The California Department of
Housing and Community Development

DATA STRATEGY

An Appendix to the
Statewide Housing Plan

Executive Summary

With half of California renters struggling to afford their housing and record numbers experiencing homelessness, the state needs certainty when determining which housing policies are most effective. The California Legislature recognized that better housing data would lead to better housing outcomes and required the California Department of Housing and Community Development (HCD) to develop a 10-year housing data strategy as part of each four-year update of the Statewide Housing Plan.

While the Legislature tasked HCD with developing a statewide housing data strategy, HCD is only one of several state agencies and departments that collects and leverages housing data to complete its work. To ensure this Data Strategy meets the needs of the many organizations that rely on housing data, HCD convened a workgroup comprised of state departments and agencies, Metropolitan Planning Organizations (MPOs), local governments, academic institutions, nonprofits, and software vendors. Based on the priorities shared in the workgroup sessions, HCD developed three overarching principles to support the state in making strategic decisions about investments in housing data collection and infrastructure:

- **Collect the Right Data at the Right Time:** The state needs congruency between the data collected and the data needed to answer policy questions. By focusing on collecting the right data, the state will strike an appropriate balance between data richness and the resources required for data collection. Having readily available data is critical for policymakers responsible for making time-sensitive decisions about how to allocate resources to meet urgent housing needs.

- **Build Capacity Within and Outside of the State:** Data-informed housing policy requires accurate data collection and reporting at the local level and effective data governance and management by the state. Streamlining and automating reporting requirements for local governments, along with investing resources in building local and state data capacity, will improve data quality and use of staff resources.

- **Leverage Partnerships:** Stakeholders and state entities have a shared interest in high-quality, up-to-date housing data, and each participant brings different expertise to the table. Partnerships between state departments and agencies, Housing Authorities, research institutions, nonprofits, Metropolitan Planning Organizations (MPOs), counties, cities, and the private sector are necessary to achieve the priorities laid out in this strategy.

Data Goals and Priorities

Timely, accurate, localized housing data creates the foundation for data-driven policy design, implementation, evaluation, and enforcement. The Data Strategy puts forth data priorities that will help the state enforce existing housing laws and inform state housing policymaking. These priorities are organized into four overarching goals: build strong data foundations, collect and curate foundational datasets, leverage data to drive policy decisions, and make reporting accurate data easier. Each goal is supported by data priorities that capture the most pressing housing data needs shared by stakeholders in the workgroup sessions.

Build Strong Data Foundations: Collecting, managing, and disseminating accurate data requires a foundation of data standards, shared definitions, and governance structures.

- **Develop strong data infrastructure and governance:** Deploy the appropriate HCD staff necessary to implement this strategy and develop successful data governance practices. Provide HCD staff with the training, databases, tools, and resources needed to support effective data use in all program areas.

- **Enable data access:** Create tools such as interactive maps and data dashboards that support local governments in developing data-informed policies and allow the public to better understand housing needs in their communities.

- **Create shared definitions:** Develop a consistent lexicon that is used across all jurisdictions with definitions available to researchers and the public.

Collect and Curate Foundational Datasets: Create foundational datasets, including through leveraging existing datasets, on development patterns and the existing housing stock to inform data-driven policymaking. Foundational datasets require ongoing, robust data management to ensure these datasets are effective policymaking tools.

- **Locate deed-restricted affordable housing:** Know the location and key characteristics of all deed-restricted affordable units in the state, including when rental restrictions expire and the target populations those projects serve.

- **Track the housing development pipeline:** Collect and maintain accurate data on the entire development pipeline from the initial application through occupancy for all housing projects, including monitoring the usage of state housing laws. Ensure projects have unique identifiers that allow them to be mapped and tracked through the full development process.

- **Collect data to better understand existing housing stock characteristics:** Identify and curate datasets that provide policymakers with a better understanding of the existing housing stock and rental prices, including datasets that help locate non-subsidized affordable housing units.

- **Develop a statewide land use map:** Develop and maintain a publicly available statewide zoning and parcel map.

Leverage Data to Drive Policy Decisions: Data-driven housing policy requires analyzing data to support better policy design, evaluation, and enforcement. Policymakers need the best available data and analytics to make time-sensitive decisions about how to allocate resources and design policies to meet critical housing needs.

- **Take a data-driven approach to affirmatively furthering fair housing:** Leverage data to ensure state affordable housing programs, Regional Housing Needs Allocations (RHNA), and local housing plans (housing elements) affirmatively further fair housing.

- **Measure displacement:** Collaborate with research institutions, local governments, and tenant advocates to better understand eviction and displacement risk.

- **Leverage data to design and target programs to end homelessness:** Track and analyze data on longitudinal interactions with the homelessness response system.

Utilize data to evaluate existing programs and design housing solutions that meet the needs of persons experiencing and at risk of homelessness.

Make Reporting Accurate Data Easier: High-quality state level datasets rely on accurate data collection and reporting at the local level. Efforts to make data reporting easier for local governments through automation and capacity building improve data quality and conserve local resources.

- **Streamline data collection:** Streamline and automate the process of collecting Housing Element Annual Progress Report (APR) data from cities and counties. Provide technical assistance and technology solutions to support local governments in adopting new approaches to submitting APRs.

- **Build data capacity:** Build data capacity within local governments and tribal entities. Deploy the resources necessary to collect timely, accurate housing data at the local level and enable policymakers to utilize these data in decision-making.

This report details a 10-year vision for each data priority. This includes recommended first steps that state departments and agencies can take and policy recommendations for the Legislature to support this vision. Successfully implementing this Data Strategy will require leadership by multiple state actors and strong, ongoing partnerships between state and non-state entities.

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Preamble

To ensure a California for all, every Californian must have a safe and affordable place to call home. The Statewide Housing Plan puts forth an ambitious yet achievable agenda to meet the housing needs of all Californians. The plan outlines policy recommendations that support three primary objectives:

1. **Keep Californians in their homes**

2. **Produce more affordable and climate-smart housing**

3. **Continue to act with urgency to address homelessness and housing need**

To make the best housing decisions for California, state housing policymakers need access to the most current and accurate data. The state must improve how it collects and analyzes data to answer critical policy questions, such as: Where is housing being planned for and built, and at what affordability level? Where are people being displaced when affordable properties convert to market rate? Who is at greatest risk of displacement and homelessness?

The California Legislature recognized that better housing data would lead to better housing outcomes and required the Department of Housing and Community Development (HCD) to develop a 10-year housing data strategy as part of each four-year update of the Statewide Housing Plan. This document, pursuant to Section 50423 of the Health and Safety Code, represents the state's first Housing Data Strategy.

The Data Strategy explores the data required to enforce existing housing laws and inform state housing policymaking while also considering the necessary resources to support this work. Timely, accurate housing data supports policymakers at all levels to achieve their housing-related goals. Implementing this Data Strategy requires the leadership of several state agencies and departments in partnership with local and regional governments, research institutions, nonprofits, and the private sector.

Introduction

With half of California renters struggling to afford their housing and record numbers experiencing homelessness, the state needs certainty when determining which housing policies are most effective. Timely, accurate housing data creates the foundation for data-driven policy design, implementation, evaluation, and enforcement. With the right data, the state can:

- Measure displacement risk and track interactions with the homelessness response system to target policy interventions that keep Californians in their homes and help end homelessness
- Identify subsidized and non-subsidized affordable housing to maintain and preserve existing affordable housing
- Assess housing development timelines to identify barriers that cause delays and drive up housing costs
- Track where housing is being produced – and at what cost – to determine if enough housing is being built near jobs, transit, and resources at all affordability levels

Better housing data is needed for more than just the development and implementation of housing policy. Housing data supports the work of many other state departments and agencies. The provision of social services, from healthcare to education, relies on an understanding of where people live and whether their basic housing needs are being met. The state must understand future development patterns – where people *will* live – to design policies to support economic development and address climate change.

Timely, accurate, localized housing data becomes even more important during an emergency. Households experiencing housing instability are more vulnerable in emergencies, including the COVID-19 pandemic and wildfires. Housing data supports policymakers in all sectors address emergencies, from education to public health to natural disaster response.

Despite the need for data-driven solutions, the state lacks information to fully answer some of its most pressing policy questions. Much of the necessary housing data is not collected by any government entity, or it is collected at the local level but not aggregated by the state. In other cases, data are collected by the state in a format that is not amenable to analysis.

Furthermore, much of the current housing data policymakers use tracks lagging indicators, making it difficult to design proactive policies to meet housing need. For example, the state has data on how it is serving people experiencing homelessness, but not data on how well the state is preventing households from needing homelessness prevention services in the first place. The Homeless Data Integration System (HDIS) captures data on households interacting with the homelessness response system, but the state lacks comprehensive data on displacement, which would allow policymakers to target anti-displacement resources and prevent households from slipping into homelessness. Additionally, many policymakers rely on federal data from the Census Bureau

to understand housing need. These data are released at a multi-year lag, making it challenging to understand the current housing landscape.

The Legislature tasked the California Department of Housing and Community Development (HCD) with developing a statewide housing data strategy but HCD is not alone in the need for housing data and is only one of the state entities currently collecting and analyzing housing data. The Legislature has entrusted several state agencies and departments with a role in the housing ecosystem, from funding housing and homelessness services, to enforcing housing laws to land use and transportation planning. Implementing this Data Strategy will require leadership by multiple state actors and strong, ongoing partnerships between state and non-state entities. When developing policies to address housing data needs, the Legislature should consider the existing authority and strengths of various state entities, and support collaboration where possible.

To ensure this Data Strategy meets the needs of the many organizations that rely on housing data, HCD convened a Data Strategy workgroup comprised of state departments and agencies, Metropolitan Planning Organizations (MPOs), local governments, academic institutions, nonprofits, and software vendors. Based on the priorities shared in these workgroup sessions, HCD developed three overarching principles to support the state in making strategic decisions about investments in housing data collection and infrastructure:

- **Collect the Right Data at the Right Time:** The state needs congruency between the data collected and the data needed to answer policy questions. By focusing on collecting the right data, the state will strike an appropriate balance between data richness and the resources required for data collection. Having readily available data is critical for policymakers responsible for making time-sensitive decisions about how to allocate resources to meet urgent housing needs.
- **Build Capacity Within and Outside of the State:** Data-informed housing policy requires accurate data collection and reporting at the local level and effective data governance and management by the state. Streamlining and automating reporting requirements for local governments, along with investing resources in building local and state data capacity, will improve data quality.
- **Leverage Partnerships:** Stakeholders and state entities have a shared interest in high-quality, up-to-date housing data, and each participant brings different expertise to the table. Partnerships between state departments and agencies, Housing Authorities, research institutions, nonprofits, Metropolitan Planning Organizations (MPOs), counties, cities, and the private sector are necessary to achieve the priorities laid out in this strategy.

Landscape Analysis

In June 2021, the Department of Housing and Community Development (HCD) convened five Data Strategy workgroup sessions: two introductory brainstorming sessions and three subgroup sessions to delve deeper into key topics. The subgroup sessions focused on annual progress reports and lexicon; local-to-state data communication; and a final session on people, policy, and preservation. The workgroup included representatives from state departments and agencies, Metropolitan Planning Organizations (MPOs), local governments, academic institutions, nonprofits, and software vendors.

Based on feedback shared in the workgroup sessions, HCD developed a framework for understanding the landscape of existing housing data. Housing data broadly fits into three categories: data already collected or aggregated by the state, data collected by local governments but not aggregated by the state, and data not collected by any government entity. Each category presents different challenges and opportunities, which inform the priorities for this Data Strategy:

- **Improvements to *data already collected or aggregated by the state* are the highest priority for this strategy.** The state must ensure that the data it already collects are accurate, collected in a format conducive to analysis, and publicly available when permissible; these goals will improve data sharing and leveragability across departments and agencies, local jurisdictions, researchers, and the public.
- ***Data collected by local governments but not aggregated by the state* represent the best opportunities for new statewide datasets.** This strategy focuses on laying the groundwork for collecting these data by creating data standards and investing in building local data capacity.
- **Collecting *data not currently collected by any government entity* is costly.** The state's efforts must begin with research to identify the most important sources of data before determining potential paths to collecting this information.

