing is the predominant housing type in 96.3% of TE-adjacent, HHO areas. Thus any policies intended to reduce VMT in TE-HHO areas must be targeted to such neighborhoods. In an extensive review of the relevant literature, Chatman et al. (2023) advocate for additional development in single-family neighborhoods as a strategy for ameliorating housing affordability in concert with promoting transportation sustainability and accessibility. They note that “Some sustainability advocates may worry that a more general housing strategy like this would increase VMT,” but they demonstrate, based on an extensive review of the literature, that “this worry is misplaced” (Chatman et al. 2023, 66).

They recommend several evidence-based strategies, beyond those outlined above, which could reduce VMT in TE-adjacent HHO areas (and, in concert with more housing development in TE-adjacent, HHO areas, reduce VMT statewide), including:

- Authorizing and promoting road pricing;
- Supporting improvements in bus service, and reallocating some state transportation funds from rail and transit to improvement to support active transportation and carpooling;
- Abolishing minimum parking requirements.

The potential for each of these strategies to reduce VMT in TE-adjacent, HHO areas is outlined below.

1. *Expanding road pricing*

A large body of research summarized by Boarnet and Handy (2017), Shaheen et al. (2019), and Brown et al. (2021), among others, indicates that road pricing can have a relatively large effect on VMT reductions, particularly when paired with other policies that ensure the availability of alternative modes of transportation. In addition, road pricing can have substantial equity benefits, if implemented in order to promote equity, because "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," and some of the environmental burdens borne by lower-income households living near roadways would be ameliorated by congestion pricing (Chatman et al. 2023, 43).

2. *Improving (non-rail) alternatives to driving*

In general, TE-adjacent, HHO areas have limited access to rail infrastructure. But, as Chatman et al. (2023, 71) document, "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." Within TE-adjacent, HHO areas, carpooling was the second most popular form of commuting as of the 2012-2016 ACS, with 8.6% of workers using this mode of transportation, after driving alone (78.8% of workers). In conjunction with road pricing, enhanced support for carpooling via, for example, smartphone applications to facilitate identifying carpool options, could reduce household-based VMT in TE-adjacent, HHO areas. Improvements in pedestrian and bicycle safety in TE-adjacent, HHO areas could also reduce vehicle dependency, particularly for non-work trips.

3. *Abolishing minimum parking requirements*

Detached single-family housing predominates in most TE-adjacent, HHO areas, and there are generally few opportunities to build additional detached single-family units in these areas. As a result, much new housing in TE-adjacent, HHO areas will – if built – most likely take the form of middle housing. Abolishing parking requirements for middle housing would make such housing far more likely to be built (by lowering development costs) and would reduce the VMT generated by the residents of these units. As Chatman et al. (2023, 17) explain, "The requirement to include parking means that finding a profit point for cheaper housing is extremely difficult." Notably, the large increase in ADU permitting was preceded by stringent limitations on parking requirements.

In addition to making housing cheaper to build, eliminating minimum parking requirements would likely reduce VMT from the residents of new units. Manville (2017, 36) finds that residents of housing units with "bundled" parking (i.e., at least one parking space included in the cost of the housing unit) "are twice as likely to be vehicle-free if they do not have bundled parking," after controlling for a variety of other plausibly explanatory variables. Manville also conducts tests for self-selection (i.e., whether residents who prefer not to own cars choose units with unbundled parking for that reason) and finds no evidence that self-selection inflates his estimates. Manville and Pinski (2020) find that bundled parking increases household VMT and decreases a household's propensity to use transit, even among car owners.

In 2022, the California legislature adopted AB 2097, which prevents jurisdictions from requiring bundled parking for projects within one-half mile of public transit (as defined in the bill). The bill allows jurisdictions to continue to enforce parking requirements outside of these areas. Even within the covered transit-adjacent areas, a jurisdiction may enforce minimum parking requirements if it finds that abolishing the minimum would negatively affect its ability to satisfy its RHNA obligations for low- and very low income households, provide housing for special needs housing, or interfere with existing residential or commercial parking (Cal. Gov't Code, §65863.2(b), *added by* AB 2097 (2022)).[52] It is too early to determine whether this carveout will substantially limit the reach of the law. Moreover, as the research cited above suggests, one way to reduce VMT due to new development in TE-adjacent, HHO areas (as well as TE-HHO areas) would be to prohibit minimum parking requirements in these areas, where AB 2097 is unlikely to apply.

[52] This exception to the rule does not apply to certain BMR housing projects (Cal. Gov't Code, §65863.2(c), *added by* AB 2097 (2022)).

