3. Accelerating Deep Decarbonization in the Transportation Sector

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Key Takeaways
- Based on the regional policy context including SANDAG's Draft 2021 Regional Plan, the County's Electric Vehicle Roadmap, local jurisdiction policies and guiding documents, and the A2Z Gap Analysis, the County has a strong policy foundation for reducing emissions related to transportation.
- Nevertheless, projected annual emissions in 2045 and 2050 are inconsistent with the levels of reductions required by EO S-3-05, EO B-30-15, and EO-B-55-18 for carbon neutrality.
- This chapter shows where opportunity areas exist to accelerate EV adoption and VMT reduction based on existing countywide policies and patterns of vehicle ownership, travel behavior, and land use development.

3.1 Introduction

Over the last two decades, California has led the country in pioneering a number of policy solutions to mitigate climate change-related hazards and create a sustainable economy. In 2006 the state legislature passed AB 32, which established a program to combat climate change and set a goal to reduce statewide greenhouse gas (GHG) emissions to 1990 levels by 2020. Recognizing that the transportation sector is the largest source of GHG emissions statewide, California has adopted several additional transportation-focused measures since that initial landmark climate bill. One such law is the Sustainable Communities and Climate Protection Act of 2008 (SB 375). SB 375 targets cars and light-duty trucks and directs the California Air Resources Board (CARB) to set regional GHG reduction targets for each metropolitan planning organization (MPO). It requires MPOs to incorporate a set of GHG reduction strategies, called a Sustainable Communities Strategy, into their Regional Transportation Plans.

A series of executive orders signed over the years have further contributed to the state's climate platform. EO S-3-05 set a goal to reduce GHG emissions to 80 percent below 1990 levels by 2050, B-30-15 set an interim goal of reducing emissions to 40 percent below 1990 levels by 2030, and B-55-18 called for the state to achieve carbon neutrality by 2045 at the latest.

Electrification of end-use services and decarbonization of electricity generation have been identified as key pathways to achieving a low-carbon future (Appendix A). Additional Executive Orders and state legislation have established targets for Zero Emission Vehicles (ZEVs) and related charging infrastructure. EO B-48-18 established goals for 200 hydrogen fueling stations and 250,000 EV charging stations (including 10,000 DC fast chargers) to support 1.5 million ZEVs on the road in California by 2025 and 5 million ZEVs on the road by 2030. AB 2127, signed in 2018, requires the CARB and the Public Utilities Commission (PUC) to prepare a statewide assessment of EV charging infrastructure needed to support levels of EV adoption required to meet the goals of EO-B-48-18. Finally, EO N-79-20 laid out a set of transportation decarbonization targets, including a mandate that 100 percent of in-state sales of new passenger cars and trucks are zero emission by 2035 and that operations of medium- and heavy-duty vehicles are zero emission by 2045.

The remainder of this chapter describes the regional policy context for the transportation sector, the modeling efforts that underpin land use and transportation plans in the region, and policy pathways to decarbonization through accelerated adoption of EVs, accelerated reduction of vehicle miles traveled (VMT), and continued investment in vehicle and fuel technology.

3.2 Regional Policy Context

The San Diego region has undertaken a number of transportation decarbonization efforts to date, which include a variety of VMT reduction strategies and electrification strategies. This section details the relevant policy documents that will continue to shape San Diego County's ability to reach accelerated decarbonization targets.

SANDAG's Draft 2021 Regional Plan & 5 Big Moves

The San Diego Association of Governments (SANDAG) is currently in the process of adopting the Draft 2021 Regional Plan, a blueprint for land use and transportation planning in the San Diego region through 2050. This plan provides the big-picture vision for the future as well as an implementation program to make the region's transportation system "faster, fairer, and cleaner." The 2021 Regional Plan identifies a 2030 target of 450,000 EVs on the road in San Diego County, supported by 40,000 chargers.[1]

The Draft 2021 Regional Plan articulates their future investments around the 5 Big Moves, an aspirational vision that provides a framework for the 2021 Regional Plan. The 5 Big Moves include VMT reduction strategies and strategies that encourage electrification of surface transportation vehicles.[2] Over the next 30 years leading up to 2050, SANDAG will refine the

transportation network and discuss a set of policies and programs to support the infrastructure and technology improvements. The five strategies in the plan are Complete Corridors, Transit Leap, Mobility Hubs, Flexible Fleets, and Next Operating System.

1. **Complete Corridors** would provide a balanced and inclusive road and highway network to maximize capacity, reduce congestion, and enable a variety of travel choices. Key features include managed lanes, Active Transportation and Demand Management (ATDM), smart high-speed communication networks, priority for shared transportation modes, and curb management. Complete Corridors are the backbone for the Flexible Fleets and Transit Leap strategies.

2. **Transit Leap** would complement Complete Corridors by creating a complete network of high-speed, high-quality transit services that connect residential areas with employment centers and attractions. Future transit services would build upon existing ones through expanded service times, higher frequency and capacity, transit priority, and better integration with other services.

3. **Mobility Hubs** are envisioned as a network of connected places with land use supportive of integrated mobility services and amenities. SANDAG's proposed network is comprised of the San Diego urban core, plus 30 surrounding hubs. Mobility Hub prototypes have been developed for eight stops along the Mid-Coast Trolley route and eight additional locations across the region.

4. **Flexible Fleets** describes the strategy of shared, on-demand transportation services which include micromobility, rideshare, microtransit, ride hailing, and last-mile delivery. This strategy relies on public-private partnership and assumes many of the new modes introduced would be electric-powered.

5. **Next Operating System (OS)** is a digital platform that compiles information from various parts of the transportation system into a centralized data hub, linking residents, businesses, and operators to real-time transportation data, and providing planners and policymakers with a new repository for analysis.

The first four of the 5 Big Moves are comprised of both strategies to reduce VMT and strategies to accelerate EV adoption, and the fifth, Next OS, is an underpinning strategy to improve data about the transportation sector so that it can continue to be analyzed and optimized over time.

Accelerate to Zero's Electric Vehicle Gap Analysis (2021)
The Accelerate to Zero (A2Z) Emissions Collaborative is an initiative by regional organizations invested in advancing transportation electrification, including the City and County of San Diego, the San Diego Air Pollution Control District, SANDAG, and San Diego Gas & Electric (SDG&E). In July 2021, it published the San Diego Regional Electric Vehicle Gap Analysis which identified existing efforts and conditions, and evaluated zero-emission infrastructure gaps and barriers. As

the A2Z Collaborative continues their work, the EV Gap Analysis will facilitate prioritizing "Communities of Concern" for transportation decarbonization investments. The Gap Analysis identifies a 2030 target of 771,000 EVs on the road in San Diego County, supported by 139,000 Level 2 chargers, 16,200 DC fast chargers, and 47 hydrogen fueling stations.[3]

San Diego County's Electric Vehicle Roadmap (2019)
The County of San Diego adopted an Electric Vehicle Roadmap in October 2019, which contains six goals and 11 recommendations that leverage the County's land use authority, permitting processes, and outreach platforms in order to increase EV ownership and charging installations in the unincorporated area and at County facilities.[4] These are summarized in Table 3.1, below. Because this document relates primarily to the unincorporated area of San Diego, the numbers reported for 2030 EV targets and charger targets are substantially different than the more current SANDAG or A2Z numbers. The EV Roadmap supports the 2018 Climate Action Plan adopted by the County of San Diego.

Table 3.1. Summary of Actions in San Diego County's 2019 Electric Vehicle Roadmap

Goal	Targeted Outcome	Recommendations
County Operations Recommendations		
1. Further reduce the County's fleet of gas-powered vehicles.	Increase the number of EVs in the County's fleet to 501 by 2027.	Amend three Board policies to assist fleet EV conversion by requiring new light-duty vehicles to be EV.
		Convert 250 County fleet gas-powered vehicles to EVs by 2025 and install necessary infrastructure.
		Convert an additional 251 County fleet gas-powered vehicles to EVs for a total of 501 by 2027 and install necessary infrastructure.
		Keep pace with technological trends, track the costs and benefits of fleet conversion, and update the Green Fleet Action Plan no later than 2025 to set goals for medium- and heavy-duty fleet vehicle conversions.
2. Accelerate the installation of EV charging stations at public locations in County facilities and in the unincorporated County.	Contribute to the regional EV charging network by installing 2,040 Level II charging stations at County facilities and throughout the unincorporated area by 2028.	Amend Board policy G-15, "Design Standards for County Facilities" by 2019 to require charging infrastructure development at new County facilities.
		Install an additional 63 publicly accessible EV charging stations for a total of 100 chargers at County facilities by 2021.