The table below highlights key datasets in each category and current barriers to effective data use and collection.

Table 1: Housing Datasets and Barriers to Effective Use

Data Type	Collected or Aggregated by the State	Collected by Local Governments but not Aggregated by the State	Not Currently Collected by Any Government Entity
Housing Datasets	Project-specific development pipeline data (annual progress reports) (HCD) Historic state and federally funded affordable properties (Preservation Database) (HCD) Demographics of tenants in state-funded affordable housing (HCD, TCAC, CDLAC, CalHFA) Costs of affordable housing development for state-funded affordable housing (HCD, TCAC, CDLAC, CalHFA) Local sites identified for development (housing element sites inventory, state excess land, and local surplus land) (HCD, DGS) Location and ownership of mobilehome parks. Data from complaints received and park inspections (HCD)	Parcel maps and descriptive parcel attributes such as lan use type, square footage, year built, and assessed value (County Assessors) Eviction lockout data (Sheriff departments) Locally funded affordable properties (cities and counties) Building code violations (cities and counties) Local zoning maps, including housing overlays, TOD zones, and historic zones (cities and counties) Existing rent registries (in a small subset of jurisdictions, primarily for rent controlled properties) (cities and counties)	Rental arrears (limited data during COVID-19 pandemic from Census Pulse Survey) Displacement and informal evictions Eviction notices issued Leading indicators of displacement including data on missed car payments and credit scores Rental prices and the location of non-subsidized affordable housing Registry of all rental property owners in the state Housing needs of vulnerable populations including farmworkers and tribes
Housing Datasets Continued	Factory-built housing units certified for placement in California and manufactured housing units produced and placed in California (HCD) Information from Planning Grant applications on local efforts to streamline housing production (HCD) Utility arrears and disconnections (CPUC) Fair housing violation complaints (DFEH) Persons accessing homeless services and exits into permanent housing (ICH) Homeless youth in California schools (CDE) CEQA documentation (OPR) Housing completions (DOF) Homebuyers assisted by state loan programs (CalHFA) Fire severity zones (CAL FIRE) Redevelopment Agency Reports (SCO) Energy usage in multifamily buildings (Energy Commission)	Housing development impact fees (cities and counties) Court records on legal challenges relating to housing developments (courts) Housing voucher waitlists, individuals turned away from waitlists, search times for tenants with vouchers, and demographic data on voucher holders (Housing Authorities) Short-term rentals registered with a local jurisdiction (some cities)	Construction costs for private development

Data Type	Collected or Aggregated by the State	Collected by Local Governments but not Aggregated by the State	Not Currently Collected by Any Government Entity
Barriers to Data Collection	While there are incentives for local governments to submit development pipeline data (APRs) to HCD, there are no incentives for data accuracy Many jurisdictions lack the staff capacity and technology to perform extensive quality checks Lack of data governance at the state level and differences in housing lexicon lead to inconsistent data across jurisdictions Data collected by various state entities is often siloed or published in disparate tools Relevant data may exist in reports and other structures not amenable to analysis, including programmatic data on HCD-funded affordable properties	State departments and agencies have limited data collection authority Lack of uniformity in data records across jurisdictions make it difficult to aggregate data at the state level Jurisdictions have a range of data capacity and resources. Many jurisdictions lack the necessary funding to purchase data management tools, and some rely on paper records	Collecting this data would require significant financial investments Collecting datasets that include personally identifiable information requires secure data infrastructure and clear legal frameworks Private companies have and sell much of this information, but government entities cannot afford to purchase or are hindered by the difficulty of cross-agency collaboration to pool resources
Data Strategy Focus	Develop data governance structures to improve data quality Invest in databases to streamline collection and analysis Spur use through public data tools and targeted resources for local governments Improve data sharing across state departments and agencies	Create guidelines to standardize data collected by local and regional governments Build local data capacity and share best practices across jurisdictions Explore opportunities to aggregate data	Identify the level of data needed for effective policymaking Explore partnerships with research institutions and other state departments and agencies to collect new data

Data Goals

During the workgroup sessions convened by HCD, stakeholders made recommendations about the state's most pressing data needs. HCD developed a set of data priorities based on this collaborative effort and grouped these priorities into four overarching goals:

- **Build Strong Data Foundations:** Collecting, managing, and disseminating accurate data requires a foundation of data standards, shared definitions, and governance structures.
- **Collect and Curate Foundational Datasets:** Create foundational datasets, including through leveraging existing datasets, on development patterns and the existing housing stock to inform data-driven policymaking. Foundational datasets require ongoing, robust data management to ensure these datasets are effective policymaking tools.
- **Leverage Data to Drive Policy Decisions:** Data-driven housing policy requires analyzing data to support better policy design, evaluation, and enforcement. Policymakers need the best available data and analytics to make time-sensitive decisions about how to allocate resources and design policies to meet critical housing needs.
- **Make Reporting Accurate Data Easier:** High-quality state level datasets rely on accurate data collection and reporting at the local level. Efforts to make data reporting easier for local governments through automation and capacity building improve data quality and conserve local resources.

Table 2 shows the overarching framework of this Data Strategy. Each goal, and its supporting data priorities, will help the state achieve key results. These goals, data priorities, and key results are guided by these three principles: collect the right data at the right time, build capacity within and outside of the state, and leverage partnerships. Together, they support the ultimate outcomes of data-driven policy design and implementation, better policy evaluation, technical assistance, enforcement, and effective allocation of resources.

These goals are structured around the analogy of building a data house. To build a sturdy house, one must first lay the foundation (**build strong data foundations**). They must also procure the appropriate materials (collecting data) and labor (curating data) to build the house (**collect and curate foundational datasets**). These materials are used to build the structure of the house **(leverage data to drive policy decisions)**. Construction of the home requires many suppliers and sub-contractors, which must be supported by efficient coordination of timing and resources (**make reporting accurate data easier**). Even after the house is built, new materials and ongoing maintenance are needed to maintain the structure.

Together, these four goals ensure the state has the data necessary to design policies that meet the housing needs of all Californians.

Table 2: Data Goals and Priorities

Principles	Goals	Data Priorities	Key Results	Outcomes
Collect the right data at the right time Build capacity within and outside of the state Leverage partnerships	Build strong data foundations	Develop strong data infrastructure and governence	Measure displacement risk and track interactions with the homelessness response system to target policy interventions and help end homelessness. Identify subsidized and non-subsidized affordable housing to maintain and preserve existing affordable housing. Assess progress along the housing pipeline to understand barriers that cause delays in the development process and drive up housing costs. Track where housing is being produced - and at what cost - to determine if enough housing is being built near jobs, transit, and resources at all affordability levels.	Data driven policy design and implementation Better policy evaluation, technical assistance, and enforcement Effective allocation of resources
		Enable data access		
		Create shared definitions		
	Collect and curate foundational datasets	Locate deed-restricted affordable housing		
		Track the housing development pipeline		
		Collect data to better understand existing housing stock characteristics		
		Develop a statewide land use map		
	Leverage data to drive policy decisions	Take a data-driven approach to affirmatively furthering fair housing		
		Measure displacement		
		Leverage data to design and target programs to end homelessness		
	Make reporting accurate data easier	Streamline data collection		
		Build local data capacity		

Data Priorities

The Legislature tasked the Department of Housing and Community Development (HCD) with developing a set of housing data priorities for the state. These data priorities, or objectives for how the state can better use, collect, and share housing data, support the four goals outlined in this strategy. The priorities capture the most pressing housing data needs shared by stakeholders in the workgroup sessions.

HCD is only one of many state departments and agencies currently collecting and analyzing housing data for the purposes of informing policy and enforcing housing law. Successful implementation of these data priorities requires leadership from the various state actors that are involved in the housing ecosystem. When developing policies to address housing data needs, the Legislature should consider the existing authority and strengths of various state entities, and support collaboration where possible. In many cases, the level of progress towards these priorities will be dependent on the resources and authority provided by the Legislature.

The table to below includes a summary of each data priority.

Table 3: Data Priorities

Goal	Data Priority	Explanation
Build strong data foundations	Develop strong data infrastructure and governance	Deploy the appropriate HCD staff necessary to implement this strategy and develop successful data governance practices. Provide HCD staff with the training, databases, tools, and resources needed to support effective data use in all program areas.
	Enable data access	Create tools such as interactive maps, data dashboards, and curated datasets that support local governments in developing data-informed policies and allow the public to better understand housing needs in their communities.
	Create shared definitions	Develop a consistent lexicon that is used across all jurisdictions with definitions available to researchers and the public.

Goal	Data Priority	Explanation
Collect and curate foundational datasets	Locate deed-restricted affordable housing	Know the location and key characteristics of all deed-restricted affordable units in the state, including when rental restrictions expire and the target populations those projects serve.
	Track the housing development pipeline	Collect and maintain accurate data on the entire development pipeline from the initial application through occupancy for all housing projects, including monitoring the usage of state housing laws. Ensure projects have unique identifiers that allow them to be mapped and tracked through the full development process.
	Collect data to better understand existing housing stock characteristics	Identify and curate datasets that provide policymakers with a better understanding of the existing housing stock and rental prices, including datasets that help locate non-subsidized affordable housing units.
	Develop a statewide land use map	Develop and maintain a publicly available statewide zoning and parcel map.
Leverage data to drive policy decisions	Take a data-driven approach to affirmatively furthering fair housing	Leverage data to ensure state affordable housing programs, Regional Housing Needs Allocations (RHNA), and local housing plans (housing elements) affirmatively further fair housing.
	Measure displacement	Collaborate with research institutions, local governments, and tenant advocates to better understand eviction and displacement risk.
	Leverage data to design and target programs to end homelessness	Track and analyze data on longitudinal interactions with the homelessness response system. Utilize data to evaluate existing programs and design housing solutions that meet the needs of persons experiencing and at risk of homelessness.
Make reporting accurate data easier	Streamline data collection	Streamline and automate the process of collecting Housing Element Annual Progress Report (APR) data from cities and counties. Provide technical assistance and technology solutions to support local governments in adopting new approaches to submitting APRs.
	Build data capacity	Build data capacity within local governments and tribal entities. Deploy the resources necessary to collect timely, accurate housing data at the local level and enable policymakers to utilize these data in decision-making.

The next section provides a detailed description of each data priority, including a 10-year vision, recommended first steps state departments and agencies can take, and policy recommendations for the Legislature to help accomplish the priority. Realizing the long-term vision put forth in this strategy will require stakeholder collaboration within and outside of the state, and progress will be dependent on the resources and authority provided by the Legislature.

Build Strong Data Foundations

Collecting, managing, and disseminating accurate data requires a foundation of data standards, shared definitions, and governance structures.