VIII. Summary, Conclusions, and Recommendations

This study identifies TE-HHO and TE-adjacent, HHO areas where new housing development could promote more equitable development patterns while reducing per capita vehicle miles traveled. It also estimates the potential for new housing in these areas based primarily on general plans and identifies policy levers to promote residential densification in these areas.

In developing the TE-HHO designation, we assessed existing metrics and techniques. We determined that it is crucial to create two separate metrics, one for "TE" areas and one for "HHO" areas, because combining the two into a single indicator can yield misleading results. Many indicators of transportation efficiency, such as residential density and transit accessibility, tend to be negatively correlated with a variety of indicators of neighborhood resources and amenities, including school quality, adult educational attainment, homeownership, and income. When relying on such a metric, the meaning of the "high opportunity" (or "high resource") construct becomes unclear. For example, a neighborhood with good access to jobs and transit may have lower-performing schools or relatively high pollution burdens, and a combined metric may not facilitate the relevant distinction. Creating the two metrics separately, and then identifying areas of overlap, facilitates the identification of areas with substantial resources where new development can reduce per capita VMT.

While it is important to create the two metrics separately, there are a variety of reasonable ways to create each metric. In creating the HHO metric, we opted for simplicity, creating an indicator based on three variables: tract-level median household income, inter-generational income mobility, and pollution burden scores. As Appendix 2 illustrates, the income-based component of this measure captures multiple dimensions of neighborhood resources, including test scores and poverty rates. Notably other researchers have also recently adopted an income-based measure for assessing housing policy in California, because such a measure easily translates to multiple scales, unlike other measures such as the TCAC/HCD Opportunity Map (Monkkonen, Lens, et al. 2023). (The income mobility measure and pollution burden measure are similarly scalable.) In creating the TE metric, we opted for continuity. Researchers have previously used the cluster analysis-based metric developed by Salon (2014) for statewide analysis to identify census tracts where additional residential development would reduce per capita VMT (A. L. Brown et al. 2021). We therefore updated this metric using more recent data. We then combined the TE and HHO designations to identify TE-HHO census tracts. We also identified TE-adjacent, HHO areas to identify HHO areas that may be most susceptible to becoming TE, due to their proximity to TE areas. We generated a geodatabase identifying census tracts as "TE-HHO", "TE-adjacent, HHO," "TE", or "non-TE, non-HHO."

Using the geodatabase, we evaluated the development potential in priority areas (i.e., TE-HHO areas and TE-adjacent, HHO areas). The estimates of potential buildout are primarily based on the maximum allowable density provided in local general plans. We used harmonized land use data provided by regional planning agencies, supplemented by local data collected from individual jurisdictions. We also explored the possibility of analyzing the cumulative constraints imposed by the layering of different regulatory restrictions, but found that the available data do not support such analysis.

The development potential in the identified priority areas, according to planning documents, substantially exceeds the number of existing units. Additionally, these areas are more likely to be racially concentrated areas of affluence (as defined by the California Department of Housing & Community Development), compared to the rest of the state, and they are less likely to be confronting gentrification, compared to TE areas not designated as HHO. The priority areas also do not currently provide substantial housing opportunities for new entrants. Such characteristics suggest that expanding housing opportunities in the identified priority areas can reduce housing costs and VMT, while contributing to enhanced socioeconomic mobility.

Our analysis revealed that, compared with the rest of the US, multifamily housing permitting in California has been significantly lagging since 2015, and we identified a variety of policy levers and data resources that could facilitate housing development in TE-HHO and TE-adjacent, HHO areas. These include:

- **More effectively authorizing middle housing in single-family zoning districts statewide, including in TE-HHO and TE-adjacent, HHO areas.** Middle housing includes townhomes, duplexes, triplexes, and quadplexes. State law currently authorizes the development of such housing in single-family zoning districts, but restricts development to owner-occupiers and allows local governments to impose fees and burdensome substantive requirements. California's success in liberalizing the regulation of accessory dwelling units provides a model for potential changes to middle housing regulation, as do examples from other states such as Oregon.
- **Requiring each local government to identify presumptive densities for sites included in the Housing Element of its general plan.** Our analysis reveals that general plan land use elements often include densities for housing sites that may be unrealistic. This is potentially problematic, because several recently adopted laws give enhanced regulatory significance to these general plan densities. In addition, if municipalities declare a presumptive density for each site in their Housing Elements, then they can more realistically calculate the number of housing units that they expect to be developed over an eight-year planning cycle. Such declarations would also substantially improve the kinds of modeling efforts described below.
- **Providing authoritative maps of sites that should be exempt from California Environmental Quality Act (CEQA) review or that should qualify for expedited review of their exempt status.** CEQA can provide important information about possible environmental harms, but it can also delay or derail residential infill projects that would yield environmental benefits and improve affordability. Although there are numerous exemptions from CEQA for infill projects, it is often unclear whether a particular exemption applies to a given project. A 2023 amendment to state law provides for expedited judicial review of exemptions for infill projects and adopts a standard of review that should militate in favor of exemption for qualifying projects. However, it is not clear which projects will qualify for expedited review. At a minimum, the state should require municipalities to identify qualifying sites as part of their housing elements. More broadly, the state legislature could consider creating infill priority areas, where middle housing and multifamily residential development is exempt from CEQA review.
- **Facilitating the targeting of incentives and mandates for below-market-rate housing using quantitative models.** Programs that require the provision of below-market-rate (BMR) units as a condition of project approval often produce BMR units. But such