		Prepare an EV charger site assessment for County facilities and the unincorporated area and install 2,040 Level II chargers.
3. Promote and incentivize County employee EV ownership.	Increase County employee EV ownership and use to reduce employee commute emissions.	Promote and incentivize County employee EV use by developing partnerships with banks, credit unions, and dealerships to extend lending and pricing benefits.
Unincorporated Area Recommendations		
4. Incentivize and/or require EV charging infrastructure in new and existing private multi-family residential and/or non-residential development.	Increase charging station installations in new and existing private development.	Prepare a cost/benefit analysis of options to incentivize and/or require EV charger installations in private development.
5. Fund EV expert/consumer advocate as a regional resource.	Increase EV ownership and charging station installations through education, outreach, regional collaboration, and incentives.	Identify regional partners and cost sharing opportunities to fund a regional EV expert/consumer advocate on an ongoing basis.
6. Collaborate with regional partners to support public and private fleet electrification.	Increase EV use in regional light-, medium-, and heavy-duty fleets.	Develop public and private regional partnerships to provide fleet electrification technical support on an ongoing basis.

San Diego County's Climate Action Plan (2018)

Through Climate Action Plans (CAPs), both the County of San Diego and many cities within the County have set out a series of measures to reduce GHG emissions over the coming decades. The County's 2018 CAP, which is currently being revised to achieve compliance with the California Environmental Quality Act (CEQA), included 11 strategies and 26 measures which focus on activities that occur within the unincorporated area of the region and within County-owned facilities.[5] The framework for the 2018 CAP is the GHG emissions inventory (baseline year 2014) and the state's GHG reduction targets. San Diego County set emissions targets of 3,147,275 and 1,926,903 MTCO$_2$e for future years 2020 and 2030, respectively. Measures in the Built Environment and Transportation GHG emissions sector specifically are projected to help the County achieve reductions of 233,758 MTCO$_2$e in 2030.[5]

City of San Diego's Climate Action Plan (2015)

The City of San Diego adopted its landmark CAP in 2015 and projected that its implementation would help the city surpass the target of 51 percent below 2010 GHG emissions by 2035 and maintain its trajectory to meet its proportional share of the 2050 state target. Among the local strategies for achieving the GHG reduction targets are a range of activities that aim to decrease

transportation-related emissions by improving mobility and reducing VMTs. Specific implementation measures involve changing land uses, promoting alternative modes of travel, and enhancing vehicle fuel efficiency. As the largest jurisdiction in the County, the policies and actions of the City of San Diego often can help provide resources and examples against which other jurisdictions can model their approach.

Summary of Additional State, Regional, and Local Goals and Actions

In addition to the County and City of San Diego's CAPs, the other jurisdictions in the County have also adopted CAPs, with associated goals around VMT reduction, EV adoption, and emissions reductions for the transportation sector. Some have additionally developed targets and taken actions related to the adoption of EVs and/or the implementation of charging infrastructure. This regional context was included in the A2Z Gap Analysis and is summarized in Table 3.2 below.

Table 3.2. County of San Diego Jurisdictions' Relevant Goals & Actions

Jurisdiction	Relevant Goals, Targets, and Actions
Regional and State Agencies	
Caltrans District 11	● Partnering with SDG&E to provide charging at park and ride facilities throughout the region. ● Installing corridor charging at rest areas and remote inter-city travel locations.
County of San Diego	● Established streamlined permitting processes in 2017, compliant with AB 1236, to encourage EV charging infrastructure in new developments. ● Adopted the Electric Vehicle Roadmap in 2019.
North County Transit District	● Developed a Zero Emissions Bus Rollout Plan, detailing full transition by 2042. ● Planning to purchase six battery electric and eight hydrogen fueled buses by 2023.
SANDAG	● Launched Plug-In San Diego in 2015. ● Committed over $30m over 30 years to support build-out of Level 2 charger network through the San Diego County Incentive Project. ● Identified additional electrification and mode-shift opportunities through the Draft 2021 Regional Transportation Plan and associated Big 5 Moves.
San Diego Metropolitan Transit System	● Developed a transition plan to convert fleet of 800 buses to zero emissions by 2040. ● Acquired eight battery electric buses by 2021.
Cities	
Carlsbad	● Adopted residential and non-residential ordinances for EV parking. ● Adopted 2011 CAP goal to increase ZEV miles from 4.5% to 25% by 2035.
Chula Vista	● Currently, has 31% of alternatively-fueled fleet vehicles; continuing to work towards their CAP goal of 40% by 2020.

	● Installed around 120 chargers for their fleet vehicles.
Coronado	● Identified "greening" the city's 100 fleet vehicles as a way to reduce transportation emissions.
Del Mar	● Adopted CAP goal to increase alternatively-fueled VMT to 20% in 2020 and 30% in 2035. ● Adopted CAP goal to set aside 10% of on-street parking and in city lots for high-efficiency and clean vehicles by 2020.
El Cajon	● Plans to install 128 new EV charging stations at commercial developments and 79 new EV charging stations at multi-family developments by 2030.
Encinitas	● Requires new residential units to install EV charging infrastructure. ● Multi-family developments must include EV charging infrastructure at 5% of the total number of parking spaces.
Escondido	● Plans to install 281 EV charging stations in park and ride lots by 2035.
Imperial Beach	● Encourages developers to install EV charging infrastructure for new and retrofit developments. ● Planning to assess municipal fleet replacement timeline for switching to ZEVs.
La Mesa	● Partnered with SANDAG, San Diego Air Pollution Control District (SDAPCD), and local developers to develop strategies to increase EV infrastructure at existing multi-family complexes.
Lemon Grove	● Plans to adopt a zoning ordinance requiring installation of EV charging infrastructure at 5% of the total number of parking spaces at new multi-family and commercial developments.
National City	● Installed charging stations at City Hall. ● Partnered with SDG&E to install EV charging infrastructure across the City.
Oceanside	● Plans to require new single-family developments to include prewiring to enable 240-volt charging.
Poway	● Installed 11 EV charging stations around the City.
San Diego	● Adopted CAP goal to convert 90% of gas-powered municipal fleet vehicles to zero emission by 2035. ● Installed 57 public EV charging stations at City facilities.
San Marcos	● Will require (starting in 2021) new multi-family and commercial developments to include EV charging infrastructure at 5% of total number of parking spaces.
Santee	● Requires all new residential and commercial developments to install e-chargers.
Solana Beach	● Collaborating with SANDAG to increase EVs in the City.
Vista	● Requires new multi-family developments to have 3% of total parking spaces equipped with EV charging infrastructure.

	● Requires new commercial developments to have 6% of total parking spaces equipped with EV charging infrastructure.

Source: San Diego Regional EV Gap Analysis, July 2021; SANDAG Draft 2021 Regional Plan.

3.3 Transportation Modeling & Emissions Forecasts

In support of this Regional Decarbonization Framework, Fehr & Peers has undertaken a review of the assumptions and outcomes of the San Diego Association of Governments (SANDAG) regional model and Evolved Energy's EnergyPATHWAYS model described in Appendix A. There are fundamental differences between the two models. **SANDAG** uses an activity-based model (ABM) that simulates individual and household transportation decisions at a detailed level. The most current model is ABM2+, which is being used to support the 2021 Regional Plan. **EnergyPATHWAYS** estimates energy use and GHG emissions given a specific electrification trajectory and fleet composition.

SANDAG's ABM2+ simulates travel behavior in the San Diego region using land use and transportation network data to estimate VMTs and estimate corresponding GHG emissions. ABM2+ starts with a street-based active transportation network, a highway network, and a transit network. The resident transportation model, disaggregate models, and aggregate models are executed, and the resulting trip tables are summed up and used by an iterative traffic assignment process. The outputs – specifically, VMT by speed bin and vehicle classification – are then converted off-model to greenhouse gas emissions using Emission Factors (EMFAC) emissions factors.

EnergyPATHWAYS is a stock accounting tool from Evolved Energy that quantifies all energy infrastructure. The transportation portion of the model uses service demand projections, existing vehicle stock, and efficiency measures to estimate total emissions. The model can be made applicable to varying geographies across the nation by modifying the underlying parameters. In the context of California, it uses the 100% zero-emission vehicle (ZEV) sales by 2035 goal and makes assumptions about adoption of EV technologies. In this model, decarbonization comes from fuel shifts, not mode shifts. As such, many factors that are central to ABM2+, such as vehicle miles traveled (VMT), are not considered.