The Data Gym: The roles of business, data, and technology
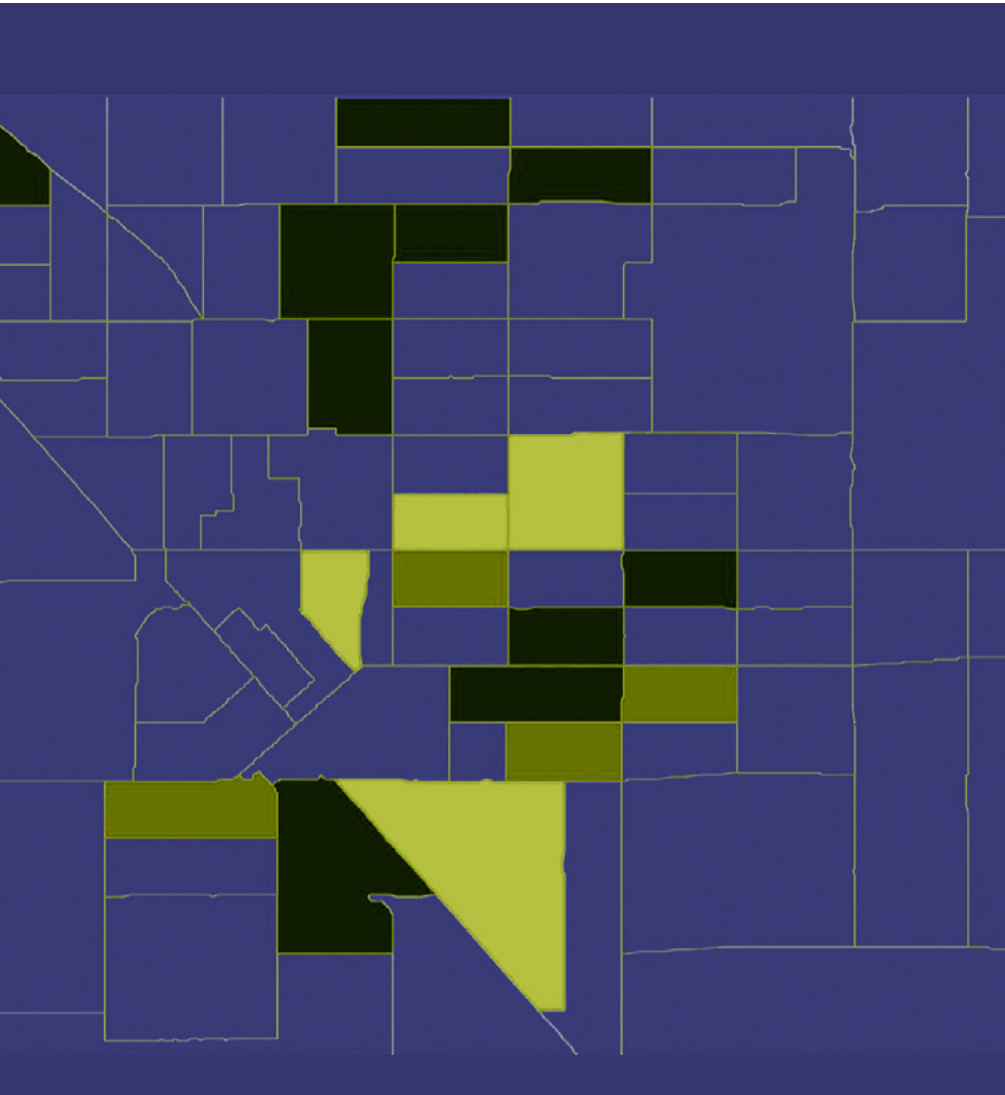

Business needs to decide how much effort they want to put into getting their data game into shape.

**Data teams** train business on how to best use data equipment and how to target trouble spots.

Technology provides and maintains the data gym.

Source: California's Data Strategy

Develop Strong Data Infrastructure and Governance: Deploy the appropriate HCD staff necessary to implement this strategy and develop data governance practices. Provide HCD staff with the training, databases, tools, and resources needed to support effective data use in all program areas.

Data governance refers to the actions, processes, and technology that support the state in collecting, using, protecting, and sharing data. This includes setting internal data standards and developing the infrastructure necessary to enable data use across program areas. An effective data governance approach should treat data as an enterprise function that is managed organization-wide, rather than in silos at the programmatic level.

Having strong data infrastructure and governance at HCD will build the foundation needed to collect and leverage housing data to design impactful policies, target resources effectively, and enforce existing housing laws. Data is an enterprise asset and data management must be treated as an integral function in all programs. This requires directing resources towards data training for business (program) staff, hiring additional staff to support data teams, and investing in data infrastructure, including ongoing maintenance of existing databases.

Recommended First Steps

- Develop a basic data training curriculum for all new HCD staff that includes training on data management practices and analytical tools.
- Integrate data hiring and infrastructure needs into all HCD budget proposals and legislative analyses. Deploy data staff to support data needs in all business areas.
- Enhance collaboration between IT and program staff on database management and build database expertise among program staff.
- Create a forum for regular communication between HCD IT and the data teams within each division to share best practices and facilitate data sharing.

Enable Data Access: Create tools such as interactive maps and data dashboards that support local governments in developing data-informed policies and allow the public to better understand housing needs in their communities.

Making data accessible to local governments, researchers, advocates, and the public provides a common frame of reference for housing policy development and advocacy. While making raw data available is critical to advance research, the state must also level the playing field by building tools that are accessible to those without technical expertise. One place HCD is already doing this is with Housing Element Annual Progress Report (APR) data. HCD makes the raw data available for download, but the same information is also aggregated into a data dashboard with appealing visuals and charts. The dissemination of other datasets would benefit from this dual approach.

Recommended First Steps

- Ensure authoritative HCD datasets are available through the California Open Data Portal. Provide thorough documentation of these datasets to assist users with accessing and interpreting the data.
- Continue to improve public housing data tools such as the Affirmatively Furthering Fair Housing Data Viewer, APR Dashboard, and

Emergency Rental Assistance dashboard. Develop new data tools to meet the needs of stakeholders and the public.

- Explore opportunities to develop data tools that combine data from multiple state departments and agencies. For example, a map that combines data on housing element sites inventories (HCD), locations where CEQA streamlining options may exist (OPR), and proximity to transit (Caltrans) could help identify sites suitable for infill housing development.
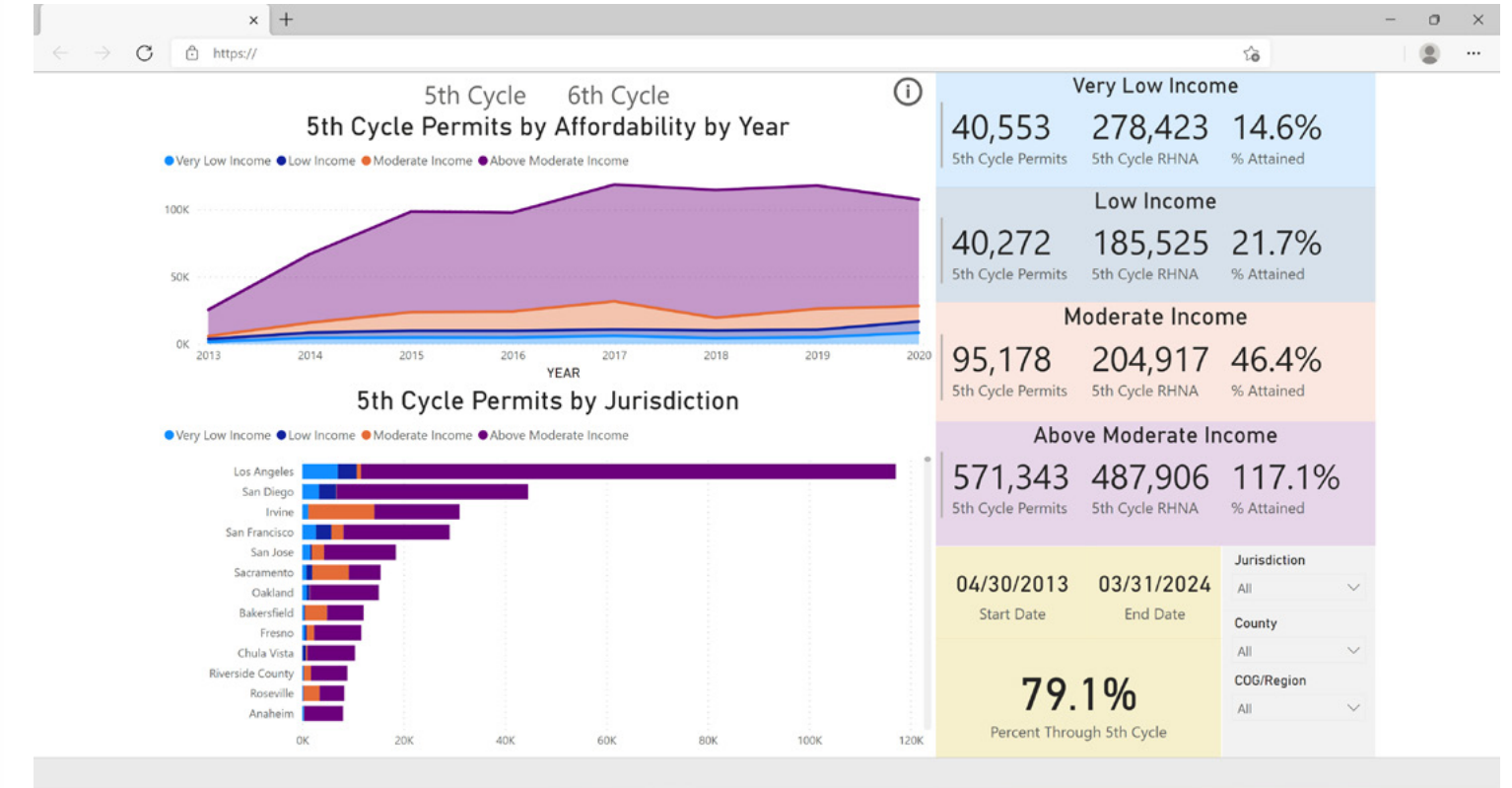
The Annual Progress Report (APR) dashboard allows users to view housing applications, building permits, and construction activity by location, structure type, and affordability

Create Shared Definitions: Develop a consistent lexicon that is used across all jurisdictions with definitions available to researchers and the public.

Inconsistent housing lexicon across cities and counties hinders accurate statewide data on the housing development pipeline. Workgroup members described the ways planners currently are not speaking the same language when using key terminology. These differences in definitions often reflect differences in the planning process, with approvals occurring at different stages in the development pipeline.

While the instructions in the state's Housing Element Annual Progress Report (APR) form standardize some definitions, many terms remain ambiguous or are interpreted differently across jurisdictions. The state must engage key stakeholders to create shared definitions and deploy resources to ensure these definitions are incorporated into local planning processes and permit systems. Efforts to better align the planning approval process across jurisdictions will also support shared definitions.

Recommended First Steps

- Convene a workgroup of relevant state departments and agencies, cities and counties, Metropolitan Planning Organizations (MPOs), researchers, and planning professionals to develop agreed upon definitions of key planning lexicon.

- Collaborate with state entities and other relevant stakeholders to develop standard state definitions of infill development and rural jurisdiction that capture state priorities around infill development and rural housing needs. Create maps and other resources that clearly identify infill parcels and rural jurisdictions.
- Provide technical assistance resources, including written materials and webinars, to ensure adoption of common lexicon. Collaborate with local governments and software vendors to support local governments in updating their permit systems and internal databases to align with the agreed upon lexicon.

Collect and Curate Foundational Datasets

Create foundational datasets, including through leveraging existing datasets, on development patterns and the existing housing stock to inform data-driven policymaking. Foundational datasets require ongoing, robust data management to ensure these datasets are effective policymaking tools.

Locate Deed-Restricted Affordable Housing: Know the location and key characteristics of all deed-restricted affordable units in the state, including when rental restrictions expire and the target populations those projects serve.

To preserve subsidized affordable housing that is at risk of converting to market rate, HCD and the California Housing Partnership Corporation (CHPC) developed a Preservation Database to track local, state, and federally funded affordable housing units. These data support HCD's enforcement of preservation noticing requirements and enable the state to direct resources towards preserving high-risk properties.

While the Preservation Database is already supporting data-driven preservation policies, there are several challenges with the existing data. These include the lack of pre-assigned unique identifiers for projects funded through multiple programs, missing data on locally funded properties, and incomplete information on state funded affordable properties. Accurate tracking of affordable housing units in the state, including developing a system

of unique project identifiers, will require improvements to data governance and infrastructure within HCD and enhanced coordination with other state funding agencies and local governments.

Recommended First Steps

- Work with HCD's State and Federal Divisions of Financial Assistance to fill in gaps in the Preservation Database. Improve the accuracy of geolocation data to develop a map of HCD-funded properties.
- Improve data quality by collecting information on funding sources and property characteristics for all developments with affordable units as part of the annual owner certification process.
- Develop a process for adding Housing Element Annual Progress Report (APR) data on deed-restricted units to the Preservation Database, including density bonus and inclusionary units which are not currently tracked in the database.
- Convene a workgroup of state departments and agencies that fund affordable housing to develop a strategy for integrating unique project identifiers across all state housing programs.

