TRANSPORTATION & LAND USE

REGIONAL CONTEXT

Los Angeles originally developed around streetcar lines, which real estate developers funded to boost property values and demand for homes in outlying areas of the county. With the advent of the automobile and later investment in highways, those "hub and spoke" communities filled in with developer-driven auto-oriented development. This history shaped the development patterns of the Los Angeles region and leaves cultural and infrastructural legacies today. Car travel has enabled residents of this diverse and expansive region to live and work across 88 cities and over 4,700 square miles. It has also led to environmental degradation. The high rate of driving miles (vehicle miles traveled or "VMT") emits significant amounts of greenhouse gases and other harmful air pollutants, while the associated infrastructure has left the region more vulnerable to climate impacts.

Tailpipe emissions from cars and trucks contribute 40% of greenhouse gas emissions statewide, and at least a third of the emissions in Los Angeles County, more than any other single sector (although building energy use is a close second).[1] In addition to carbon pollution, cars and trucks are the single largest source of air pollution in the region and a major contributor to high asthma and other respiratory disease rates. Internal combustion engines are also major contributors to the urban heat island in and of themselves. Perhaps more importantly for the region's future, 25% of all land is now dedicated to roadways and parking.[2] These surfaces are made of impermeable, heat-trapping materials that increase temperature, air pollution, stormwater runoff, and water pollution throughout the region, as well as preclude other uses, such as housing, open space, and civic spaces. All of these impacts further exacerbate the negative effects of climate change in the region. Los Angeles's transportation system must be transformed to minimize greenhouse gas and other emissions and to enable more resilience in the face of increasing extreme weather events and rising temperatures. This system should ultimately create minimal environmental impact and improve public health. It will also free up land for more housing and open space provision.

The coming decades are anticipated to bring the development of new, cleaner fuel sources, transformation of vehicle technologies, advancement in transit information systems, and the investment of billions of dollars in new public transit infrastructure. Some of these changes are underway, such as

the rapid increase in car- and ride-sharing through services like Zipcar, Uber, and Lyft, and in access to transit information through new apps and mobile devices such as the GoLA app. But these still largely rely on internal combustion engine (ICE) vehicles. Other changes, such as the development of new transit lines and the associated land use changes, will likely take decades unless there is concerted dedication to change and funding. As Phillip Washington, Metro's Chief Executive noted, "We're not building for today. We're building for 100 years down the road."[3]

While the transformation of Los Angeles's transportation system is underway, the carbon footprint and resilience of this future system is still undetermined. New technologies have the potential to enable efficient, equitable, and environmentally friendly mobility to an extent not previously possible. But they could also exacerbate driving miles, congestion, and inequity, among other impacts. Decision-makers should begin working today to minimize the long-term environmental impacts and ensure the system is resilient in the face of climate change and moves toward zero carbon fuels. They should leverage changes in technology, create synergies among travel modes, and build infrastructure that improves public and environmental health. They also must alter policies and avoid infrastructure investments that have unsustainable environmental impacts. They will need forward-thinking, creative solutions to the political challenges and create new partnerships across sectors and jurisdictions.

THE ROLE OF REGIONAL COLLABORATION

Multiple business, government, and nonprofit groups have spent recent decades working to create a more sustainable, just, reliable, and efficient transportation system. Their efforts have included municipal and regional actions coordinated by SCAG and Metro, sub-regional actions organized by various Councils of Government as well as several active and expert organizations and nonprofit coalitions.

Given the wide variety of existing reports, plans, and activities, the Framework focuses specifically on: 1) activities that will lead to the greatest climate benefit and 2) actions that require cross-jurisdictional and cross-sectoral partnership.

Reducing greenhouse gas emissions from transportation and building climate-resilient transportation infrastructure

Improvements to Los Angeles's transportation system can bring multiple benefits, from reducing air pollution, improving mobility and accessibility, reducing congestion, and improving livability and quality of life. The Framework seeks to provide clarity in decision making and prioritization of goals and activities by focusing on some of the most promising activities to reduce greenhouse gas emissions significantly and improve climate resiliency, particularly through infrastructure that promotes alternatives to automobile travel.

Developing opportunities for regional collaboration and coordination

While federal, state, and local actions all help shape our transportation system, regional collaboration has a critical role to play in reducing tailpipe greenhouse gas emissions and increasing the overall

resilience of the transportation system. Most travel occurs within the region and can, therefore, best be improved through collaborative regional actions. The Framework offers recommendations that can be used to bridge multiple governmental efforts, maximize the efficacy of investments, and ensure that the region's actions lead to real, tangible climate benefits.