For the purposes of this chapter, the 2021 Regional Transportation Plan and SANDAG's ABM2+ are discussed further. At the conclusion of this chapter, Table 3.7 provides a summarized comparison between the two models, and Appendix A of the Regional Decarbonization Framework provides full technical documentation for the EnergyPATHWAYS model.

SANDAG Emissions Forecasts

As described above, SANDAG's Draft 2021 Regional Plan includes policy and transportation investment initiatives that are referred to as the 5 Big Moves, which include Complete Corridors, Transit Leap, Mobility Hubs, Flexible Fleets, and Next Operating System. Together, these five key strategies for mobility aim to deliver an efficient and equitable transportation system that meets state climate targets and local Climate Action Plan goals. However, these policies and actions are not sufficient to meet the requirements of EO S-3-05 and EO B-55-18, as described in the emissions forecasts included in the Draft 2021 Regional Plan EIR. In order to reach deep decarbonization goals, additional efforts will be necessary both to rapidly electrify the surface transportation sector and to reduce VMT.

The Draft EIR for the Draft 2021 Regional Plan evaluates environmental impacts related to regional growth and land use change as well as the transportation network improvements and programs of the 5 Big Moves together because the per-capita CO_2 emissions from vehicles addressed by state targets are influenced by the combined effects of both components. ABM2+ models the effect of the 5 Big Moves in conjunction with the rest of the 2021 Regional Plan through four forecast scenarios: Baseline Year 2016, interim years 2025 and 2035, and Horizon Year 2050.

Compared to existing conditions, the Draft EIR reports that the regional growth, land use change, and transportation network improvements included in the 2021 Regional Plan would result in a reduction of GHG emissions across all sectors for all interim and horizon years. These reductions are summarized in Figure 3.1, which shows GHG impact of Passenger Cars and Light-Duty Vehicles with and without the SAFE Rule Impact (the SAFE Rule sets national fuel economy standards instead of California standards). For Passenger Cars and Light-Duty Vehicles, emissions are also forecasted to decrease for all interim and horizon years. For Heavy-Duty Trucks and Vehicles, emissions are forecasted to remain the same from 2025 onward. For Rail, emissions are forecasted to increase between 2016 and 2050. Projected annual emissions in 2045 and 2050 (18 MMTCO$_2$e across all sectors and 7.6 MMTCO$_2$e for the Surface Transportation sector, including Passenger & Light-Duty with no SAFE Rule impact, Heavy-Duty & Trucks, and Rail) would be inconsistent with the levels of reductions required by EO S-3-05, EO B-30-15, and EO-B-55-18.[ix]

Per SB 375, specific GHG emissions reduction targets for the transportation sector are not yet established for Horizon Year 2050, but the target established for SANDAG for 2035 is to reduce

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[ix] EO S-3-05 requires a reduction of GHG emissions to 80 percent below 1990 levels by 2050. EO B-30-15 requires a reduction of GHG emissions to 40 percent below 1990 levels by 2030. EO B-55-18 requires carbon neutrality across all sectors by 2045.

per capita CO_2 emissions from passenger cars and light-duty vehicles to 19 percent below 2005 levels. As shown in Figure 3.2, implementation of the 2021 Regional Plan would reduce per capita CO_2 emissions from this sub-sector of Surface Transportation to 20 percent below 2005 levels by 2035, and therefore would meet SB 375 targets.

Summary of 2016 Greenhouse Gas Inventory and Greenhouse Gas Projections

Greenhouse Gas Emissions (MMT CO_2e)

Emissions Category	2016	2025	2030	2035	2045	2050
Passenger Cars and Light-Duty Vehicles* (No SAFE Rule Impact)	10.5	8.0 (7.8)	7.4 (6.9)	6.5 (5.9)	6.4 (5.7)	6.4 (5.7)
Electricity	5.3	3.4	1.9	1.3	0.2	0.2
Natural Gas	3.1	3.3	3.4	3.4	3.5	3.6
Industrial	2.1	2.2	2.3	2.4	2.5	2.5
Heavy-Duty Trucks and Vehicles	1.8	1.7	1.7	1.7	1.7	1.7
Other Fuels	1.1	1.4	1.4	1.5	1.5	1.5
Off-Road Transportation	0.62	0.72	0.79	0.83	0.91	0.95
Solid Waste	0.59	0.62	0.64	0.65	0.67	0.67
Water	0.24	0.28	0.22	0.15	-	-
Aviation	0.21	0.29	0.32	0.34	0.40	0.43
Rail	0.11	0.17	0.18	0.19	0.20	0.20
Wastewater	0.07	0.08	0.08	0.08	0.08	0.08
Agriculture	0.05	0.06	0.06	0.06	0.06	0.06
Marine Vessels	0.05	0.06	0.06	0.06	0.08	0.08
Soil Management	0.05	0.04	0.04	0.04	0.04	0.04
Total* (Total: No SAFE Rule Impact)	26	22 (22)	20 (20)	19 (18)	18 (18)	18 (18)

MMT – million metric tons, SAFE Rule – Federal Safer Affordable Fuel-Efficiency Vehicles Rule, April 2020

*Includes GHG impact of SAFE Rule

2016 is an inventory year, the rest are forecast years. The GHG emissions projections include the impact of federal and State regulations and regional policies and programs to reduce GHG emissions.

Source: Energy Policy Initiatives Center, University of San Diego 2021

Figure 3.1. Summary of 2016 Greenhouse Gas Inventory and Greenhouse Gas Projections. Source: SANDAG.

	Per Capita Reductions from 2005 Levels
Per Capita Reduction under the Proposed Plan (On-Model Results Only)	-19.03%
Per Capita Reduction under the Proposed Plan (Off-Model Results Only)	-3.05%
CARB Adjustment Factor for EMFAC 2007–2014[1]	+1.7%
Induced Demand Adjustment Factor[2]	+0.38%
Per Capita Reductions	-20.0%

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4.8 Greenhouse Gas Emissions

	Per Capita Reductions from 2005 Levels
CARB Target	-19%

Source: Appendix I.
[1] The GHG reductions for the 2021 Regional Plan were calculated using the CARB model EMFAC 2014 and adjustment factors provided by CARB to account for differences in emissions rates between EMFAC 2007 (used to set the original targets in 2010) and EMFAC 2014.
[2] The induced demand adjustment factor methodology is described in Attachment 3 of Appendix I.

Figure 3.2. SB 375 GHG Reduction Targets under the Proposed Plan from Passenger Vehicles and Light-Duty Trucks, 2035, (2021 Regional Plan EIR Table 4.8-9).

3.4 Decarbonization Strategies: Policy Pathways to Close the Gap

Based on the regional policy context summarized above, including SANDAG's Draft 2021 Regional Plan, the County's Electric Vehicle Roadmap, local jurisdiction policies and guiding documents, and the A2Z Gap Analysis, the County has a strong policy foundation for reducing emissions related to transportation. The remainder of this section describes the ways in which the County can accelerate actions needed to achieve regional decarbonization of the transportation sector through accelerated EV adoption, accelerated VMT reduction, and vehicle and fuel technology improvements.