requirements can also preclude development of projects that might otherwise have been built, thereby impeding the state's efforts to address its housing shortage. Even programs providing incentives for the inclusion of BMR units must be precisely calibrated to spur development. Modeling tools can help policymakers to prospectively estimate and retrospectively assess the impacts of different requirements and incentives.

- **Improving data collection to facilitate mapping and modeling.** Our analyses reveal that statewide modeling and mapping exercises will require substantial improvements in data collection concerning regulatory designations. Metropolitan planning organizations (MPOs) are best positioned to collect the relevant data, but they should have more uniform guidance concerning data standards and quality control. If the legislature requires cities to declare presumptive densities, as described above and detailed in Chapter VII, that could substantially aid in relevant modeling exercises. In addition state agencies could support the development of uniform standards for data collection and technical assistance for MPOs to adopt those standards and collect the relevant data. As documented in Chapter IV, significant idiosyncrasies in zoning measures can limit the ability of policymakers to assess local regulatory requirements. Therefore, in addition to compiling data on allowable density, the standards for data collection should include regulatory constraints such as minimum lot size, floor area ratio, and height restrictions.

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Glossary of Terms

AB: Assembly Bill
ABAG: Association of Bay Area Governments
ACS: American Community Survey
ADU: Accessory Dwelling Unit
AFFH: Affirmatively Furthering Fair Housing
AMI: Area Median Income
API: Asian and Pacific Islander
APR: Annual Progress Report
BMR: Below-market-rate
CBSA: Core-Based Statistical Area
CEQA: California Environmental Quality Act
CFA: Confirmatory Factor Analysis
COG: Council of Governments
DAC: Disadvantaged Community
DBL: Density Bonus Law
DU: Dwelling Unit
FAR: Floor Area Ratio
FCOG: Fresno Council of Governments
GHG: Greenhouse gas
HCD: Department of Housing & Community Development
HOA: Homeowner Association
IPA: Infill Priority Area
MFA: Mitigation Fee Act
MPO: Metropolitan Planning Organization
MTO: Moving to Opportunity for Fair Housing Demonstration Program
OPR: Office of Planning & Research
REAP 2.0: Regional Early Action Planning grant program
RCAA: Racially Concentrated Areas of Affluence
RHNA: Regional Housing Need Assessment/Allocation
RIP: Residential Infill Project
SACOG: Sacramento Area Council of Governments
SANDAG: San Diego Association Of Governments
SB: Senate Bill
SBCAG: Santa Barbara County Association of Governments
SCAG: Southern California Association of Governments
SCS: Sustainable Communities Strategy
SFR: Single family residence
TAZ: Transportation Analysis Zone
TCAC: California Tax Credit Allocation Committee
TE-HHO: Transportation-efficient, healthy, high-opportunity

Appendix 1. Applying Confirmatory Factor Analysis to California's Opportunity Map

Confirmatory factor analysis is applied to the model that the California Tax Credit Allocation Committee and the Department of Housing and Community Development (TCAC/HCD) used to develop the 2021 Opportunity Map. This appendix first provides an overview of CFA, explains why CFA is suitable for evaluating the model used by TCAC/HCD in opportunity mapping, and describes the results of the analysis. In CFA, researchers assume that observed variables (e.g., opportunity indicators) are reflective of underlying latent factors (e.g., domains of opportunity). The covariance among the indicators is used to confirm or reject the hypothesized factor structure. As suggested by the covariance among the indicators that the Opportunity Map combines to create the three pre-specified domains of opportunity (economic, environmental, and education), these three domains are not adequately represented by the indicators.