To meet these ends, the Framework identifies three goals that will reduce the transportation sector's contribution to climate change and make the associated infrastructure more resilient in the face of climate impacts. It defines a set of strategies for each of these goals and then describes actions to meet each of the strategies.

Goal 1 — Decarbonize tailpipe emissions primarily through mass adoption of battery electric vehicles and use of low-carbon biofuels and hydrogen fuels when necessary, including an interim goal of 50% reductions by 2030

Goal 2 — Design and redesign transportation infrastructure to improve public health and air quality through more transit, pedestrian and bicycle infrastructure and redesign of existing automobile infrastructure to encourage vehicle-sharing, carpooling, and alternative travel modes

Goal 3 — Adopt land use patterns that channel all new growth into compact development near transit, and retrofit existing single-family suburban neighborhoods to be more walkable, bikeable and transit-oriented

POLICY LANDSCAPE

The transportation sector, as the biggest emitter of greenhouse gases, represents a major focus of climate action at the state, regional, and local levels. The majority of state efforts focus on reduction of tailpipe emissions, primarily by encouraging low-carbon fuels, including for battery electric vehicles (depending on the electricity source). The section below summarizes the key policy goals.

Reducing tailpipe greenhouse gas emissions through improved fuels and technology

A major component of state efforts to decarbonize the transportation sector involves changing vehicle fuels and technology. Reducing the carbon content of gasoline, switching to low-carbon and no-carbon fuels, and increasing fuel efficiency are all part of this transition. Assembly Bill 1493 Clean Car Standards (Pavley, 2004) is the cornerstone legislation, which was the first legislation to mandate greenhouse gas emissions reductions from passenger vehicles. It directed the California Air Resources Board to adopt measures to maximize reductions.[4] To meet the requirements of Assembly Bill 1493, the state has developed a series of additional laws and initiatives, most prominently the state's low carbon fuel standard, which the Air Resources Board adopted pursuant to Assembly Bill 32 authority.

Two programs aim to pull the diverse set of actions together: 1) The Air Resources Board's Advanced Clean Car Standards Program and 2) DRIVE, The California Energy Commission's Alternative Fuel and Vehicle Technologies Program. A study by the University of California Berkeley analyzed 49 state

greenhouse gas reduction policies and found that Assembly Bill 1493 is one of the five most important initiatives to help meet the state's 2020 and 2030 reduction targets.[5]

The Advanced Clean Car Standards program pulls the state's greenhouse gas emissions goals together with vehicle air pollution mandate and zero emissions vehicle targets into one package of standards. Together these standards are predicted to reduce the greenhouse gas emissions from cars by 34% and smog forming emissions 75% when fully implemented in 2025.[6] However, these goals are unlikely to be sufficient to help Los Angeles achieve its greenhouse gas emissions reductions goals.

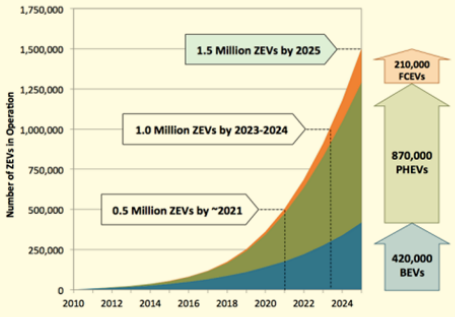
DRIVE, the California Energy Commission's Alternative Fuel and Vehicle Technologies Program, aims to accelerate the development and deployment of advanced fuels and technology through financial incentives. With as much as $100 million available annually, the program provides incentives to "businesses, vehicle and technology manufacturers, workforce training partners, fleet owners, consumers and academic institutions to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policy objectives."7

Fuel and technology transitions are implemented mainly through state action and through private enterprise. Local and regional action can support through facilitating the installation of electric vehicle charging stations, purchasing clean fuel vehicle fleets, and encouraging the siting of low-carbon biofuel infrastructure. As fuels and vehicles become cleaner, the emissions from passenger vehicles will decrease. Battery electric vehicles in particular represent the most promising technology to achieve significant, long-term reductions, and regional action will be integral to successful adoption at a large scale. The following section discusses options to maximize consumer adoption of this technology.

Increasing vehicle electrification

In 2012, Gov. Gerry Brown issued Executive Order B-16-20124, which set goals for the number of zero emissions vehicles (ZEV) in California, along with electric vehicle charging infrastructure. It set the goal for 1.5 million ZEVs by 2025, 1 million by 2024, and 500,000 by 2021. The graph below depicts these goals. The 2013 ZEV Action Plan, developed by a state interagency working group and updated in 2015, lists actions that state agencies and others should consider taking to meet these targets. DRIVE, The California Energy Commission's Alternative Fuel and Vehicle Technologies Program, mentioned above, is providing financial incentives to accelerate the transition.