Accelerate EV Adoption

Within the 5 Big Moves and the 2021 Regional Plan more broadly, electrification is identified as a major factor in reaching regional GHG emissions reduction targets in the following ways:

- Establishes incentives to incorporate EVs into Flexible Fleets and Transit Leap
- Includes programs that could increase the number of EVs and charging stations throughout the region and within Mobility Hubs as part of the Complete Corridor strategy
- Centers Mobility Hubs around EV charging infrastructure
- Incorporates transitioning into a zero-emission fleet for the Flexible Fleet strategy

While Complete Corridors' main goal is to promote a switch from single occupancy driving to modes such as transit, shared rides, and active transportation, the initiative would help the San Diego region reach its 2030 electrification goals. The plan does not lay out a timeline for how the Transit Leap strategy will aid electrification, but it does promote the idea that new and existing services can switch to alternative fuel sources and electric power. Per the plan documentation, it is likely that future high-speed rail projects will be powered by a combination of both diesel and electricity. **In order to accelerate electrification through this strategy, SANDAG would need to adopt an aggressive implementation timeline for Complete Corridors and Transit Leap, focusing on implementation in the parts of the County where transit will be most viable and well-utilized.**

The 5 Big Moves documentation also mentions several partnerships and policies that can assist with public charging and hydrogen fueling stations build-out. These include the CALeVIP San Diego County Incentive Project, which in late 2020 began providing rebates for placement of public level 2 and direct current fast charging stations, and coordination with SDG&E to manage the demands that EV charging places on the grid. SANDAG and SDG&E are also working to provide programs that install charging stations for workplaces, multi-unit dwelling communities, and medium- and heavy-duty vehicles. **In order to accelerate electrification through this strategy, SANDAG and SDG&E would need to increase the levels of incentives and rapidly advance EV charging infrastructure installations, focusing first on Communities of Concern (CoCs) and then in places where transit is not yet viable.**

In addition to the 5 Big Moves components related to electrification, San Diego regional actions and policies to accelerate EV adoption are articulated in the A2Z EV Gap Analysis. Although the main goal of the Gap Analysis was to identify needs in order to inform a long-term strategy, the report captured some initial solutions that can inform the strategy. These include:

- Lowering the upfront costs of EV ownership through incentives, targeting the new and secondary market
- Leveraging cooperative buying for medium- and heavy-duty fleets

- Exploring alternatives to vehicle-purchase incentives, including low-emission zones, EV mandates, ordinances, or registration controls to enforce emissions standards
- Streamlined permitting for charging infrastructure
- Prioritization of infrastructure in communities of concern
- Coordinated education campaigns for end users, property owners, and frontline salespeople
- Workforce training for commercial drivers and automotive maintenance workers

Downscaled Geographic EV Adoption Targets

The A2Z Gap Analysis identifies an EV population target of 771,000 across San Diego by 2030. This target is substantially higher than SANDAG's reported target in the Draft 2021 Regional Plan, but provides an upper-limit estimate of San Diego's regional share of the state-wide target. For the purposes of downscaling to local jurisdictions in San Diego County, Fehr & Peers has used the A2Z target numbers rather than the SANDAG targets.

Based on the current distribution of registered EVs in San Diego, Fehr & Peers has identified which jurisdictions will need to accelerate adoption policies most aggressively to meet the stated goals. Table 3.3 shows the share of regional population within each San Diego County jurisdiction, the share of regional VMT, the current number of EVs, the current number of vehicles, and the proportion of EVs as a share of each jurisdiction's vehicle population. Figure 3.3, following the table, shows the share of EVs as a proportion of all vehicles, by jurisdiction.

Table 3.3. Jurisdiction-level EV Population, Population Share, and VMT Share

Jurisdiction	Total # EVs (2020)	Total # Vehicles (including EVs) (2020)	Share % of Total Vehicles that are EVs (2020)	Total Vehicle Ownership Share % (2020)	Share of Regional Population (2019)	Share of Regional VMT (2012)
Unincorporated San Diego County	7,838	473,689	1.7%	16.9%	11.1%	15%
Carlsbad	3,804	92,092	4.1%	3.3%	3.5%	4.5%
Chula Vista	2,708	205,797	1.3%	7.3%	8.0%	5.7%
Coronado	395	12,727	3.1%	0.5%	0.7%	1.0%
Del Mar	861	13,358	6.4%	0.5%	0.4%	0.3%
El Cajon	1,183	126,488	0.9%	4.5%	5.2%	2.9%
Encinitas	2,318	51,148	4.5%	1.8%	1.9%	2.1%
Escondido	2,222	139,093	1.6%	5.0%	5.4%	4.5%
Imperial Beach	128	17,299	0.7%	0.6%	0.8%	n/a
La Mesa	967	54,751	1.8%	2.0%	2.2%	1.9%
Lemon Grove	145	20,861	0.7%	0.7%	0.8%	0.6%
National City	145	42,934	0.3%	1.5%	1.9%	1.7%
Oceanside	1,979	112,863	1.8%	4.0%	4.7%	4.3%
Poway	1,240	40,736	3.0%	1.5%	1.5%	1.9%
San Diego	25,337	1,179,150	2.1%	42.1%	43.1%	46.3%
San Marcos	1,876	73,657	2.5%	2.6%	3.0%	2.7%
Santee	544	44,691	1.2%	1.6%	1.7%	1.4%
Solana Beach	554	10,580	5.2%	0.4%	0.4%	0.6%
Vista	1,208	88,872	1.4%	3.2%	3.6%	2.6%
TOTAL	55,452	**2,800,786**	**n/a**	**100%**	**100%**	**100%**

Notes:

1. EV population and total vehicle population data from California Energy Commission (2020).

2. Population data from American Community Survey 5-Year Estimates (2015-2019), extracted by zip code. Zip codes were classified into the 19 jurisdictions above per the County of San Diego Superior Court zip code directory. Zip codes whose geographic boundaries fell into multiple jurisdictions were reviewed using aerial imagery to determine land use and classified into the jurisdiction with the greatest overlap of urban use.

3. VMT data from SANDAG ABM1 (2012). Total VMT is calculated using the OD method at the TAZ level and then aggregated to the jurisdictional level, which may result in some double-counting of trips but overall reflects a reasonable proportional share of the County's VMT.
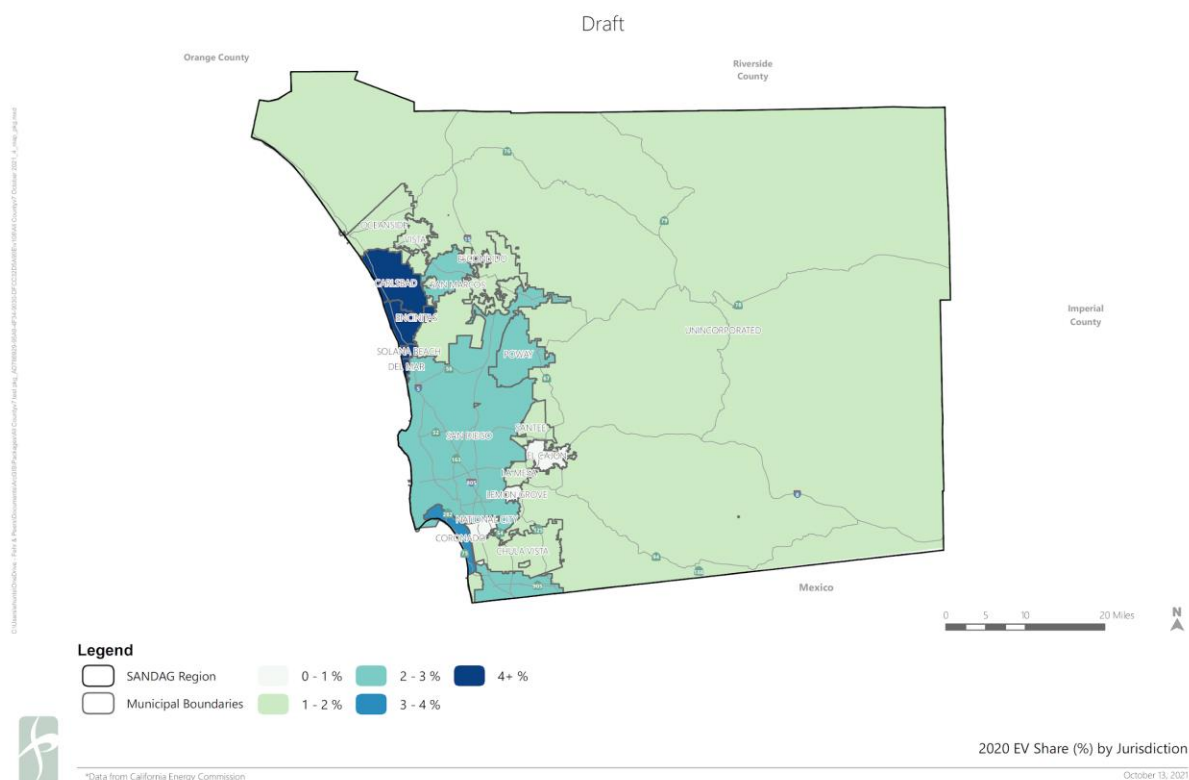
Figure 3.3. EV Share of All Vehicles, by Jurisdiction (2020). Source: CEC and Fehr & Peers, 2021.