Track the Housing Development Pipeline: Collect and maintain accurate data on the entire development pipeline from the initial application through occupancy for all housing projects, including monitoring the usage of state housing laws. Ensure projects have unique identifiers that allow for mapping projects and tracking them through the full development process.

Comprehensive data on the development pipeline allow the state to identify where delays in the development process are occurring, and remove these barriers through legislation, technical assistance, or enforcement actions. Understanding the efficacy of recent housing policies requires tracking the usage of state housing laws and development interventions such as CEQA streamlining and the Streamlined Ministerial Approval Process (SB 35).

Housing Element Annual Progress Reports (APRs) represent the most detailed dataset on housing development in the state, but the quality and completeness of data reported by jurisdictions in their APRs remains a challenge. While APR submission rates have increased dramatically from only half cities and counties in 2013 to over 90 percent in 2020, a small minority of jurisdictions fail to submit APRs and many more submit incomplete or inaccurate data. There are significant opportunities to improve data quality and accuracy before expanding the breadth and depth of reporting requirements. For example, data inconsistencies make it difficult to map and track projects over time.

Stakeholders recommended HCD tackle several issues to improve data quality prior to expanding the breadth and depth of reporting requirements. These include implementing automated quality checks, changing the data submission format, requiring unique identifiers, and exploring opportunities to partner with Metropolitan Planning Organizations (MPOs) on more robust data quality checks.

Workgroup participants emphasized the value of identifying the simplest metrics that accurately capture development pipeline progress and can inform data-driven policy decisions. These metrics could be developed from existing data sources, such as APRs, without requiring extensive additional data collection efforts.

A more detailed analysis of APR data can be found in Appendix 1.

Recommended First Steps

- Reach full local compliance with APR submission requirements.
- Conduct an analysis of APR data to identify errors, including identifying projects that cannot be geolocated or tracked through the development process. Use this information to assist localities in updating past APR forms, and to inform changes to the APR form to improve accuracy. Identify jurisdictions that are struggling with APR reporting requirements and provide tailored technical assistance.
- Publish a technical assistance memo with guidance on how jurisdictions should determine the affordability level of non-deed restricted properties in their APRs. Establish an internal quality control process to verify the affordability level of below market rate units.
- Conduct an APR workflow analysis of a sample of jurisdictions to understand local variation in planning processes, including how jurisdictions collect, manage, and report housing data. Use these findings to better align data collection requirements and fields with key stages in the planning process, including capturing differences in the development process for projects with ministerial versus discretionary review.
- Explore opportunities to track the impact of all adopted housing laws on the development process, including CEQA streamlining provisions. Work collaboratively with cities, counties, and MPOs on changes to the APR to ensure form updates strike an appropriate balance between data richness and the resources required for data collection.
- Improve the accuracy of geolocation data (i.e., Assessor Parcel Number (APN) and address) in submitted APRs and require an additional unique identifier for each project. Consult with cities, counties, and MPOs to develop guidelines for local governments on how to generate unique identifiers, including clearly defining what constitutes a project.
- Research options for collecting APR data in a format that increases accuracy and minimizes user error, such as a web-based form.
- Partner with researchers on developing a statewide housing model that uses APR data and the Governor's Office of Planning and Research (OPR) State Clearinghouse to analyze the impact of housing laws and policies and predict future development patterns.

Collect Data to Better Understand Existing Housing Stock Characteristics: Identify and curate datasets that provide policymakers with a better understanding of the existing housing stock and rental prices, including datasets that help locate non-subsidized affordable housing.

Preserving non-subsidized naturally occurring affordable housing (NOAH) and developing disaster resilience strategies requires data on rental housing, including location, quality, and affordability. There are significant opportunities to leverage existing datasets to deepen the state's understanding of the housing stock. For example, County Assessors maintain records of the existing housing stock, including assessed value, property age, and corporate ownership.

Recommended First Steps

- Convene a workgroup of Housing Authorities to understand the rental and housing stock data they are collecting, including data on the neighborhoods and properties where Section 8 vouchers are used. Explore opportunities for the state to provide technical assistance and resources

- to support Housing Authorities with data collection and standardization.
- Initiate conversations with County Assessors and relevant state departments and agencies to develop a strategy for creating a statewide housing stock database to inform policy decisions. Explore opportunities to use County Assessor data to identify properties that have undergone substantial renovations.
- Identify datasets that could help measure the prevalence of short-term rentals, including tracking units converted from owner or renter-occupied to short-term rentals.
- Partner with a research institution to develop a model for identifying and tracking naturally occurring affordable housing (NOAH), including properties in need of rehabilitation, using County Assessor data and other public data sources such as Census Bureau data. Start with a pilot program in a few counties before expanding statewide.
- Consider opportunities to use a panel dataset to understand the ways rental units are moving up and down the price scale. Initiate conversations with the Census Bureau about a research partnership to use geolocated American Housing Survey data (AHS) to create a panel dataset.

- Complete an assessment of the data HCD collects on mobilehome parks. Based on this assessment, make recommendations to the Legislature about additional data that would support the state's efforts to preserve mobilehome parks and enforce code requirements. Explore using aerial data to identify special occupancy parks that may not be permitted with the state.
- Partner with the U.S. Department of Housing and Urban Development (HUD) and the California Energy Commission (CEC) to collect and analyze data on utility expenditures and energy efficiency in state funded affordable housing to support state and federal emission reduction goals.[1]
- Conduct a statewide study of Fair Market Rents (FMRs) and the need for Small Area Fair Market Rents (SAFMRs) to expand eligibility of housing vouchers and address voucher value issues.

Develop a Statewide Land Use Map: Develop and maintain a publicly available statewide zoning and parcel map.

A statewide zoning and parcel map creates a foundation for data-informed land use policies that help address climate change and support healthy and affordable housing for all Californians. Creating a statewide land use map is a resource-intensive, long-term project that supports the work of several state departments and agencies. This effort should engage the geospatial data expertise of the California Department of Technology (CDT) and the California Government Operations Agency (GovOps). Some of the larger Metropolitan Planning Organizations (MPOs) have already undertaken efforts to aggregate local land use data and are well positioned to be key partners to the state.

Accurate land use maps rely on up-to-date, digital data from cities and counties. The Legislature should consider the resources and technical assistance needed to support local compliance with any new reporting requirements, particularly for smaller and rural jurisdictions that may lack digital parcel and zoning maps.

Additional information on land use management systems can be found in Appendix 2.

Recommended First Steps

- Explore options for acquiring a statewide parcel database through the Data Acquisition Program led by GovOps with the State Chief Data Officer and Geographic Information Officer. Analyze the parcel data collection approaches of other states and make recommendations on the approaches most suitable for California.

- Collaborate with MPOs and relevant state entities to establish a strategy for developing a statewide land use database.
- Partner with the Department of General Services (DGS) to map sites identified for housing development in local housing elements. Combine this map with APR data to track development on housing element sites and use these data to enforce No Net Loss Law.[2]
- Explore opportunities to collect additional data on land use, including local zoning maps, as part of the General Plan Annual Progress Report jurisdictions submit to the Governor's Office of Planning and Research (OPR). If implemented, provide OPR with form authority to specify data fields and format in addition to funding for database upgrades and staff to provide technical assistance and review data.

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[1] U.S. Department of Housing and Urban Development. Climate Action Plan, PDF File, November 2021.

[2] California Department of Housing and Community Development, No Net Loss Law: Government Code Section 65863, PDF Files, October 2019.

Leverage Data to Drive Policy Decisions

Data-driven housing policy requires analyzing data to support better policy design, evaluation, and enforcement. Policymakers need the best available data and analytics to make time-sensitive decisions about how to allocate resources and design policies to meet critical housing needs.

Take a Data-Driven Approach to Affirmatively Furthering Fair Housing: Leverage data to ensure state affordable housing programs, Regional Housing Needs Allocations (RHNA), and local housing plans (housing elements) affirmatively further fair housing.

The Legislature requires all public entities responsible for housing and community development programs to take "meaningful actions, in addition to combatting discrimination, that overcome patterns of segregation and foster inclusive communities free from barriers that restrict access to opportunities for protected classes" (AB 686 Chapter 958, Statutes of 2018). One way the state can leverage data to affirmatively further fair housing is by collecting and analyzing detailed data on current and prospective tenants in state-funded properties. These data allow state housing funders to identify and remove any barriers that restrict access to affordable housing for protected classes.

Leveraging data the state already has, HCD also plays an active role in ensuring local housing plans (housing elements) overcome patterns of segregation. HCD has taken a data-driven approach to this responsibility,

creating an interactive mapping tool (the AFFH Data Viewer) to assist local governments with the new required assessment of fair housing in their housing elements. Tools like this help jurisdictions meet their own legal responsibilities, while expanding access to opportunity in California.

Recommended First Steps

- Continue to make improvements to HCD's AFFH Data Viewer and provide additional technical assistance and resources to train local governments on how to use the tool.
- Combine Housing Element Annual Progress Report (APR) data with HCD's AFFH Data Viewer to identify locations where development patterns are reinforcing segregation.
- Explore opportunities to collaborate with rental listing and property management technology companies to utilize data on the rental application process to understand the prevalence of discrimination against protected classes. Use these data to target the Department of Fair Employment and Housing (DFEH)'s enforcement efforts.
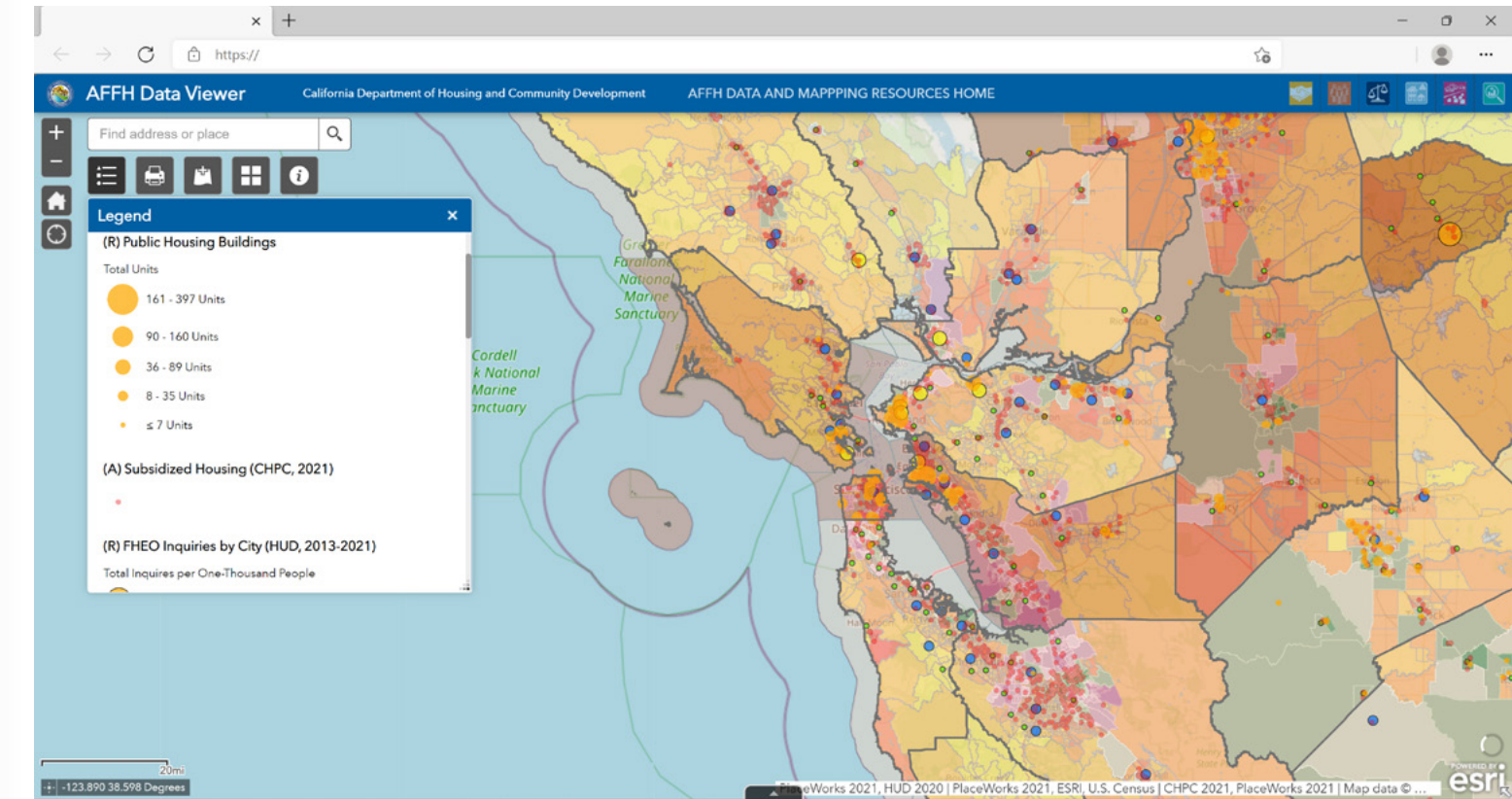
The Affirmatively Furthering Fair Housing (AFFH) [Data Viewer](#) allows user to explore data relating to fair housing enforcement, disparities in access to opportunity, disproportionate housing needs, and more.