A. Confirmatory factor analysis

CFA addresses latent variable measurement models, which provide the relationships between a group of observed indicators and a smaller set of latent variables (i.e., factors that are not observed directly) (Brown and Moore 2014). CFA begins with a set of pre-specified factors, and each factor is assumed to influence a group of observed indicators and account for the correlations among these indicators. Ideally, the pre-specified measurement model should be based on a strong empirical or conceptual foundation. CFA can provide evidence of the validity of a theoretical construct by testing whether the covariance of the observed indicators is consistent with the factor structure of the hypothesized model.

The TCAC/HCD Opportunity Map seeks to identify the level of the opportunity and resources for each census tract or rural block group. The opportunity metric is developed based on a model that anticipates three latent constructs of opportunity, which can be measured by indicators "linked to improved life outcomes for low-income families" (California Fair Housing Task Force 2020, 6). As discussed in the main report, validity – whether an indicator accurately represents the underlying phenomenon of interest – is an important criterion for evaluating opportunity metrics. CFA is suitable for evaluating the validity of the model used in the TCAC/HCD Opportunity Map by showing how well the observed indicators reflect the underlying domain of opportunity.

B. Applying CFA to the Opportunity Map model

The model used in the TCAC/HCD Opportunity Map can be thought of as a three-factor, first-order model. It is a first-order model, because no higher-order factor is specified to account for the correlations among the three opportunity factors. The model contains three latent constructs or factors (i.e., the economic, environmental, and education domains of opportunity) and a set of indicators that represent each factor. For example, the five indicators of the economic domain - poverty, adult education, employment, job proximity, and median home value - are assumed to share the common influence of the unobserved economic domain. Before conducting analysis based on the three opportunity domains, the TCAC/HCD investigators first filtered out tracts identified as racially segregated and high-poverty. Following the TCAC/HCD methodology, we remove these tracts from the sample and then use CFA to test the validity of the TCAC/HCD three-factor model.[53] We obtain the data on all indicators used to develop the Opportunity Map from the Othering & Belonging Institute.

Several model fit indices, presented in Exhibit A1, suggest that the TCAC/HCD model does not fit the data well. Our CFA begins with the hypothesis that the model can be expressed as three opportunity factors underlying a set of observed indicators. A poorly fit CFA model would indicate that the covariance of the observed indicators cannot be adequately captured by the factor structure of the hypothesized model. Following Brown & Moore (2014) and Knaap (2017), we use the following fit indicators to evaluate the model used in the Opportunity Map:

- The Standardized Root Mean Square Residual (SRMR), which represents the square-root of the difference between the residuals of the sample covariance matrix and the hypothesized model;
- The Incremental Fit Index (IFI), which represents the ratio of the model chi-square and the chi-square of a baseline model that assumes there are no latent variables, adjusting for sample size and degrees of freedom;
- The Bentler's Comparative Fit Index (CFI), which measures the relative improvement in fit from the baseline model to the hypothesized model;
- The Tucker–Lewis index (TLI), which measures the reduction in misfit per degree of freedom from the baseline model to the hypothesized model; and
- The root mean square error of approximation (RMSEA), which assesses how far a hypothesized model is from a perfect model.

A better fit between model and data is indicated by: (1) a small discrepancy between the data and the hypothesized model (i.e., smaller SRMR); (2) a large improvement in fit compared to a poorly fit baseline model that assumes no correlations between all variables (i.e., larger IFI, CFI, and TLI); and (3) a hypothesized model that closely approximates a perfect model (i.e., smaller RMSEA). All values from the CFA analysis of the TCAC/HCD model fall outside of the guidelines for acceptable model fit (Exhibit A1).[54]

[53] CFA is implemented using the lavaan package in R (a statistical computing software environment) (Rosseel 2012).
[54] Other important parameter estimates from CFA include factor loadings, which are regression coefficients expressing the direct effects of the latent variables on the indicators. Factor loadings are not examined in this analysis because they should only be interpreted in the context of a model with a good fit (Brown and Moore 2014). If the model does not provide a good fit to the data, the estimated factor loadings are likely biased.

Exhibit A1: Model Fit Indices

Fit measure	Value	Guidelines for acceptable model fit
SRMR	0.082	<0.08
IFI	0.792	>0.9
CFI	0.792	>0.9
TLI	0.765	>0.9
RMSEA	0.092	<0.08

Note. "SRMR" = standardized root mean square residual; "IFI" = Incremental Fit Index; "CFI" = comparative fit index; "TLI" = Tucker-Lewis Index; and "RMSEA" = root mean square error of approximation. These indices provide different information about model fit (e.g., incremental fit and absolute fit).