In order to show where policy efforts can be focused to help accelerate EV ownership efforts, the Countywide 2030 EV targets can be downscaled to the jurisdictional level. Table 3.4 shows the future target number of EVs based on three alternative methods of calculation:

- Based on population share
- Based on VMT share
- Based on vehicle ownership share

There is no perfect way to downscale EV targets to the local jurisdictional level. Basing the future target on population would follow the A2Z approach to determining the target number of EVs in San Diego as a proportion of California's targets. However, this would produce an overestimated target in places where vehicle ownership rates are lower than average. Basing the future target on VMT would produce more aggressive targets in places where people drive longer distances. Basing the future target on vehicle ownership would reify the existing vehicle ownership patterns, which reflect the current inequities of EV ownership due to the cost of purchasing a vehicle as well as existing land use and travel behavior patterns. These travel patterns may change in the future as a result of future land use development patterns, encouraging more transit-oriented development (discussed further in the section to follow).

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These downscaled targets are intended therefore to reflect a range of reasonable order of magnitude for each jurisdictions' EV population in 2030.

Table 3.4. Downscaled Jurisdiction Targets to Meet Regional A2Z EV Goals

Jurisdiction	Total # EVs (2020)	Future Target # EVs Based on Population Share	Future Target # EVs Based on VMT Share	Future Target # EVs Based on Vehicle Ownership Share
Unincorporated San Diego County	7,838	116,612	115,286	130,397
Carlsbad	3,804	26,396	34,708	25,351
Chula Vista	2,708	62,772	44,209	56,652
Coronado	395	4,931	7,682	3,503
Del Mar	861	984	2,402	3,677
El Cajon	1,183	24,074	22,334	34,820
Encinitas	2,318	14,340	16,486	14,080
Escondido	2,222	35,285	34,983	38,290
Imperial Beach	128	6,470	n/a	4,762
La Mesa	967	13,829	14,320	15,072
Lemon Grove	145	6,117	4,366	5,743
National City	145	14,320	13,280	11,819
Oceanside	1,979	40,895	32,828	31,069
Poway	1,240	11,378	15,024	11,214
San Diego	25,337	329,880	357,089	324,596
San Marcos	1,876	22,417	20,779	20,276
Santee	544	13,375	11,088	12,303
Solana Beach	554	3,191	4,248	2,912
Vista	1,208	23,736	19,890	24,465
TOTAL	**55,452**	**771,000**	**771,000**	**771,000**

Note: Percentages from Table 3.4.2 multiplied by A2Z's Countywide target of 771,000 EVs to determine jurisdictional targets.

To support the local acceleration of EV adoption towards the targets identified above, it will also be necessary to accelerate the rollout of EV charging infrastructure. The County and SANDAG can enhance the Plug-In San Diego Electric Vehicle Charging Map to provide improved modeling for charging infrastructure location suitability at a regional scale.[x] SANDAG and the County can collaborate with local jurisdictions to encourage them to undertake a local EV

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[x] The Plug-In San Diego EV Charging Stations Map can be found at https://evcs.sandag.org/, which includes methodological information about how the TAZs were analyzed to identify EV trip end percentiles.

Infrastructure Siting Plan, to identify more granular placement locations, and to support infrastructure investments in Communities of Concern.

Policy Opportunity Areas

Jurisdictions within the San Diego region have a great deal of room to strengthen policies related to transitioning to EV fleets and providing sufficient charging infrastructure. Based on the summary of efforts described in the Regional Policy Context section of this chapter, along with the findings from the A2Z Gap Analysis, there is a wide variety of policies and actions that have been informally or formally adopted by jurisdictions across the San Diego region, which range from more encouragement-based to more requirement-based. There is also variation in how these policies apply to different types of land use and development. The variety of policies and actions are summarized in Figure 3.4.

Policies shown on the left of Figure 3.4 – for example, adopting a policy to provide EV chargers in lots that are owned by the jurisdiction – will not be sufficient to meet aggressive EV adoption goals. In contrast, policies shown on the right of Figure 3.4 – for example, those that require private developers to install chargers at a high percentage of their parking spaces, across all land use types (commercial, residential, etc.), at new development and retrofitting infill sites, with additional support for multi-family and communities of concern – would be substantially more effective at meeting aggressive EV adoption goals.
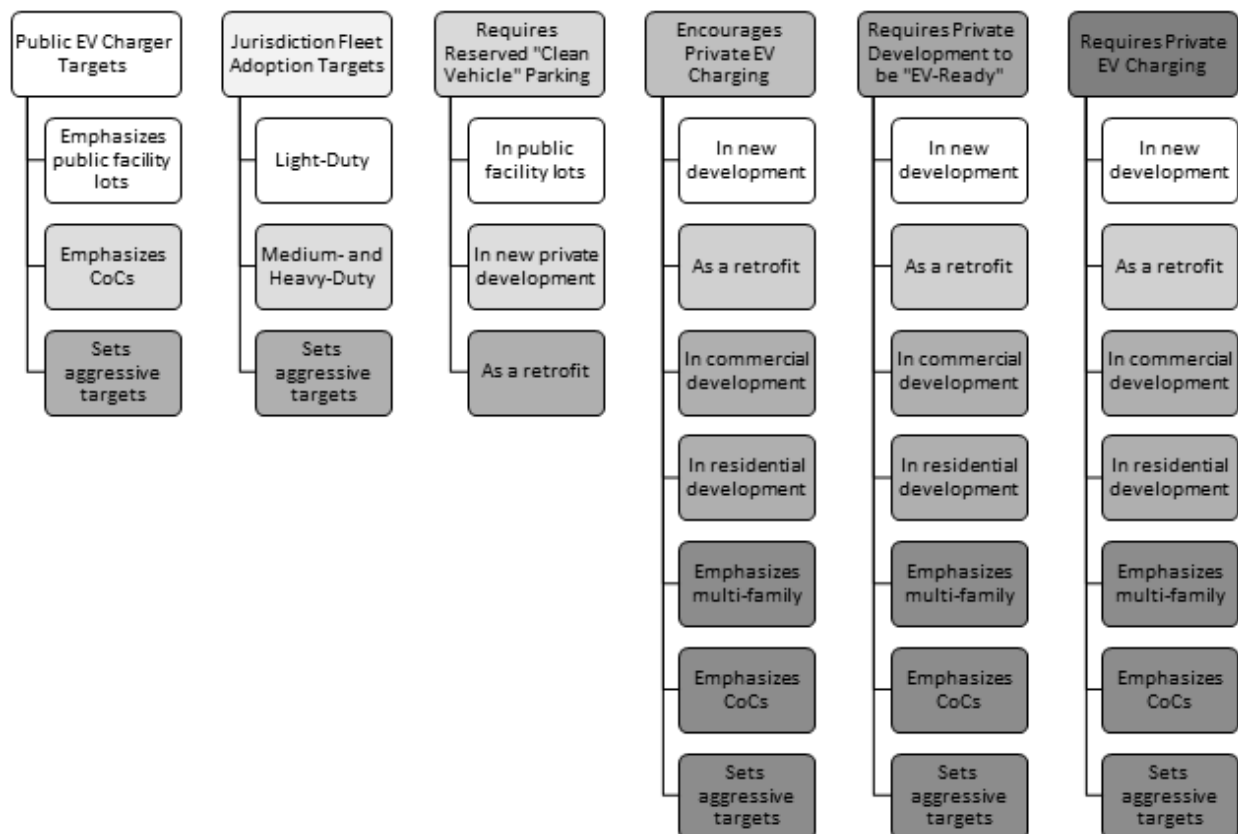
Figure 3.4. Policy Options to Accelerate EV Adoption.

In order to accelerate decarbonization most aggressively, the County can consider moving its own policies along the spectrum from more encouragement-based to more requirement-based, and by expanding the reach of requirements and ordinances to cover more land use contexts. To support the accelerated adoption of the strongest and most effective policies, the County can offer more appealing incentives, streamline development processes and infill benefits, and provide readily accessible information for property owners and vehicle owners. For areas where it does not have direct jurisdictional control or where collaboration across sectors is required, the County can partner with other entities to support workforce development goals, continue to collaborate across the region to share information and lessons learned, and support state-level advocacy to bring implementation funding to San Diego County. Table 3.5 summarizes ways in which the County can implement these actions and policies within the region or partner to make progress where the County lacks jurisdictional authority.