Measure Displacement: Collaborate with research institutions, local governments, and tenant advocates to better understand eviction and displacement risk.

Displacement, or involuntary moves due to conditions beyond a household's control, has a myriad of negative impacts on residents, and in severe cases leads to homelessness. The state needs better data on displacement, especially leading indicators of housing instability, to design policies and allocate resources to prevent displacement. Currently, much of the research on displacement relies on indirect measurements. Using Census data, researchers often measure changes in neighborhood-level racial or socioeconomic demographics as a proxy for displacement. These data have several limitations. They fail to measure the number of households displaced and there is a significant lag between data collection and release. To effectively prevent displacement, policymakers need leading indicators and predictive models to track neighborhood change and displacement.

The lack of statewide data on formal or informal evictions hinders efforts to enforce anti-rent gouging and just-cause for eviction laws. Collecting individual-level data on displacement, while valuable, is difficult and costly, warranting further exploration of how existing data sources and innovative analytical techniques can be used to measure displacement.

Recommended First Steps

- Conduct a landscape analysis of jurisdictions, community-based organizations, and state entities that collect data that could help measure evictions and displacement. Explore opportunities to collect data on evictions, such as reporting on sheriff lockouts or eviction court filings, that would support the Department of Fair Employment and Housing's (DFEH) ability to protect California residents from housing discrimination.
- Prepare a technical assistance memo for local jurisdictions that provides guidance on how to use existing data and tools to better track residential displacement.
- Partner with research institutions to use existing large datasets to understand which tenants are at the greatest risk of displacement and identify leading indicators of displacement and homelessness.
- Study the impact of the Emergency Rental Assistance Program (ERAP) on preventing displacement.

Leverage Data to Design and Target Programs to End Homelessness: Track and analyze data on longitudinal interactions with the homelessness response system. Utilize data to evaluate existing programs and design housing solutions that meet the needs of persons experiencing and at risk of homelessness.

Too many California households have been displaced into homelessness, and the state must take a data-informed approach to ending homelessness. Historically, the state's primary measurement of homelessness came from the Point-in-Time (PIT) count, an annual count of people experiencing homelessness on a single night in January required by the U.S. Department of Housing and Urban Development (HUD).[3] The PIT count excludes households that may be homeless but not unsheltered or in a shelter the night of the count and provides little information on the efficacy of homelessness services.

The other primary dataset on homelessness comes from data about persons receiving homelessness services, including emergency shelter, interim housing, and permanent supportive housing. HUD requires each Continuum of Care (CoC) to collect client-level data for certain federally funded homelessness programs in a Homelessness Management Information System (HMIS). These data are entered into HMIS by a variety of service providers who are part of a CoC's homelessness response system. Many service providers do not currently interact with HMIS, often because they do not receive state funding (e.g., faith-based or community-based organizations) or are funded by state programs without HMIS reporting requirements.[4] The Legislature recognized the need to expand data collection to additional state programs and added HMIS reporting requirements to 10 additional state homelessness programs and all future programs (SB 977, Chapter 977, Statutes of 2021). These expanded reporting requirements are most impactful when supplemented with funds provided to CoCs for HMIS system maintenance and technical assistance for service providers.

To better understand the dynamic nature of the people that seek homelessness services over time, the California Interagency Council on Homelessness (Cal ICH) recently developed the Homeless Data Integration System (HDIS), a database that aggregates and de-duplicates data collected by CoCs. These data help inform the state's response to homelessness by measuring the efficacy of different interventions, quantifying racial disparities in outcomes, and targeting programs to underserved populations. Long term efforts that focus on linking HDIS data to other statewide datasets will help the policymakers better understand the relationship between housing instability and life outcomes and target early interventions to prevent homelessness.

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[3]US Department of Housing and Urban Development, "Point-in-Time Count and Housing Inventory Count," HUD Exchange, Accessed November 11, 2021.

[4]California State Auditor Elaine Howle, Homelessness in California: The State's Uncoordinated Approach to Addressing Homelessness Has Hampered the Effectiveness of Its Efforts, February 2021.

The Homelessness Data Integration System (HDIS) dashboard provides interactive data on people experiencing homelessness served by homelessness response programs across the state.

Recommended First Steps

- Make ongoing improvements to HDIS, including conducting quality assessments to ensure the data submitted to HDIS is accurate and comprehensive. Continue leveraging HDIS data to analyze racial and ethnic disparities in CoC outcomes and explore additional data that can help identify and address these disparities.
- Link HDIS data to other statewide data systems to create a longitudinal dataset that provides information about participation and access to benefits and services across key state programs.
- Explore opportunities to integrate additional data into HMIS, including the data school districts collect on homeless students. Currently, these data are aggregated by the California Department of Education (CDE) and reported to the U.S. Department of Education (DoE) but are not linked to HMIS records.
- Convene state homelessness program funders, HUD, CoCs, and service providers to explore additional HMIS data fields that will help the state evaluate the efficacy of homelessness prevention and response programs. These could include more detailed typologies of interim and permanent supportive housing and tracking prevention programs serving persons at risk of homelessness.
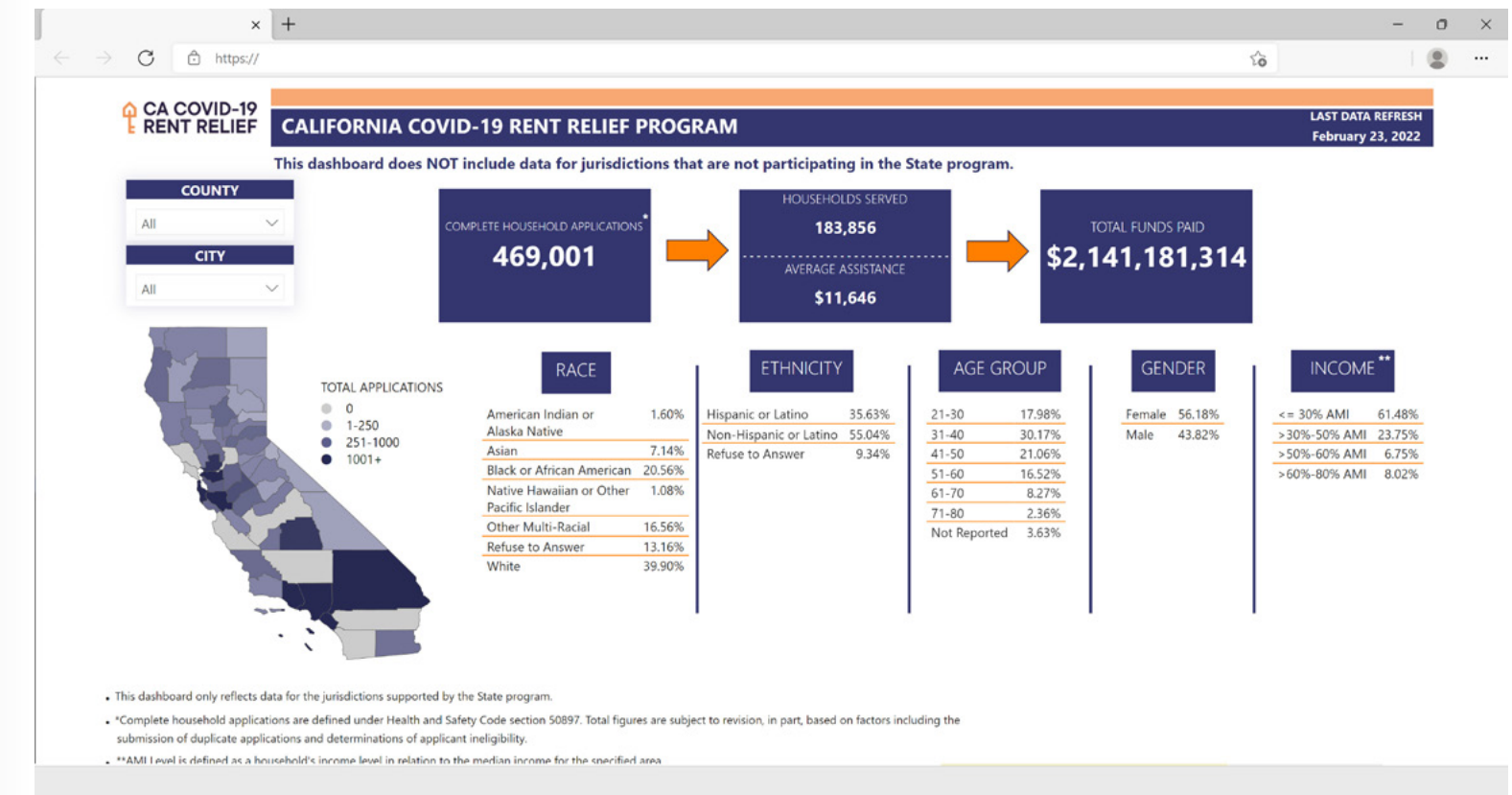
The California COVID-19 Rent Relief Program dashboard allows users to view up to date information on households served by the program.

Make Reporting Accurate Data Easier

High-quality state level datasets rely on accurate data collection and reporting at the local level. Efforts to make data reporting easier for local governments through automation and capacity building improve data quality and conserve local resources.

Streamline Data Collection: Streamline and automate the process of collecting Housing Element Annual Progress Report (APR) data from cities and counties. Provide technical assistance and technology solutions to support local governments in adopting new approaches to submitting APRs.

The rich data collected through the Housing Element Annual Progress Report (APR) provides critical information on the development pipeline, but the reporting process can be time consuming for local governments. Local permit systems may not collect data in a format conducive to completing the APR, or data may be stored in multiple systems maintained by different departments, contributing to inaccurate data.

Technology can be harnessed to simplify data reporting for local governments by automating data collection. For example, HCD could build application programming interfaces (APIs) that allow HCD's databases to "talk to" the permit systems used by local governments. Automated data collection allows for ongoing reporting, ensuring policymakers have up-to-date information on housing development across the state.

Recommended First Steps

- Assess jurisdictions' existing capacity and their readiness to submit APRs in more automated formats. Consult with local and regional governments to develop a strategy to achieve a more streamlined approach to data submission.
- Begin building the data infrastructure necessary to support automated data submission, including developing the data standards to support an API.
- Gauge interest in a statewide permit system option. Explore opportunities for a state-led procurement of permit systems with the functionality to submit APRs through automated methods.
- Align state housing data reporting requirements across state agencies that collect housing data, including HCD, the Governor's Office of Planning and Research (OPR), and the Department of Finance (DOF). This may require changes to the data collected, for example, requiring local jurisdictions to report on all units on the APR rather than only net-new units.

An API is a software that allows two applications to talk to each other. An API is a messenger that sends information back and forth between a website or application and a user.