Figure 3: ZEV Growth Scenario to Achieve ZEV Executive Order Goals



Source: Melaina, Marc, Michael Helwig (National Renewable Energy Laboratory) 2014. *California Statewide Plug-in Electric Vehicle Infrastructure Assessment.* California Energy Commission. Publication number: CEC-600-2014-003.

Successful consumer adoption of electric vehicles will require new charging infrastructure such as at workplaces, multi-unit dwellings, and along interstate corridors and other heavily traveled locations. Local and regional planning will be integral to efficient and equitable placement of these chargers, and financial incentives for rapid deployment will ease installation where current business models are lacking. In Los Angeles, where more than 50% of the housing stock is multifamily, policy makers need to overcome barriers to charging access (primarily lack of incentive to install) so apartment dwellers will be willing to purchase or lease electric vehicles and access them for the first or last miles to transit stations. Local governments are already facilitating streamlined and consistent permitting requirements for EV charging installation across the state by implementing Assembly Bill 1236 (Chiu, 2015).

Electric vehicles will also increase the demand for energy. Energy providers (utilities and Community Choice Aggregators) will be responsible for meeting this increased demand, such as through increased energy efficiency and demand response, and clean renewable sources. Managed "smart" charging can also help improve grid reliability, particularly with more intermittent renewables on the grid, by soaking up surplus renewables at key times of the day.

Los Angeles has a number of efforts to accelerate the transition to electric vehicles. For example, the City of Los Angeles adopted goals in its sustainability pLAn,[8] including:

- **Charging stations.** By 2017, install more than 1,000 new publicly available EV charging stations throughout the city, including more than 100 on City of Los Angeles property.
- **Light duty electric cars.** By 2025, 10% of all light-duty passenger vehicles on the road will be electric or zero emission; by 2035, 25% of all light-duty passenger vehicles on the road will be electric or zero emission (notably these targets are less aggressive than what this Framework recommends).
- **Goods movement.** Increase the percentage of Port-related goods movement trips that use zero-emissions technology to at least 15% by 2025 and 25% by 2035.

Los Angeles County has also set a goal of installing 500 chargers at its facilities by 2017.[9]

As another example, SCAG predicts there could be as many as 700,000 electric vehicles in its territory by 2022 and has developed a PEV Readiness Plan[10] to help ensure adequate infrastructure is in place.

A significant missing element is the electrification of public transportation as well. As the region's mode shift moves toward public transportation, all transit agencies must also provide electrified public transportation options. This new strategy is being piloted by the Los Angeles County Metro, arguably the largest public transit system in the U.S., which will provide the model and the testing of options for the other transit agencies in the region.

Reducing vehicle miles traveled

In addition to reducing the carbon intensity of fuels, the state recognizes the importance of reducing vehicle miles traveled (VMT) as a means to reduce emissions. Senate Bill 375, the Sustainable Communities and Climate Protection Act (Steinberg, 2008), aims to reduce emissions and VMT through land use measures that connect regional transportation and housing planning. The state, through the California Air Resources Board, sets greenhouse gas reduction targets for the municipal planning organizations (MPO) in the state to meet through the development of a Sustainable

Communities Strategy (SCS). The SCS must demonstrate how the region will meet that target through a combination of transportation and housing plans (failure to meet the target prompts the development of an alternative plan). Due to the size and complexity of the SCAG region (with SCAG as the MPO), the sub-regional "Councils of Government" have the option of either adopting SCAG's SCS or developing their own. Under Senate Bill 375, the SCAG territory must meet an 8% per capita reduction in vehicle miles traveled by 2020. The state set a conditional target of 13% per capita for 2035.[11] Notably, these targets were largely the result of political compromise and are unlikely to achieve the amount of emissions reductions needed to meet long-term climate goals. This is an important area for greater regional collaboration and ambition.

Over the long term, the connection between housing and transportation will become even more important. California has a significant shortage of housing, particularly in coastal metropolitan areas. Finding solutions that enable more housing (and jobs) to be built near transportation or that densifies existing neighborhoods will not only help to meet this fundamental need, but also increase the feasibility of transit to move more people without increasing driving miles. In addition, local land use planners, with regional coordination, need to develop plans to retrofit suburban neighborhoods with access to transit with more compact development, such as through dividing large homes into smaller units and faster permitting for second-unit dwellings.