Table 3.5: Electrification Strategies and County Implementation Approach

Strategy	Partnership Opportunity	County Implementation Approach
Set Public EV Charger Target	✓	Update 2019 EV Roadmap to include more aggressive targets; continue to partner with A2Z Collaborative to downscale jurisdictional targets on appropriate roadways; identify partnership opportunities with those jurisdictions that have made the least progress toward their targets to share information and successful implementation strategies
Set Fleet Adoption Target	✓	Update 2019 EV Roadmap to include more aggressive targets; identify partnership opportunities with those jurisdictions that have made the least progress toward their targets to share information and strategies to accelerate fleet transition
Set-Aside Public Parking Spots for Clean Vehicles		Adopt requirements in County zoning code
Encourage EV Charging Infrastructure at Development Projects		Encouragement through incentives can complement stronger policy requirements where no County jurisdictional authority exists
Require New Development to be "EV-Ready"		Adopt requirements in County zoning code; adopt ordinance that requires retrofitting
Require EV Charging Infrastructure to be Installed at Developments		Adopt requirements in County zoning code; adopt ordinance that requires retrofitting
Offer Consumer Incentives to Purchase EVs	✓	Partner with SANDAG to accelerate and increase the amount of incentives, reduce barriers to accessing incentives, and promote aggressively in CoCs
Provide Readily-Accessible Information to Property Owners and Vehicle Owners	✓	Partner with private entities to understand information gaps; partner with SANDAG to produce coordinated educational materials and aggressively promote
Train Workforce to Support EV Ecosystem	✓	Partner with educational institutions to develop workforce training needs; increase funding to existing programs
Collaborate to Share Information Across Region	✓	Continue to partner with A2Z Collaborative
Engage in State-level Advocacy to Bring Implementation Funds to San Diego County	✓	Continue to partner with A2Z Collaborative

Accelerate Reduction of VMT

Current San Diego region actions and policies to reduce VMT are articulated in the 2021 Draft Regional Plan across the 5 Big Moves and regional land use development policies. SANDAG is required to demonstrate how the region will reach targets by reducing VMT. As such, plans for the 5 Big Moves describe ways to influence behavior change and support denser land uses. To meet the targets, vehicle trips need to be replaced with biking, walking, transit, and shared rides. The Draft 2021 Regional Plan articulates the following strategies to reduce VMT:

- Complete Corridors support a greater variety of transportation options, and the initiative promises investments in infrastructure to make alternative transportation more attractive. Complete Corridors also employ congestion pricing as a tool for reducing demand and VMT during peak times.
- Flexible Fleets provide convenient and affordable alternatives to driving alone.
- Transit Leap calls for a multimodal high-speed, high-capacity, high-frequency transit network that appeals to people who otherwise drive alone. In the 5 Big Moves, SANDAG states that public transit will "continue to be the most efficient way to move many people," therefore reducing VMT.
- Mobility Hubs are communities with a high concentration of people, destinations, and travel choices. Higher density Mobility Hubs have a supportive mix of land uses that can help to encourage ridership and usage of the Transit Leap system. However, Mobility Hubs in less dense areas may rely on more motorized services in order to connect residents to transit and not reach the same VMT reductions.

Table 3.6 provides details on VMT-reduction strategies that would support acceleration of VMT reduction within San Diego County. For those strategies that rely on zoning changes, the County can only directly influence the zoning code within its own jurisdiction. For other jurisdictions, the County can support information sharing, evaluation to prove effectiveness of strategies, and inter-jurisdictional collaboration to encourage other jurisdictions to undertake similar zoning changes to encourage denser, more walkable, and more transit-oriented development.

Table 3.6: VMT Reduction Strategies and County Implementation Approach

Policy Strategy	Electrification Opportunity	County Implementation Approach
Expand geographic reach of bus and rail services in areas where development can support transit use	✓	Identify corridors with land use patterns that can support transit; partner with transit agencies to fund additional miles of transit service
Invest additional transit service hours in places where transit is productive and high occupancy, focused on infill locations	✓	Identify highest-performing transit corridors; partner with transit agencies to fund additional hours of transit service
Provide incentives and regulatory relief to facilitate higher density infill and transit-oriented development		Modify zoning code along transit corridors to allow denser development; streamline permitting process for developments along transit corridors; leverage parking reductions, density bonuses, and other incentives to encourage development in transit corridors
Disincentivize development in rural (or non-infill) areas that cannot support efficient transit use or multi-modal transportation options		Utilize transit opportunity areas, infill areas, and VMT efficiency metrics to encourage compact development and discourage exurban and very rural development
In existing rural, non-infill, or underserved transit areas, invest in TNC partnerships to ensure sufficient access to opportunities	✓	Identify limited-access areas that would benefit from additional mobility resources; develop TNC partnerships to support travel using higher-occupancy vehicles
Incentivize high occupancy personal vehicle use		Investigate opportunities to implement pricing structures (cordon pricing, HOT lanes, etc.) that incentivize high occupancy vehicles
Design walkable communities, particularly in places where compact development patterns are already established		Adopt pedestrian-oriented design guidelines for all new development; reduce or remove parking minimums in walkable neighborhoods
Expand pedestrian and bicycle facilities, using a network approach to ensure destinations are served, corridors and intersections are equally comfortable and safe		Update county bicycle and pedestrian planning documents; partner with SANDAG to accelerate implementation of 2010 San Diego Regional Bicycle Plan; develop Pedestrian Safety and/or Vision Zero and/or Local Road Safety Plan
Expand modal options including a wide range of e-bikes, e-scooters, bikeshare, micro transit, shuttles, and TNC partnerships	✓	Partner with SANDAG to build out network of Mobility Hubs where shared vehicles and new mobility services can be found

Conduct programs to ensure people of all abilities and ages are comfortable using bicycle and pedestrian facilities		Partner with mobility advocacy organizations to fund expanded education programming; implement periodic regular open streets events throughout the County
Encourage TDM programs that incentivize some proportion of telework, telemedicine, remote learning and use of transit		Develop County TDM ordinance and Transportation Management Organization (TMO) to work with employers and service providers
Expand broadband in places where it is weak		Conduct broadband gap analysis; seek funding to improve communications infrastructure in areas that lag; require enhanced communication technology in all new development through TDM ordinance
Restructure distribution centers to enable more efficient delivery patterns that enable short-haul electrified freight vehicles and AV delivery	✓	Conduct electrified freight study to understand where opportunities for distribution efficiencies exist; modify zoning code to encourage distribution centers in efficient locations

Geographic Opportunity Areas

The above strategies are likely to be successful in different locations across the County. Transit-oriented strategies will be most successful in places where the density of population and development can support efficient transit vehicle use, or 'infill' locations. Walking and biking strategies will likely be more effective in infill locations. In non-infill locations, strategies related to trip reduction through TDM, partnerships with TNCs that prioritize electrification and high-occupancy ridership, and enhancing broadband service may be more successful strategies to reduce VMT.

Figure 3.5 shows the transportation analysis zones (TAZ) in San Diego County that meet the following definition of infill:

- Household density above 385 housing units/square mile (selected based on the US Census definition for urban area)
- Intersection density above 128 intersections/square mile (matches Frost (2018) average value for 'Urban Places')
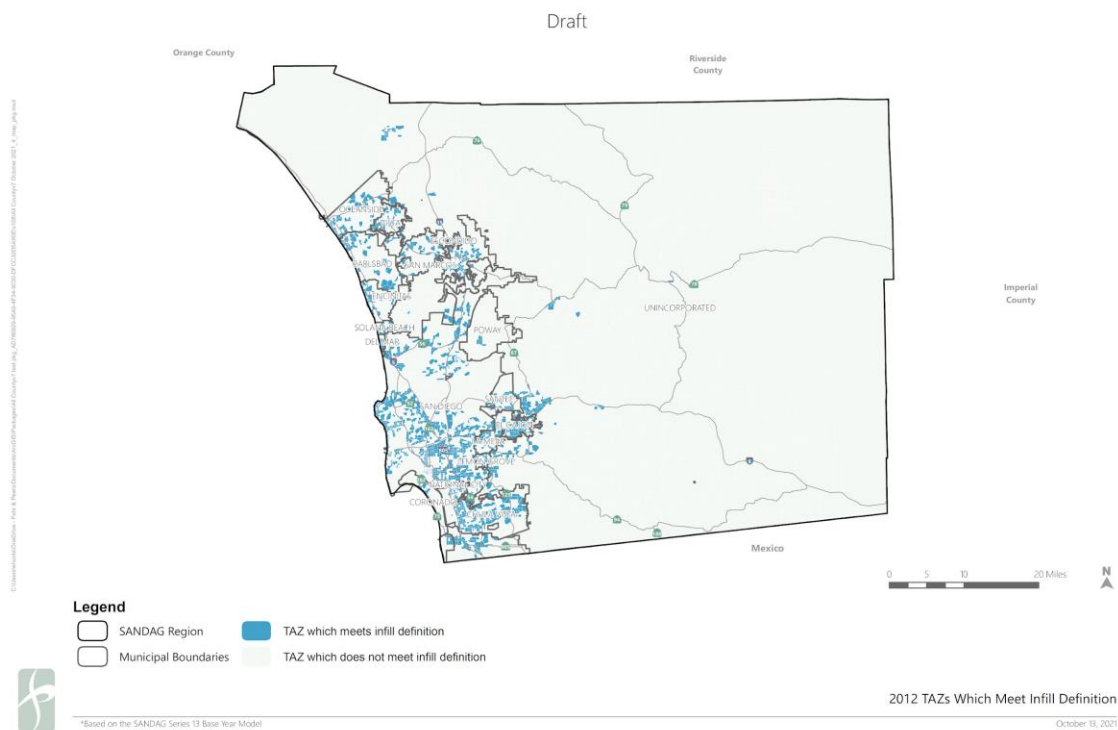- Job Accessibility of 12.73 (average value for local employment accessibility in Salon (2014))