Appendix 2. Resource and Demographic Indicators by Income

We sort tracts into five income categories: below 80%, 80-100%, 100-120%, 120-140%, and at or above 140% of the statewide median household income as of the 2015-19 ACS. We refer to the five categories as below middle, lower middle, upper middle, high, and highest income. As shown in Exhibit A2, tracts in a higher income category generally fare better in a wide range of resource indicators.

Exhibit A2: Resource and Demographic Indicators by Income Category

Income Category	N	Mean Math Proficiency	Mean Reading Proficiency	% Unemployed	% Receiving Public Assistance	Mean Commute Time	% with a Bachelor's or higher	% owner-occupied housing	% in Poverty	% in Single-Parent Households
Highest	1,786	63	65	2.7	1.3	32	65	71	5	7
High	901	52	56	3.1	1.9	31	50	63	8	9
Upper Middle	1,148	46	51	3.4	2.3	30	43	58	9	11
Lower Middle	1,383	41	46	3.9	3.1	29	35	52	13	13
Below Middle	2,747	34	39	5.1	5.8	28	24	39	23	20

Appendix 3. Land Use Data Collected Individually from Local Jurisdictions

For conducting the analysis of nominal capacity, we collected land use data for jurisdictions outside of the ABAG and SCAG regions, which have provided harmonized land use data. We did so by searching city data platforms and emailing local agencies if the information was not available online. Exhibit A3 describes the land use data collected individually from local jurisdictions.

Exhibit A3: Individually Collected Land Use Data from Local Jurisdictions

Local Jurisdiction	County	Data Collection Method	Data Collected
Unincorporated El Dorado County	El Dorado	Email	General Plan
Fresno city	Fresno	Online	Zoning
Clovis city	Fresno	Online	General Plan
Unincorporated Fresno County	Fresno	Online	Zoning
Bakersfield city	Kern	Online	General Plan
Unincorporated Kern County	Kern	Online	General Plan
Unincorporated Monterey County	Monterey	Online	General Plan
Monterey city	Monterey	Email	General Plan
Lincoln city	Placer	Online	Zoning
Roseville city	Placer	Online	General Plan
Unincorporated Placer County	Placer	Online	General Plan
Rocklin city	Placer	Email	General Plan
Citrus Heights city	Sacramento	Email	Zoning
Elk Grove city	Sacramento	Online	General Plan
Folsom city	Sacramento	Email	General Plan
Rancho Cordova city	Sacramento	Online	General Plan
Sacramento city	Sacramento	Online	General Plan
Unincorporated Sacramento County	Sacramento	Online	General Plan
Carlsbad city	San Diego	Online	General Plan
Chula Vista city	San Diego	Online	General Plan
Coronado city	San Diego	Email	Zoning
Encinitas city	San Diego	Online	Zoning
Escondido city	San Diego	Online	General Plan
La Mesa city	San Diego	Online	General Plan
Oceanside city	San Diego	Online Portal Request	Zoning
Poway city	San Diego	Online	Zoning
San Marcos city	San Diego	Email	General Plan
Santee city	San Diego	Email	General Plan
San Diego city	San Diego	Online	Zoning

Solana Beach city	San Diego	Email	Zoning
Vista city	San Diego	Online	General Plan
Unincorporated San Diego County	San Diego	Online	Zoning
El Cajon city	San Diego	Email	General Plan
Del Mar city	San Diego	Online Portal Request	Zoning
Tracy city	San Joaquin	Online Portal Request	General Plan
Lodi city	San Joaquin	Email	General Plan
Santa Barbara city	Santa Barbara	Email	General Plan
Santa Maria city	Santa Barbara	Email	General Plan
Unincorporated Santa Barbara County	Santa Barbara	Email	General Plan
Goleta city	Santa Barbara	Email	General Plan
Santa Cruz city	Santa Cruz	Online	General Plan
Scotts Valley city	Santa Cruz	No response	
Unincorporated Santa Cruz County	Santa Cruz	Online	General Plan
Modesto city	Stanislaus	No response	
Davis city	Yolo	Email	General Plan
Woodland city	Yolo	Email	General Plan
Unincorporated Yolo County	Yolo	Online	General Plan
West Sacramento city	Yolo	No response	

Appendix 4. Validating Nominal Capacity Estimates within ABAG and SCAG Counties

Because ABAG and SCAG compile land-use designation and density information from local plans and ordinances, errors may occur due to variations in data quality and accuracy across jurisdictions. To validate the derived nominal capacity and resolve some of the potential measurement errors, we further investigate the parcels with unusually low and unusually high derived capacities.