Customer (website/application)

Waiter (API or "messenger")

Kitchen (database)
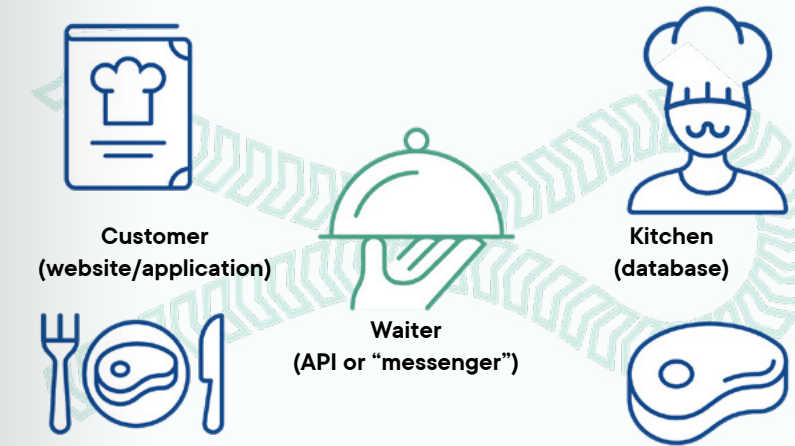
Imagine you are at a restaurant. The menu lists all the food you can order. The kitchen will prepare your food, but first they need your order. The waiter is the messenger, or API, that takes your order, communicates it to the kitchen, and delivers your food back to you. The kitchen is the database that receives your request (food order) and sends information (the food) back to you via the API (your waiter).

APIs allow sharing of information without building custom functionality into each website. For example, you can build Google Maps into your website without having to design your own map and benefit from any map updates Google makes.

Using APIs to connect local permit systems to a state database will automate the data collection process and allow users to access up-to-date permit information.
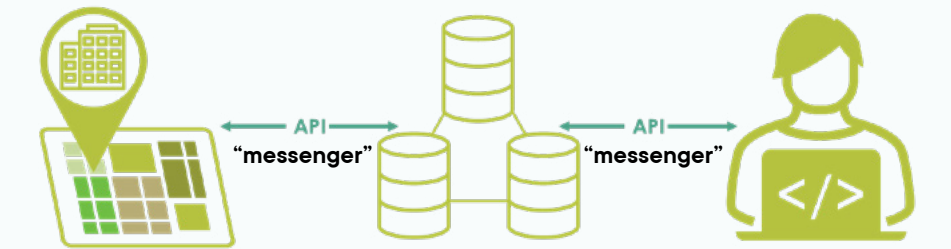
Local planning staff enter records of building activity into their permit system (database).

Records transmitted from local permit system to statewide permit database through an API.

Members of the public can access permit data. An API receives the users' request and retrieves it from the database.

More information on permit systems can be found in Appendix 2.

Build Data Capacity: Build data capacity within local governments and tribal entities. Deploy the resources necessary to collect timely, accurate housing data at the local level and enable policymakers to utilize these data in decision-making.

Consistent, accurate data at the state level requires investment in local data capacity and infrastructure. Cities and counties are required to report data to the state, including housing production data reported through the Annual Progress Report (APR), but often lack sufficient resources to meet reporting requirements. HCD's outreach to local and regional governments for this Data Strategy identified a significant need for additional resources for data management within local planning departments to support data-driven policymaking. Cities and counties have leveraged Planning Grant funding for one-time data projects but expressed a need for ongoing funding to hire staff with data expertise and cover ongoing software expenses. To build data capacity in lower-resource jurisdictions, the state should explore opportunities to provide more comprehensive technical assistance.

While tribes, as sovereign nations, are not subject to the same reporting requirements as cities and counties, building tribal data capacity supports the state in designing policies to meet the housing needs of California's Native American population. California's tribal communities face unique housing challenges but are often left out of or inaccurately represented in state and federal datasets. When these datasets are used to allocate funding and design policies, tribes may face barriers to accessing state funding or policy interventions may not adequately meet their housing needs.[5] The state must actively partner with tribes on research that accurately represents the lived experience of California's tribal communities and exercise flexibility in data requirements for funding programs.

Recommended First Steps (Local Government Capacity)

- Continue to provide and expand upon HCD's current data technical assistance, including support with APRs and the affirmatively furthering fair housing (AFFH) assessment in housing elements.
- Establish peer workgroup sessions between planning departments of similar size and capacity level to share data successes and challenges.
- Support local governments with their data sharing efforts by providing templates, guidelines, and data standards. For example, HCD could develop a fee schedule template for local jurisdictions to use to meet their statutory mandate to share data on local development fees.[6]

- Explore opportunities to provide more extensive technical assistance to jurisdictions, including in-depth data trainings for local planning staff with a range of data expertise. Identify potential private and public funding sources that could provide ongoing or project-specific data technical assistance to lower capacity jurisdictions.
- Explore opportunities to negotiate state pricing for key data software, including providing grant funding to lower resource jurisdictions to cover the cost of software subscriptions.

Recommended First Steps (Tribal Entity Capacity)

- Fund a study led by a statewide tribal equity advisory committee to understand how tribes are gathering and reporting data with recommendations on how the state can support tribal data infrastructure and capacity. Pursue opportunities to allow tribes to use alternative data sources to qualify for state housing funding by using AB 1010 (Chapter 660, Statutes of 2019) to waive or modify program requirements. Begin with data sources that are currently accepted by the U.S. Department of Housing and Urban Development (HUD) and expand to other datasets identified through the research study.
- Fund research that provides insight into the unique housing needs of California's tribal communities and addresses some of the limitations of Census data about Native American populations. For example, The California Coalition for Rural Housing and Rural Community Assistance Corporation's 2019 report on tribal housing needs combined federal datasets, a survey of tribal leaders, and a windshield survey of housing units for a sample of reservations and rancherias to provide an improved understanding of tribal housing conditions.[7]
- Explore opportunities to partner with tribal leaders, the U.S. Department of Housing and Urban Development (HUD), and the U.S. Census Bureau to improve tribal data, including exploring opportunities for tribes to administer their own censuses or surveys,[8] creating geographies that accurately represent tribal lands,[9] and addressing concerns around the new Census differential privacy policy.[10]

[5]National Congress of American Indians Policy Research Center, "Data Disaggregation," NCAI Policy Research Center, Accessed December 21, 2021.

[6]Hannah Schwartz, How Much Does It Cost to Permit a House?, PDF File, May 2021.

[7]California Coalition for Rural Housing and Rural Community Assistance Corporation, California Tribal Housing Needs and Opportunities: A Vision Forward, PDF File, August 2019.

[8]National Congress of American Indians Policy Research Center, The Geospatial Dimensions of Tribal Data, PDF File, October 2017.

[9]National Congress of American Indians Policy Research Center, Differential Privacy and the 2020 Census: A Guide to the Data and Impacts on American Indian/Alaska Native Tribal Nations, PDF File, May 2021.

[10]National Congress of American Indians Policy Research Center, Differential Privacy and the 2020 U.S. Decennial Census: Impact on American Indian and Alaska Native Data, PDF File, September 2019.

Conclusion

Tracking Progress

To ensure this Data Strategy continues to meet the state's most pressing housing data needs, HCD will collect ongoing feedback on the state's progress towards implementing these data priorities through an annual workgroup session and other opportunities for public comment. HCD will adapt the strategy based on stakeholder input, available resources, new legislation, and technological advances. These updates will be memorialized in an annual update on Data Strategy implementation.

The state cannot achieve its Statewide Housing Plan objectives or track its shared progress without better housing data. The goals and data priorities laid out in this strategy will help target anti-displacement and homelessness prevention resources, preserve existing affordable housing, remove barriers to development, and support land use policies that promote housing for all Californians. Knowing where people live, and where they will live in the future, is critical for a range of state functions, from protecting public health to educating our children to addressing climate change.

Collecting the data necessary to enforce existing housing laws and inform state housing policymaking requires the leadership of several state departments and agencies. Effective collaboration across stakeholders within and outside of government will help the state leverage existing data sources and collect new data. Success will hinge on making strategic investments to build capacity and data infrastructure within state, regional, and local governments. This Data Strategy represents the first state housing data strategy in the nation and sets California on a pathway to becoming a leader in data-driven housing policy.

Appendices

Appendix 1: Assessment of Annual Progress Reports

Since 1969, California has required all local governments (cities and counties) to adopt housing plans (housing elements) that meet the housing needs of their communities. Every city and county must submit a Housing Element Annual Progress Report (APR) on their housing element progress to the Department of Housing and Community Development (HCD) on April 1st of each year.

Annual Progress Report Form Updates

During the lead up to the last Statewide Housing Assessment (SHA), HCD's research about the state of housing in California demonstrated significant data gaps. In this SHA, HCD identified that California housing policy would benefit from more expansive data to help inform policy, legislation, and practice. The Legislature recognized the need for better information on housing production, and significantly expanded APR reporting requirements with AB 879 (Chapter 374, Statutes of 2017).

To meet these new legislative requirements, HCD made several significant changes to APRs. These changes, described in Table A.1, took effect with the 2018 APR.

Table A.1: Overview of APR Form Changes

	Pre-2018 APR	Current APR
Format	Excel or PDF	Macro-enabled Excel form with significant data validation. Data uploaded to and stored in Housing Element Tracking System (HETS) database with the ability to export reports
Project Information Tracked	Project specific information for projects with affordable units	Project specific information for all projects, including address and APN
Development Stages Tracked	Reporting only on permitted units	Reporting on applications, entitlements, permits, and certificates of occupancy
Use of APR Data	Used for informational purposes	Used to determine whether each city is making progress towards their housing goals for SB 35 determination. Submission required to access some state housing and transportation funding

HCD has built new tools to support the collection and analysis of this expanded dataset, but there is more that can be done to ensure APR data remains usable and understandable. As part of this Data Strategy, the Legislature requested an assessment of the quality of data submitted in APRs and recommended changes to report requirements and technical assistance based on this assessment. This APR assessment represents an opportunity to learn from the successes and challenges of APRs and serves as a model of the type of assessments needed as the state implements this Data Strategy.

Successes

The new APR form represents the most detailed data on housing development in the state. Other statewide data sets provide aggregate data on housing permits (Construction Industry Research Board (CIRB), Census Bureau) and completions (Department of Finance) by unit category. The APR provides data on multiple stages in the development process and project-specific information about the affordability level of the new units. Jurisdictions must also report the address and Accessor Parcel Number (APN) for each project, allowing HCD to understand where development occurs.

Despite the expanded reporting requirements, APR submission rates have increased. The submission rate increased from 50 percent of cities and counties in 2013 to 93 percent in 2020. This is a testament to the extensive outreach and technical assistance provided by HCD, and the success of the new incentives for APR submission.

Collecting development pipeline data in a uniform format (a macro-enabled Excel workbook) enables HCD to aggregate and analyze data across communities. To increase accuracy, HCD built data validation into the APR form and within HCD's Housing Element Tracking System (HETS) database. The APR forms submitted by local governments must meet all validation requirements to be deemed complete by HCD. These database investments created a foundation for public sharing of APR data through the APR dashboard and a public portal to download raw data.

Challenges

As part of the research for this Data Strategy, HCD convened workgroup sessions with state departments and agencies, Metropolitan Planning Organizations (MPOs), local governments, academic institutions, nonprofits, and software vendors to discuss APRs. These sessions highlighted several of the challenges experienced by local government staff when preparing their APRs:

- **Data collection processes are designed around workflow processes and may not be conductive to meeting reporting requirements**. Through the development project life cycle, many local departments will track information pertaining to a single project, including planning, building, and housing, and public works. This information may be stored in separate databases, making it difficult to develop a report that tracks the project through the full development process.