Figure 3.5. TAZs Which Meet Infill Definition. Source: SANDAG Series 13 Base Year Model (2012), Fehr & Peers, 2021.
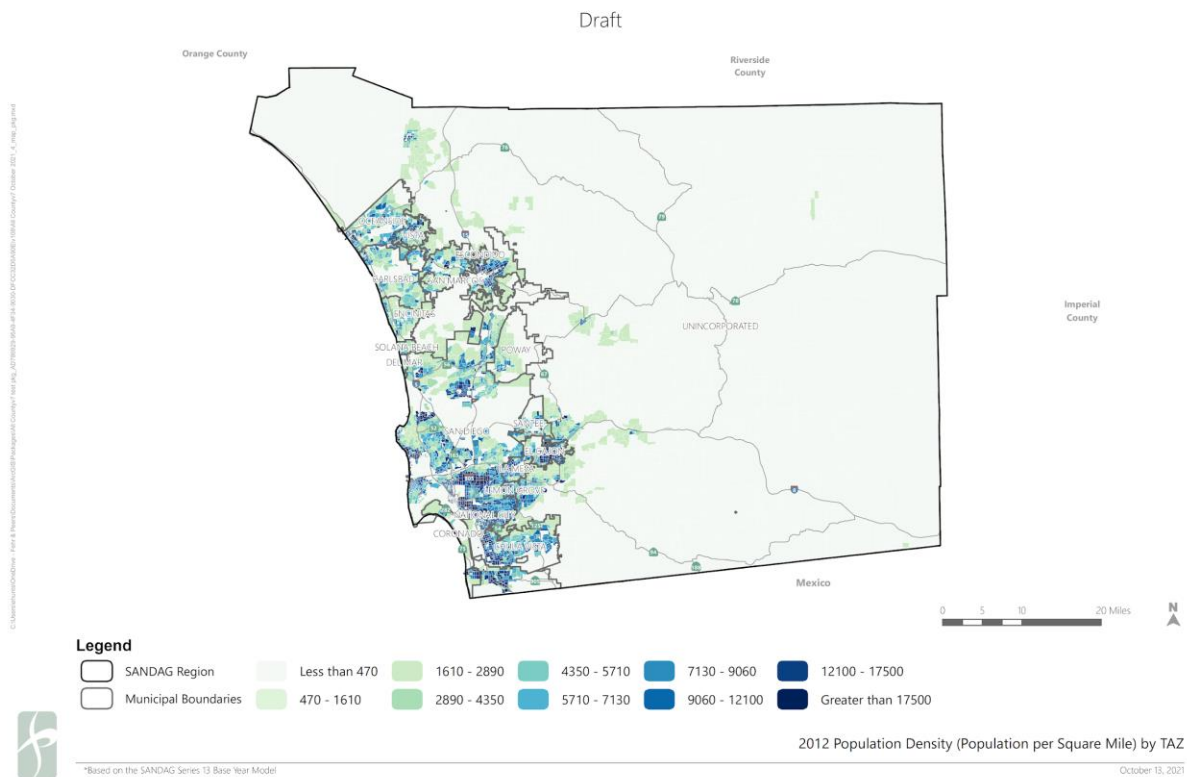

Figure 3.6. 2012 Population Density. Source: SANDAG Series 13 Base Year Model (2012), Fehr & Peers, 2021.
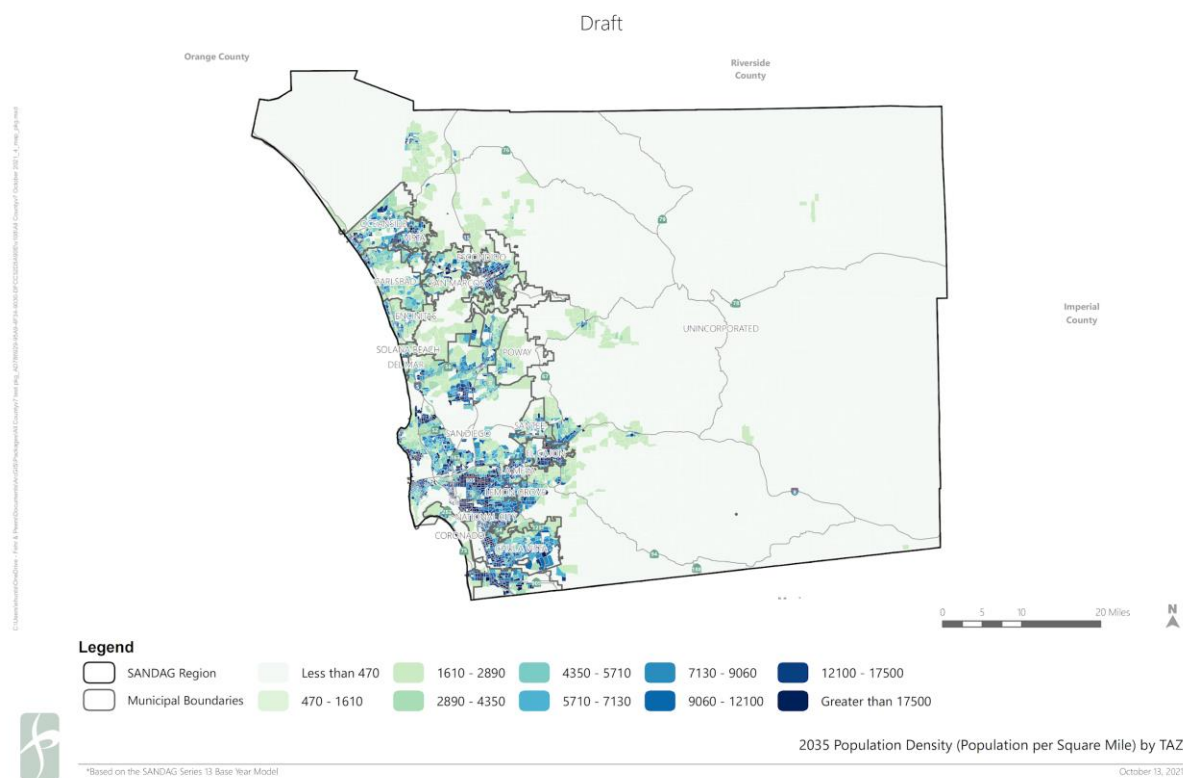
Figure 3.7. 2035 Population Density. Source: SANDAG Series 13 Base Year Model (2035), Fehr & Peers, 2021.

Over time, additional areas may become well-suited for infill-oriented VMT reduction strategies as they meet higher population density thresholds. Figures 3.6 and 3.7 show how population density is anticipated to change between 2012 and 2035, creating more opportunity for future expansion of infill-oriented and transit-oriented strategies.

3.5 Conclusion

This chapter shows where opportunity areas exist to accelerate EV adoption and VMT reduction based on existing countywide policies and patterns of vehicle ownership, travel behavior, and land use development. Recommended areas for accelerated action will help the County meet more aggressive decarbonization targets that have been established for California but are not yet satisfied in the guiding policies in the region. Following discussion with the County, the project team will conduct additional analysis to ensure the County has access to the most helpful information to guide their decisions and move towards deep decarbonization of the transportation sector.

Summary of Key Actions

Actions that will accelerate decarbonization of the transportation sector are largely grouped into two categories: electrification of vehicles, and reduction of VMT. The key actions that the County can pursue over the next 10 years to make progress towards deep decarbonization goals will include a mix of both strategies. As part of this Regional Decarbonization Framework, additional work will be conducted to identify which of these actions may already be underway, which are the highest priority to initiate, which geographic areas need more focus, where local jurisdictions have control, and where actions could benefit from regional coordination and collaboration.