We first examine the parcels for which the derived capacity is less than 1 unit per parcel. A spot check of the data shows that many of the parcels with derived capacities of less than 1 unit are used for residential purposes and have at least one housing unit, with the exception of parcels that are very small in size (i.e., less than 0.01 acre, or 500 square feet). A small number of parcels have a maximum allowable density of less than 1 unit per acre (ranging from 0.05 to 0.5). Most of these parcels are located in the unincorporated area of Los Angeles County, and the others are largely located in high-income jurisdictions including Rancho Palos Verdes and La Cañada Flintridge. Given the low allowable density, the derived capacity for many of these parcels is less than one unit. We recode the derived capacity to 1 if a parcel meets two criteria: (1) the calculated nominal capacity (i.e., maximum allowable density multiplied by parcel size) is less than 1 and (2) the parcel size is larger than 0.01 acre. We recode the derived capacity as zero if the calculated nominal capacity is less than 1 and the parcel size is no greater than 0.01 acre.

We then examine the derived maximum number of units nominally allowed on SFR parcels according to the general plans or zoning ordinances. We focus on SFR parcels because, in principle, the nominal capacity for such parcels should be 1 unit per parcel. For the Bay Area, the parcels designated for SFR according to the general plan or zoning have a nominal capacity of 1.57 units on average. While 88 percent of the SFR-designated parcels are used for SFR, the existing uses for the remaining parcels include condos, cluster homes, duplexes, commercial buildings, etc. Limiting the sample to only parcels that are planned or zoned for SFR and are used as SFR, the average nominal capacity goes down to 1.4 dwelling units. While this value is still substantially larger than one, the average parcel planned and used for SFR is 0.21 acres or 9,148 square feet. Therefore, it is reasonable that a parcel of this buildable area can be subdivided to accommodate more than 1 unit and we use derived maximum unit counts that are greater than one.

Additionally, we compare the derived nominal capacity on the parcels that are designated for single-family residential use in local general plans and, where applicable, specific plans for the SCAG region. According to our analysis, the median nominal capacity for these parcels is 1.1 units. However, there are also values substantially larger than 1. For example, one 49-acre parcel planned for single-family residential use in Los Angeles is in fact used to accommodate mobile homes and has a derived capacity of 592 units. In Fullerton, Orange County, a 39-acre parcel is planned for single-family residential but currently has a golf course on it. If this parcel is redeveloped into residential use, current density standards will allow a maximum of 235 units. Whether a parcel designated for SFR can accommodate more than 1 unit largely depends on whether the parcel can be further subdivided. We find that for parcels that are designated for SFR use and have a nominal capacity of 2 units or more, the minimum parcel size is 0.06 acres, or approximately 2600 square feet. We treat these parcels as subdividable to fit more than one unit.

Lastly, for parcels in the City of Newport Beach, we use the nominal capacity directly obtained from the local planning agency in place of the SCAG data. This is because density data for Newport Beach is largely missing in the SCAG data, and the city contains a large number of TE-HHO tracts. There are also tracts in the Bay Area with missing or misleading allowable density data. For example, “06081603801” in San Bruno City is missing density information for the majority of the parcels. Another example is from tract “06001425103” in Emeryville, where the allowable density equals zero for 95 percent of the parcels. Upon spot-checking the parcels, it is clear that the allowable density is not zero. Therefore, we set the nominal capacity for these parcels equal to the tract’s density average

Appendix 5. Nominal Capacity by Existing Use in ABAG and SCAG Regions

We analyze the parcels with high nominal capacity estimates in the SCAG and ABAG regions. In SCAG, parcels with high nominal capacities are generally planned for mixed-use and multi-family use. There are also a smaller number of parcels planned for SFR, with very large lot sizes. For example, a parcel in Yorba Linda planned for SFR has a lot size of 268 acres, which can accommodate 4,815 units, although it is vacant. Another parcel in Rancho Mirage has a SFR parcel with 407 acres, which has a capacity of 2,036 housing units, but it is also vacant. Although there are unsubdivided SFR parcels with large estimates, the majority of the parcels that make up the larger share of our nominal capacity estimates are parcels that are planned for mixed use or multifamily, but are vacant or used as commercial space.