- **Jurisdictions struggle to update permit systems to track new APR data requirements.** The Legislature has continued to expand data collection requirements to track the implementation of new policies. Many software permit vendors require jurisdictions to pay for any updates to permit systems to track and report new information. These costs are levied on each jurisdiction, despite the changes being shared across jurisdictions, making the system updates prohibitively expensive for many cities and counties. Additionally, jurisdictions need to make these changes prior to beginning data collection for the reporting year but may not be aware of new requirements at that time. For example, updates for the 2021 APR (due 4/1/2022) are most effective if implemented by 12/31/2020.
- **Local development processes may not align with the fields in the APR form:** Jurisdictions must report to HCD the number of housing applications received, including units approved or denied. Particularly in smaller jurisdictions, there may not be an application process separate from building permit applications. Policymakers and researchers find it difficult to understand the project lifecycle due to this lack of clarity around the dates reported for when an application

is received, a project is entitled, and building permits are issued.
- **Addresses and APNs may change throughout the development process, making longitudinal project tracking difficult.** County Assessors maintain addresses and parcels which may change, particularly during the development process. Changes in addresses or APNs may not get incorporated into local permitting systems.

To help local governments navigate some of these challenges, HCD provides extensive technical assistance (TA) with the APR form. In addition to webinars and written TA documents, HCD staff conduct one-on-one sessions with local governments. When an APR form does not conform to reporting requirements, HCD staff works with a jurisdiction to make corrections until the form is uploaded to the HETS database. HCD staff spends an estimated cumulative 800 hours, or 100 workdays, providing APR technical assistance to local jurisdictions each year.

Opportunities to Improve Accuracy

Workgroup participants emphasized a need to focus on improving the accuracy of APRs, including longitudinal project tracking, before collecting additional information on the APR form. In a survey of planning staff conducted by HCD, only 62 percent reported having a high degree of confidence in the accuracy of the housing development

data their jurisdiction tracks.[11] HCD's database supports accurate reporting by requiring certain data fields and ensuring standardized data format. This process helps standardize data for reporting and analysis but does not verify if underlying data is accurate. For example, there is no way to identify a missing project or an incorrect unit count, as the state has no other project-level data to use as a comparison.

HCD has identified the following APR fields as key areas for accuracy improvements:

- **Geolocation:** Using the addresses reported on the APR form, HCD was able to geolocate 95 percent of projects reported on 2018, 2019, and 2020 APRs. In addition to the 5 percent of projects HCD could not geolocate, some projects were geolocated in the wrong location. An up-to-date, accurate statewide parcel map would enable geolocating projects using their APN.
- **Longitudinal Project Tracking:** Tracking projects through the development process requires combining data from multiple years of APR forms. Addresses and APNs have proven insufficient for longitudinal project tracking. This challenge is particularly pronounced for new subdivisions which can be developed in phases over several years.

- **SB 35 Projects:** HCD has identified projects that were likely reported as SB 35 projects in error. The 2020 APR form had additional instructions and reminders about reporting SB 35 data, which reduced the prevalence of this error.
- **Deed-Restricted Affordable Projects:** Jurisdictions report on the affordability level, deed restriction type and duration, and funding source for any deed-restricted units. Information reported on the APR form is not compared to datasets of affordable projects funded by the state, and HCD staff has identified missing HCD-funded projects on APRs.
- **Non-Deed Restricted Affordable Projects:** Jurisdictions can count non-deed restricted below market rate units towards their housing goals. The APR form requires jurisdictions to provide justification for their affordability determination based on the proposed sales price or rents. The methodology for affordability determinations varies across jurisdictions, particularly for reporting of non-deed restricted Accessory Dwelling Units (ADUs).
- **Infill Units:** The APR form has an optional field to track whether development is occurring on an infill parcel. The APR instructions

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[11]Survey conducted for HCD in Spring 2021 by Emmanuel Lopez as part of completing degree requirements of the U.C. Berkeley Master of City Planning. The survey was sent to HCD's list of planning directors and the planning staff who complete their jurisdictions' APR. Survey response was voluntary, with 199 responses from jurisdictions across the state.

define an infill unit, but the definition is not interpreted uniformly across jurisdictions. For example, many jurisdictions report every project as an infill unit.

- **Net-New Units:** The APR form requires reporting only on net-new units, rather than all units permitted. For example, if a duplex is demolished and replaced with a fourplex, only two units are reported on the APR. This has caused confusion for jurisdictions and can prevent jurisdictions from reporting units that are not net-new but have changed in affordability level. Additionally, other datasets (CIRB, Census, DOF) collect information on all new units making it difficult to use these datasets to validate aggregated APR data.

Recommendations

Efforts to increase the accuracy of APR data should take a multipronged approach that combines improvements to the APR form and instructions with additional technical assistance and database enhancements. This approach should include:

- **Aligning Lexicon:** Before making major changes to the APR form, HCD should form a workgroup to develop shared lexicon. APR form fields can then be revised to reflect these shared definitions and capture variations in local planning processes, including whether projects were subject to ministerial or discretionary approvals. For example, in the entitlement field, jurisdictions could provide the date of the first and last entitlement or indicate that no entitlement was needed.

- **Requiring Unique Project Identifiers:** Unique project identifiers are necessary to enable longitudinal project tracking. HCD should consult with cities, counties, and MPOs to develop guidelines for local governments on how to generate unique identifiers, including clearly defining what constitutes a project.

- **Increasing Technical Assistance Available to Local Governments:** HCD provides extensive assistance with the APR form, but many jurisdictions report challenges stemming from the data collection process. The state could expand technical assistance to support cities and counties in developing efficient workflows and configuring permit systems to improve data quality.

- **Improving Reporting Process for State-Funded Affordable Housing:** The state needs a process to proactively provide jurisdictions with data on state-funded affordable housing developments. This will require assigning unique identifiers to state funded projects and creating a combined dataset across funders.

- **Revamping Data Collection Format:** The APR would benefit from a technology solution that relies on a web-based form with an integrated workflow tool to support identifying and correcting potential errors.

Using a web-based form allows for live data validation and error identification, in addition to pre-populated information from prior APRs. A workflow tool would enable HCD and MPOs to review local development data and propose corrections that could be confirmed or corrected by cities and counties.

- **Streamlining Data Collection:** Collecting APR data directly from permitting systems, such as using application programming interfaces (APIs), will improve accuracy and reduce workload for localities. This recommendation is explored further in Appendix 2.

The expanded APR reporting requirements provided the state with a rich source of data on the development pipeline. Policymakers use these data to evaluate key housing legislation and track local jurisdictions progress towards their housing goals. The Legislature can further enhance the quality of APR data through investments in technology and staff capacity at the state, regional, and local level.
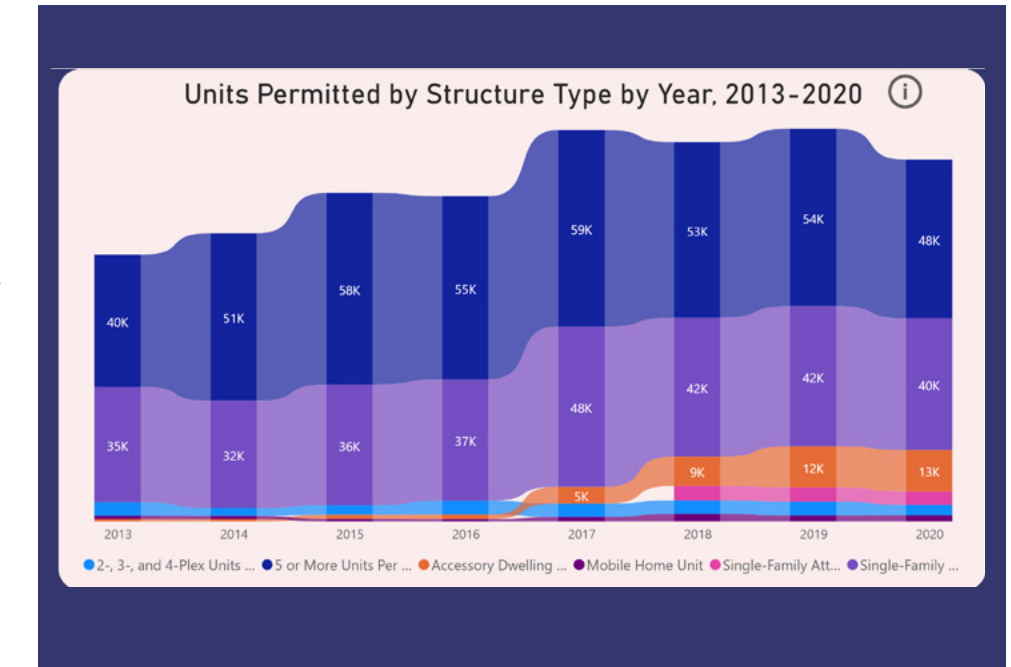
The annual progress report (APR) dashboard allows users to view housing applications, building permits, and construction activity by location, structure type, and affordability

Appendix 2: Land Use Management and Permit Systems

City and county planning staff use software solutions to manage local land use policies and development approvals. These software solutions fit into two broad categories:

- **Permit Systems:** Software used to track development process milestones and facilitate permit applications, reviews, and approvals. These systems can maintain a record of project characteristics such as number of units and unit typology, building square footage, and affordability levels.
- **Land Use Management Systems:** Geospatial software used to maintain parcel and zoning maps. Permit data is often mapped in land use management systems.

Most jurisdictions in California rely on software to track land use and permitting. An HCD survey of planning staff found that planning and community development agencies across the state use over 40 software solutions to support their work.[12] City or county departments may use multiple software systems to track the development process; often these software solutions lack linkages to combine data.

As part of this Data Strategy, the Legislature requested HCD conduct an evaluation of the costs and benefits of a more integrated digital land use management system and building permit application management system.

Permit System Features and Costs

Permit systems vary significantly in complexity. Based on an analysis of HCD Planning Grant applications, HCD identified the following desired permit system features:

- Digital record keeping with the ability to export reports and map data
- The ability to submit entitlement and permit applications online, including the ability to make online payments
- A development fee estimator
- Real time project status updates for applicants
- Electronic plan review that allows for simultaneous, digital review of building plans
- Cross department workflows and integration, including integrating with field inspection processes
- Integration with land use management systems, including the ability to provide public access to permit data

These features help streamline the development process by digitizing and automating elements of the approval process, but many jurisdictions cannot afford to purchase and maintain higher functionality permit systems. Due to resource constraints, jurisdictions may rely on out-of-date systems and data tracking that is misaligned with local needs and state reporting requirements. To better understand permit system costs, HCD conducted an analysis of permit system upgrades funded through state Planning Grants. Of jurisdictions that applied for an SB 2 or LEAP Planning Grant, 28 percent received funding to make improvements to their permitting or land use systems.

Based on the sample of Planning Grant permit system improvement projects analyzed, typical costs for new permit systems or major updates range from under $100,000 for a smaller jurisdiction to over a million for the implementation of a high-functionality system in a larger jurisdiction. The table below shows a range of system cost estimates based on Planning Grant application budgets. If all jurisdictions in the state were to pursue a project like this, costs are estimated to exceed $100 million.[13]

Table A.2: Estimated Permit System Costs

Jurisdiction Size	Jurisdictions	Permit System - Low End	Permit System - High End	Estimated Typical Cost	Total Range	Total Estimate
Very Small	196	$60,000	$160,000	$100,000	$11,760,000-$31,360,000	$19,600,000
Small	158	$80,000	$400,000	$150,000	$12,640,000-$63,200,000	$23,700,000
Medium	92	$93,000	$1,555,853	$200,000	$8,556,000-$143,138,476	$18,400,000
Medium to Large, Large, Very Large	93	$300,000	$1,076,622	$450,000	$27,900,000-$100,125,846	$41,850,000
Total	539				**$60,856,000-$337,824,322**	**$103,550,000**

While jurisdictions do not make large scale upgrades to their permitting systems each year, regular upgrades are necessary, and systems have additional ongoing subscription and maintenance costs. Permitting software vendors often charge jurisdictions for each change made to their permit systems on top of annual maintenance costs, including changes to comply with new state reporting requirements.

Only a small subset of jurisdictions reported annual maintenance costs of their systems in their Planning Grant applications. When reported, these costs ranged from $10,000 to $71,000 per year, but are likely much higher for large jurisdictions.[14]

[12]Survey conducted for HCD in Spring 2021 by Emmanuel Lopez as part of completing degree requirements of the U.C. Berkeley Master of City Planning. The survey was sent to HCD's list of planning directors and the planning staff who complete their jurisdictions' APR. Survey response was voluntary, with 199 responses from jurisdictions across the state.