Key electrification actions include:
- Set and meet aggressive public EV charging target
- Set and meet aggressive (100%) fleet adoption target
- Require new development to include EV charging
- Require existing development to retrofit parking with EV charging
- Increase dollar value and streamline consumer vehicle purchase incentives with application to both new and used vehicles
- Increase dollar value of incentives, provide educational resources, and streamline permitting process for landowners to install EV charging in multi-family developments
- Partner with educational institutions to assess workforce training needs; increase funding to existing programs
- Continue to partner with A2Z Collaborative to share information and successful implementation strategies across jurisdictions, advocate for funding and coordination at the state level

Key VMT reduction actions include:
- Expand geographic reach and service hours of bus and rail services in areas where development can support transit use
- Provide incentives and regulatory relief to facilitate higher density infill and transit-oriented development
- Disincentivize development in rural (or non-infill) areas that cannot support efficient transit use or multi-modal transportation options
- In existing rural, non-infill, or underserved transit areas, invest in TNC partnerships prioritizing electric and high-occupancy vehicles to ensure sufficient access to opportunities
- Investigate opportunities to implement pricing structures (cordon pricing, HOT lanes, etc.) that incentivize high occupancy vehicles

- Adopt pedestrian-oriented design guidelines for all new development; reduce or remove parking minimums in walkable neighborhoods
- Update county bicycle and pedestrian planning documents; partner with SANDAG to accelerate implementation of 2010 San Diego Regional Bicycle Plan; develop Pedestrian Safety and/or Vision Zero and/or Local Road Safety Plan
- Partner with SANDAG to build out a network of Mobility Hubs where shared vehicles and new mobility services can be found
- Develop County TDM ordinance and Transportation Management Organization (TMO) to work with employers and service providers
- Conduct broadband gap analysis; seek funding to improve communications infrastructure in areas that lag; require enhanced communication technology in all new development through TDM ordinance
- Conduct electrified freight study to understand where opportunities for distribution efficiencies exist; modify zoning code to encourage distribution centers in efficient locations

Additional Challenges & Remaining Gaps Not Addressed in this Chapter

Additional challenges and major gaps remain which will require collaboration, coordination, and technical advances to vehicle stock beyond what exists on the road today. In addition, outstanding questions regarding environmental externalities are important to consider as the County accelerates towards electrification as the primary means to decarbonize the transportation sector. These challenges and gaps that the County should consider include:

- Coordination with tribal jurisdictions in order to maximize decarbonization efforts county-wide
- Technology advances and limited jurisdictional control for influencing long-haul intercity passenger travel, including air travel and border crossings
- Long-haul freight technology and jurisdictional control
- Environmental externalities of electrification (waste, pollution, etc.)
- Vehicle production emissions, roadway maintenance emissions
- Lifestyle changes in the future that may not be reflected in today's forecasts or assumptions (work from home patterns, home delivery of goods, suburban migration)
- Policy response to pandemic conditions by transit agencies in order to match service to lower ridership levels, or to attempt to recover lost ridership

The above considerations are worthy of additional study.

Table 3.7: Comparison of SANDAG 2021 Regional Model (ABM2+) and EnergyPATHWAYS Model

Model	Fleet Mix Assumptions			Fuel Mix Assumptions	
	Passenger Cars and Trucks	Transit Vehicles	Commercial Vehicles	ZEV Adoption Rate (Passenger and Goods)	Speed
SANDAG 2021 Regional Model (ABM2+)	5 classes for traffic assignment: - Drive-alone non-transponder - Drive-alone transponder - Shared-ride 2 - Shared-ride 3+ - Heavy Truck Each class is broken down by income or by weight class for a total of 15 traffic assignment classes.	7 transit modes: - Tier 1 Heavy Rail - Commuter Rail - Light Rail - Streetcar - Rapid Bus - Express Bus - Local Bus Inputs vary by mode: - Frequency of service - Travel time - Fare	5 goods movement modes: - Truck - Rail - Pipeline - Marine - Air cargo 4 commercial truck types: - Light vehicle - Medium truck (<8.8 short tons) - Medium truck (>8.8 short tons) - Heavy truck (FHWA classes 7-13)	Zero Emission Vehicles (ZEV) and Electric Vehicles (EV) in general are handled off-model. Growth forecasts are based off EMFAC. Between Model Year (MY)2025-2050, required percent of new Light Duty Vehicle (LDV) sales that must be ZEVs in EMFAC2017: - Plug-in Hybrid Vehicles (PHEV): 7.32% - Battery-Powered Electric Vehicle (BEV): 4.06% - Hydrogen Fuel-Cell Electric Vehicle (FCEV): 14.89% PHEV, BEV, FCEV are all referred to as ZEVs.	Inputs that affect speed on regional highway networks: - Posted speed - Roadway capacity - Functional classification - Roadway operation (HOV lane, etc.) - Congestion - Origin/destination - Intersection control - Transportation mode
Evolved Energy Model (EnergyPATHWAYS)	- Light car - Light truck - Motorcycle	- Buses - Passenger Rail	- Medium truck - Heavy truck (divided into short haul and long haul)	EMFAC growth forecasts. Different assumptions by class: more BEV for HD short haul truck, more FCEV for HD long haul.	n/a

Model	VMT Accounting			Resolution	
	Method	Scale	Conversion to GHG	Spatial	Temporal
SANDAG 2021 Regional Model (ABM2+)	Accounting Methods for GHG calculations using Vehicle Miles Traveled (VMT): - Internal-Internal: all VMT included in analysis (VMT that occurs from trips that start and end in the SANDAG region) - Internal-External or External Internal: 50% of VMT included in analysis (VMT associated with trips with one trip end in the SANDAG region and one outside the SANDAG region) - External-External: all VMT excluded in analysis (VMT associated with trips that start and end outside of the SANDAG region are not included).	- Total VMT and GHG and per-capita VMT and GHG.	VMT data tables are used within EMFAC for emissions calculations of cold starts (trips) and running emissions (VMT). Calculations are adjusted by transportation activity data (VMT, speed distribution) and vehicle populations. Emissions reductions associated with various ZEV policies also calculated outside of the travel demand model.	Different resolution levels for different steps of the model: - Microanalysis zones: 23,002 Master Geographic Reference Area (MGRAs) zones (roughly equivalent to Census blocks) - Traffic assignment demand and skims: 4,996 Transportation Analysis Zones - Transit assignment demand and skims: 1,766 Transit Access Points Treatment of space is slightly different for border crossing trips.	Transportation behavior is modeled every half hour.
Evolved Energy Model (EnergyPATHWAYS)	n/a	n/a	Electricity and fuel emissions intensities determined by supply-side optimization subject to net-zero economy-wide constraints.	Vehicle stock is modeled for Southern California region (divide from Northern California is along PGE/SCE service boundary). Number of households is used to estimate vehicle stock.	Annual vehicle stock.

Model	Analysis Years		Input Data	
	Base Year	Horizon Year	Internal (SANDAG) Surveys	Outside Data Sources
SANDAG 2021 Regional Model (ABM2+)	2016	2050	- SANDAG Household Travel Behavior Survey (2016) - Transit On-Board Survey (2015) - SB 1 Transportation Network Company (TNC) Survey (2019) - Taxi Passenger Survey (2009) - Parking Inventory Survey (2010) - Parking Behavior Survey (2010) - Border Crossing Survey (2011) - Visitor Survey (2011) - Establishment Survey (2012) - Tijuana Airport Passenger Survey (2017) - Commercial Vehicles Survey (2011) - Vehicle Classification & Occupancy (2006)	- San Diego International Airport Air Passenger Survey (2009) - San Diego International Airport Passenger Forecasts (2013) - Decennial Census Summary File-1 tabulation (2010) - Census Data for Transportation Planning (CTPP) - Public Use Microdata Sample (PUMS) - American Community Survey (2015-2017) - Bicycle counts (2011) - Jurisdiction annual traffic counts (2016) - FasTrak Transponder ownership data (2012) - Caltrans Performance Measurement System (PeMS) (2016) - Caltrans Highway Performance Monitoring System (HPMS) (2016)
Evolved Energy Model (EnergyPATHWAYS)	n/a	2050	n/a	- University of Virginia Population Projections - California Air Resources Board vehicle service numbers (EMFAC) - 2021 US Annual Energy Outlook

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