In ABAG, parcels with significantly large nominal capacities are mostly planned for mixed use residential and have large general plan densities. For example, San Jose has two parcels that are 35 acres and are planned for mixed use. After considering the buildable area of these two parcels, the maximum number of units is 16,900 units. However, the existing use of these parcels are retail stores and an orchard. Exhibit A4 and Exhibit A5 present the estimated nominal capacity by type of existing land use. Exhibits A6, A7, and A8 provide examples of parcels in San Jose with high nominal capacity but few residential units. Another parcel in Rohnert Park has a maximum capacity of 4,340 units, but the existing use is manufacturing. While the SFR parcels generally have low densities, there is a parcel in Burlingame that spans 302 acres, with a density of 8 du/acres. This parcel can accommodate 2,414 units according to our estimate; however, the existing use of this parcel is unknown. In this region, we also come across three parcels that are planned for mixed use, but are being used as parking lots. These parcels have a nominal capacity of 5244 units.

Lastly, we analyze the nominal housing capacity of parcels that are planned as residential but are used as golf courses in the SCAG and ABAG regions. This is particularly an issue related to the SCAG area, as over 1000 parcels planned for residential purposes are being used as golf courses. In ABAG, there are only 16 parcels that are planned for residential use and are being used as golf courses. These parcels have a nominal capacity of 11,122 out of 2,027,805 estimated units in SCAG and 1,670 units out of 2,663,103 estimated units in ABAG.

Overall, we find that parcels with large nominal capacity usually fall into three key categories: (1) planned mixed-use/multifamily parcels used for various non-residential purposes; (2) planned mixed-use/family parcels used for low-density residential development; and (3) unsubdivided single-family parcels that are either vacant, used for non-residential purposes, or developed for residential purposes with a density lower than allowed in planning and zoning standards.

Exhibit A4: Nominal Capacity by Existing Use, ABAG Region

Maximum Nominal Capacity by Existing Land Use for ABAG				
Existing Land Use	Share of Land Area (%)	Number of Parcels	Estimated Capacity (units)	Share of Estimated Capacity (%)
Single Family Residential	65	741,073	1,102,595	41
Multi-Family Residential	9	148,117	625,040	23
Commercial	3	8,858	358,328	13
Unknown	8	43,255	246,134	9
Vacant	4	10,227	102,812	4
Public Facilities	3	3,311	63,469	2
Planned Unit Development	2	15,256	57,313	2
Industrial	1	823	39,026	1
Mobile Homes and Trailer Parks	1	199	16,717	1
Transportation, Communications, and Utilities	0	522	14,112	1
Agriculture	2	272	13,390	0
Special Care Facilities	0	320	9,254	0
Mixed Commercial and Industrial	0	734	6,809	0
Rural Residential	1	614	5,443	0
Open Space and Recreation	1	145	1,562	0
Educational Institutions	1	405	1,093	0
Undevelopable or Protected Land	0	3	6	0

Exhibit A5: Nominal Capacity by Existing Use, SCAG Region

Maximum Nominal Capacity by Existing Land Use for SCAG				
Existing Land Use	Share of Land Area (%)	Number of Parcels	Estimated Capacity (units)	Share of Estimated Capacity (%)
Single Family Residential	68	756,066	1,135,249	56
Vacant	12	19,560	167,812	8
Multi-Family Residential	8	67,984	496,114	24
Open Space and Recreation	4	7,777	11,122	1
Commercial	2	5,433	102,448	5
Public Facilities	1	1,639	27,780	1
Transportation, Communications, and Utilities	1	3,143	0	0
Educational Institutions	1	634	2	0
Agriculture	1	519	16,062	1
Mobile Homes and Trailer Parks	1	4,827	22,353	1
Undevelopable or Protected Land	1	505	766	0
Under Construction	0	1,426	14,859	1
Unknown	0	2,027	10,487	1
Rural Residential	0	859	3,106	0
Mixed Residential	0	1,830	8,314	0
Industrial	0	1,500	11,253	1
Water	0	68	0	0
Mixed Commercial and Industrial	0	2	80	0

Exhibit A6: Parcel Example of 1590 Berryessa Rd, San Jose, CA 95133

Note: Parcel is designated as “Urban Village” in general plan and used for retail stores. Estimated nominal capacity is at 8,494 units.

Exhibit A7: Parcel Example of 175 River Oaks Pkwy, San Jose, CA 95134

Note: Parcel is designated as “Transit Residential” in general plan and used for an orchard. Estimated nominal capacity is at 8,406 units.

Exhibit A8: Parcel Example in Downtown San Jose

Note: Parcel is designated as "Downtown" in general plan and is vacant. Estimated nominal capacity is at 7,559 units.

Appendix 6. Validating Consumer Reference Data

Prior to the migration analysis, we conducted several validation exercises of the consumer reference data, including assessing the accuracy of tract identifiers and addresses and comparing the ethno-racial and income variables to census data. This appendix details the results of the validation exercises.