[13]Jurisdiction sizes based on the LEAP award categories.
[14]These figures come from a non-random sample of 55 projects selected to capture a range of project types and jurisdiction sizes.

Statewide Integrated Permit Systems

Efficient permit systems provide two primary benefits to the state. First, permit system improvements can expedite processing time by streamlining and automating parts of the development process. This helps accelerate housing production and reduces development costs. Second, permit systems track the data reported on APRs; data that policymakers rely on to develop and implement housing policies. With investments in data infrastructure and databases, the state could automate the APR reporting process to receive data directly from permit systems.

In the Data Strategy workgroup sessions, participants expressed an interest in technology and tools that make the state's data reporting requirements easier for local governments. Their recommendations included both better integration with existing permit software platforms and a new system developed by the state. HCD identified three primary options for more integrated permitting systems, each with their own costs and benefits:

Table A.3: Costs and Benefits of Land Use Management and Permit Systems

Option	Costs	Benefits
Develop the functionality to receive APR data from existing permit software systems using an application programming interface (API).	• Building API infrastructure within state databases • State staff time to develop data fields and format with supporting guidance for local governments and vendors • Technical assistance to support local government in adoption • Some local governments would need to migrate to cloud-based versions of their permit system to be able to transmit data via API • Collaboration with vendors to ensure compatibility with their APIs • Vendors may charge local governments to connect with the state API	• Could be compatible with all existing and future permit systems, benefitting local governments with existing permit systems and long-term contracts and potential new vendors • The state could access permit data on an ongoing basis, rather than waiting for annual reporting to learn about the development landscape • Reduced staff time for local planning staff completing the APR • Reduced staff time for state staff processing APRs • Creates infrastructure to share APR data publicly or with other state departments and agencies through an automated process
Establish Master Service Agreement (MSA) pricing for products that meet APR reporting requirements, allowing local governments to meet permit system needs at lower costs. The state could provide grants to support jurisdictions in acquiring compatible software.	• State staff time to research the system needs of local governments • State staff time spent working with software vendors to develop product packages that meet local needs • Local staff time to update permit systems if the state contract differs from existing systems • Ongoing contracting costs with software vendors paid by local jurisdictions or through state subsidies	• Local governments can benefit from lower prices for permit systems. Smaller jurisdictions may be able to procure systems with higher functionality through state contracts • The state can work directly with vendors to build out data collection fields when APR form requirements change • Contracts would enable automated data sharing, reducing time spent by state and local staff on reporting • The state could incentivize systems that meet the needs of local governments, including technology solutions to link data tracked in separate systems
Build a statewide permit software solution that jurisdictions could opt to use. This system could be a base system that allows technology vendors to build products with added functionality.	• State staff or contractors to build permit system. The system would, at a minimum, need the features jurisdictions are already using to ensure the product is competitive with established software • Ongoing maintenance costs for the system, including providing technical support to local governments • Technical assistance and training for local staff using the permit systems • Switching permit systems can be costly. Jurisdictions would have to migrate data and re-train staff	• The system could automate APR reporting and any updates needed to support new APR fields, reducing time spent by state and local staff on reporting • The software could be provided a lower cost than what jurisdictions are currently paying • The state could access ongoing data, rather than waiting for annual reporting to learn about the development landscape

To support streamlined and automated reporting in jurisdictions of all sizes and capacity levels, the state will likely need to adopt multiple technology solutions. The ENERGY STAR Portfolio Manager developed by the Environmental Protection Agency (EPA) and Department of Energy (DOE) provides an example of a dual approach to meeting the needs of different users. Property owners can use the free service provided by the ENERGY STAR Portfolio Manager to benchmark their properties. In addition to the free software platform provided by the federal government, many private software vendors have built more advanced products that submit data into the ENERGY STAR Portfolio Manager on behalf of their users. A similar approach to permit systems could be a free state platform that allows for other vendors to build compatible systems. These systems could offer a different user experience and enhanced functionality but would still automate the reporting of APR data in a consistent format.

Similar to the way HCD collects permit data from local planning departments, Caltrans collects transit data from hundreds of transit agencies that range in size and capacity. These data are used as part of the California Integrated Travel Project (Cal-ITP), a project to make it easier to use public transportation by offering seamless trip planning and payment across modes and across services in California.[15] Local transit agencies are required to report their transit data in a standard format known as the General Transit Feed Specification (GTFS). The process of reporting these data from the transit agencies' system

of record to Caltrans is automated. For transit agencies without this reporting capability, Caltrans contracted with a vendor to build and maintain the data fields for local transit agencies and support automated reporting.

In addition to setting data standards and automating reporting, Caltrans is assisting transit agencies with their technology and reporting needs. Caltrans encourages the use of multiple interoperable Software as a Service (SaaS) solutions by establishing Master Service Agreement (MSA) pricing for products that meet state reporting requirements. Negotiating contracts at the state level reduces costs for local jurisdictions. A comparable approach for permit systems could be a requirement to report APR data in a specified data format, with MSA pricing for products that meet state requirements and grants to subsidize costs for lower-resource jurisdictions.

The state should continue to research the needs of local governments before determining whether to develop a state permit system option. When making this determination, the state must consider:

- **Maintenance Needs:** If the state is going to build a permit system, funds will need to be budgeted for maintenance and technical support every year. A useful permit system must be responsive to the evolving needs of local governments.
- **Vendor Cooperation:** Collecting data via an API and negotiating Master Service Agreements (MSAs) both rely on the willing

cooperation of software vendors and local governments. If vendors and local governments are unwilling to partner with the state to automate APR reporting, a statewide system may be the only option.

- **Local Interest:** The state should ensure there is sufficient local interest in, and need for, a statewide system before investing resources in a new system. Many local governments recently switched or upgraded permit systems with Planning Grant funds and may prefer to maintain their current systems. Additionally, some jurisdictions have highly specific customization needs that are difficult to meet with a general system.
- **User Costs:** A statewide system must be significantly lower cost than current options to support broad uptake. This will likely require the state to cover much of the costs associated with system development.

Building the capacity to collect data through an API is a critical starting point, but measures to reduce the permit system costs paid by localities are also necessary.

Statewide Integrated Land Use Management Systems

Two primary data inputs for a statewide integrated land use management system are parcel data managed by County Assessors and zoning data managed by city and county planning departments. Most jurisdictions use a

geospatial software to maintain parcel and zoning maps, but some jurisdictions still rely on paper maps. The ability to develop a statewide land use management system will require the digitization of all local parcel and zoning maps and ongoing management of these digital maps. A state system that is interoperable with the geospatial software used by local jurisdictions will help ensure the accuracy of state-level data and reduce the workload of local and state staff.

Parcel Data

County Assessors are tasked with maintaining parcel data, including parcel maps and descriptive parcel attributes such as land use type, square footage, year built, and assessed value. Integrating these data into a statewide database provides a wide range of benefits:

- Counties will only need to report on parcel data to one state entity rather than dealing with requests from multiple state agencies and departments, cities, MPOs, and the public. Collection and dissemination of parcel data could be automated by the state.
- Counties, transit agencies, and MPOs can easily work with parcel maps from adjacent counties when developing regional projects.
- Cities will have up to date parcel data to support their permit tracking and local planning efforts.

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[15] Caltrans, "California Integrated Travel Project", Cal-ITP, Accessed November 17, 2021.

- State agencies can use parcel data to manage public lands, support transit-oriented development, and prepare emergency response plans.
- Developers can use parcel data to identify sites suitable for housing development, particularly when parcel data are layered with zoning data.
- A uniform parcel layer used by state, local, and regional governments and researchers supports the creation of interoperable data tools.

Many other states including Arkansas, Oregon, New York, and Massachusetts, have already developed statewide parcel databases. Successful development of statewide databases requires:

- **State authority to collect parcel data.** States that pursued voluntary data sharing by counties tend to have parcel data for only a portion of the state. For example, since beginning the Statewide Parcel Map Program in 2014, New York has collected data for 26 out of 62 counties.[16]
- **Sustainable funding to maintain parcel data.** States with parcel maps have a designated entity to manage the map with an annual appropriation of funds for maintenance. States may also collect a fee from entities requesting parcel data, helping to cover system costs.
- **Resources and technical assistance to support local data management.** Some smaller and rural counties will require resources to digitize parcel data, and all counties may require funding to automate reporting into a statewide database or to conform to new data standards. Arkansas provided grants to counties to assist in parcel mapping when developing their statewide parcel map.[17]
- **Data uniformity:** States have taken two approaches to data uniformity: establishing data standards counties must confirm with (Arkansas) or accepting data as is and managing data cleaning at the state level (New York). Data accuracy is best supported when the state provides data standards and conducts a quality control (QC) process. States without reporting mandates and guideline authority may have to accept data as is.

A statewide parcel database should have the functionality to automatically receive data directly from local systems of record and make self-service data available to the public. Efforts to create a statewide parcel database must build on the expertise of the State Chief Data Officer and Geographic Information Officer. To support development of a statewide parcel database, the Legislature should designate a lead entity with a mandate to collect local parcel data and guideline authority to develop data standards. This project will require funding for system development and maintenance at the state level and resources for County Assessors to comply with reporting requirements.

Zoning Data

Combining zoning data with parcel data supports efforts to plan for housing and transportation and helps measure the impact of land use policies aimed at increasing density. Several of the larger Metropolitan Planning Organizations (MPOs) have aggregated land use data from their member jurisdictions. This work entailed building databases to accept information from local governments, creating mapping tools to visualize and analyze the data, and providing technical assistance to cities and counties, including digitizing their records. MPOs found collecting zoning data particularly time consuming and struggled to maintain this information on an ongoing basis. Each city and county have their own zoning laws with distinct land use controls, so creating a map that can be used for regional analysis required creating broader zoning categories that could be used to compare across jurisdictions.

Given the complexity of geospatial software, efforts to build a more integrated land use management system should focus on technology that supports integrating data from existing systems, rather than building new software. These systems should use parcel data as a base layer, and then include other datasets that provide a more complete picture of current and potential land use. This could include data on existing land uses, current zoning, applicable streamlining measures, current and planned transportation networks, and permitting activity.

Building a statewide land use mapping tool will require aggregating local data. Jurisdictions without existing land use systems will need technical assistance and funding to meet digital reporting requirements. The state should partner with MPOs on any efforts to aggregate land use data, including exploring a system where land use data are aggregated by MPOs and then rolled up to the to the state level.

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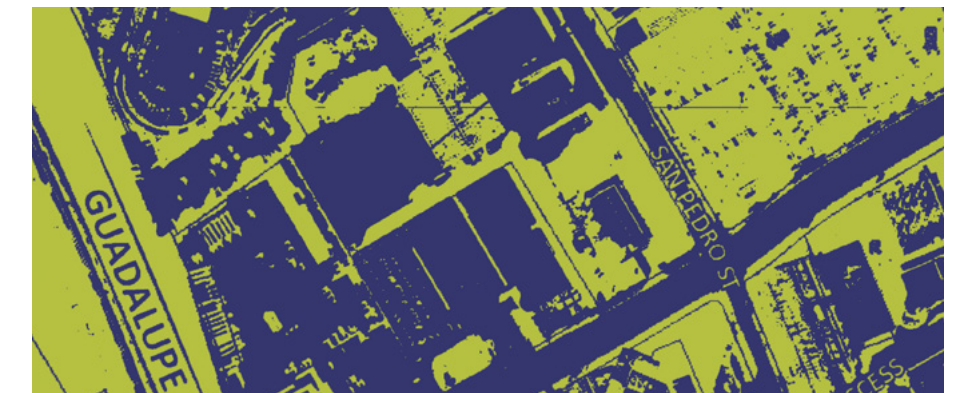
[16] New York State, "New York State Parcels", GIS.NY.GOV, Accessed November 17, 2021.

[17] Hannah Schwartz, How Much Does It Cost to Permit a House?, PDF File, May 2021.

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