A. Validating tract identifiers in consumer reference data

The consumer reference data provides census tract identifiers for each household. To validate these tract identifiers, we use subsets of the 2010 and 2019 samples in the data. Specifically, we use observations in Orange County in years 2010 and 2019. We spatially joined the consumer reference data to the Census TIGER/Line geodatabase and verify the accuracy of the tract identifiers.

The tract identifiers from the consumer reference data are consistent with the tract codes obtained through the spatial join process for 96 percent of the households. Upon spot-checking 10 unmatched observations, we find that the geocoding errors in the consumer reference data yield inaccurate coordinates. The tract identifiers in the consumer reference data are based on street addresses, while the tract identifiers obtained from the spatial join process are based on coordinates, which could be erroneous. Therefore, we use the tract identifiers provided by consumer reference data in our analysis.

B. Validating race/ethnicity information

To validate the race/ethnicity information provided in the consumer reference data, we randomly sampled 1,000,000 observations (i.e., householders) from Orange County in 2019. We obtained race/ethnicity information using an alternative method. By comparing the race/ethnicity distribution with the ACS, we find that the ethnicity information provided in consumer reference data is suitable for use.

The race/ethnicity information in the consumer reference data is imputed by DataAxel. This approach involves deriving national origins based on a name and surname analysis and categorizing the national origins into race/ethnicity groups based on the majority race in the region. DataAxle provides an appendix with predicted race/ethnicity for each national origin. We collapse the race/ethnicity categories to align with those used in the ACS. There are 73,496 householders missing race/ethnicity in the data.

Alternatively, we followed the method described in Diamond et al. (2019) to infer race/ethnicity based on individuals' name and location. This method uses the NamePrism API to derive race/ethnicity distributions for individual names. For example, entering the name "Barack Obama" on the API yields a distribution of 70.79% black, 28.86% white, and 0.21% Asian and Pacific Islander. We apply this API to obtain name-based race/ethnicity distributions for all observations. Next, we obtain the racial/ethnic distribution at the block group level from the 2019 5-year ACS. Using the name and location priors, we compute the posterior distribution using Bayes' Rule and assign a derived race/ethnicity to observations if the probability for the highest race/ethnicity category is at least 80% for an observation. Otherwise, we treat the observation's race/ethnicity as missing. As a result, race/ethnicity is missing for 141,269 householders.

Exhibit A9: compares the racial/ethnic distributions in Orange County obtained from these two methods with the ACS 2019 1-year estimates. Compared to the distribution derived using the Diamond et al. (2019) approach, the distribution in the consumer reference data aligns more closely with the ACS. Non-Hispanic white householders are slightly overrepresented, while Black/African American householders underrepresented. Additionally, the missing data issue is less pronounced in the consumer reference data compared to using the alternative method for inferring race/ethnicity. Therefore, we use the race/ethnicity information in the consumer reference data for our analysis.

Exhibit A9: Racial/Ethnic Distributions for Householders in Orange County

Race/Ethnicity of Householder	Consumer Reference data	Diamond et al. (2019) Method	ACS 2019 1-year estimates
Hispanic Householder (%)	23.9%	4.7%	24.3%
API Householder (%)	17.4%	15.2%	20.9%
Black / African American Householder (%)	0.8%	0.2%	1.9%
White Householder (%)	57.8%	80.0%	50.6%
Other Race Householder (%)	0.1%	0.0%	2.3%

Lastly, we compare the full 2019 consumer reference data sample with households statewide in the 2019 1-year ACS. As shown in Exhibit A10, the median age of householders in the consumer reference data sample is higher than the statewide distribution. Households with non-Hispanic white householders are notably overrepresented in the sample, while Black / African American householders are significantly underrepresented. However, median household income and median home value are lower in the consumer reference data sample than in the ACS.

Exhibit A10: Comparison of Consumer Reference Data 2019 Sample with ACS

Variable	Consumer Reference data 2019 sample	Households Statewide
Number of Households	11,637,740	13,157,873
Median Age of Householder	57	51
Married Households (%)	53.5	49.3
Share of Households with Children (%)	34.9	28.9
Average Household Size	2.5	2.9
Hispanic Householder (%)	25.8	29.7
API Householder (%)	10.9	14.7
Black / African American Householder (%)	2.5	6.2
White Householder (%)	60.7	46.7
Other Race Householder (%)	0.1	2.6
Owner Households (%)	78.3	54.9
Median Household income, in thousands of 2019$	66	80
Median Home Value, in thousands of 2019$	366	569