Within Los Angeles, SCAG's Regional Transportation Plan/Sustainable Communities Strategy lays out a detailed plan to reduce greenhouse gas emissions from passenger vehicles and comply with the mandate of Senate Bill 375. In addition, Los Angeles County Metro's short and long range transportation plans describe options for increasing mobility across the region. Furthermore, several Councils of Government and individual cities have transportation plans that define a path to greater sustainability for their jurisdictions. All of these efforts will work together to shape Los Angeles's transportation future but will require local implementation and possibly stronger targets to help achieve long-term climate goals in the region.

Other state level measures to reduce VMT include implementing congestion pricing options, such as Los Angeles's High Occupancy Toll (HOT) lanes, and policies that would create fees based on annual vehicle miles travelled. Recent reforms to the California Environmental Quality Act (CEQA) have also prioritized streamlined environmental review for low-VMT projects over high-VMT ones, while state officials have explored options for tying auto insurance to the number of miles driven in the vehicle, through higher premiums on those who drive more.

Ultimately, local and regional action will play a key role in reducing VMT. The three goals listed below highlight the most important and effective regional actions to reduce VMT.

GOAL 1 — Decarbonize tailpipe emissions primarily through mass adoption of battery electric vehicles and use of low-carbon biofuels and hydrogen fuels when necessary, including an interim goal of 50% reductions by 2030

Tailpipe emissions

Reducing and eliminating the carbon content of fuels is essential to meeting state greenhouse gas reduction targets. Regional and local actors can influence vehicle technology and fuel sources by encouraging electric vehicle adoption and other low-carbon fuels and creating more options for reducing driving. The Framework describes three strategies to reduce tailpipe emissions through reduced driving and promoting cleaner fuels and lists actions for each of these strategies:

Strategy 1 — Plan, develop, and fund a multimodal transportation system that builds infrastructure for transit, biking, and walking and that only maintains and retrofits existing roadways rather than adding new automobile capacity

Strategy 2 — Adopt local policies that encourage alternatives to automobile use, such as reduced subsidies and excessive on-site requirements for parking

Strategy 3 — Leverage advances in car- and bike-sharing technology, as well as autonomous vehicles, to encourage more transit, biking, and walking

Strategy 4 — Decarbonize vehicle fuels by encouraging consumer adoption of battery electric vehicles (and low-carbon biofuels and hydrogen where necessary) through improved charging infrastructure and other incentives

Providing efficient, reliable, and enjoyable alternatives to driving is fundamental to enabling people to make other choices. But land use policies and infrastructure must work together to support different modes of travel. Local land use policies, particularly parking policies, often work in opposition to the sustainable, multimodal system that agencies and municipalities across Los Angeles are funding. In fact, policies such as those that subsidize the cost of parking make walking, biking, and public transit more expensive and difficult. In addition, multimodal strategies and investments and policy reforms should be structured to encourage new clean fuel and other carbon-reducing technologies.

The Framework's recommendations below are based on academic and other research and a recognition of the existing political, legal, and financial constraints. The best practices compendium contains additional information regarding case studies.

Strategy 1.1 — Plan, develop, and fund a multimodal transportation system that builds infrastructure for transit, biking, and walking and focuses solely on maintenance and retrofitting of existing roadways rather than adding new automobile capacity

Multimodalism is based on the understanding that different modes of travel are suitable for different types of trips. An integrated multimodal system allows people to choose the mode that is best for a particular trip at a particular time, which reduces car dependence and the associated greenhouse gas emissions. A multimodal system invests in and plans for choices including biking, walking, car sharing, taxis, and the enabling of the option not to travel at all (such as telecommuting).[12] Successful multimodalism requires place-making. Urban design elements, housing and employment location, and neighborhood elements all contribute to reducing car dependence and increasing the attractiveness of other modes. With the recent opening of the Expo line to Santa Monica, for example, Metro demonstrated a commitment to multimodalism by opting to build less parking than with past rail transit lines, more

housing development near stations, and more integration of other modes such as buses and shared ride services, to increase connectivity.

Multimodalism represents a dramatic shift away from car-centered planning and investments.[13] It requires including multiple players in decision making, which can lead to changes in a jurisdiction's traditional role and authority and, therefore, sometimes more conflict and competition.[14]

> *More travel choices also mean private entrepreneurs will take the lead on some services normally offered by the public sector: from taxi or bus services to parking management to goods movement. And with the benefits of redefining and reallocating street space in a multi-modal system come new political problems in terms of fighting for that space, too.*[15]

Planning for a multimodal system involves integrating infrastructure and policy decision making to enhance connections among modes, leveraging public and private partnerships so that public transit can benefit from the increase of car- and ride-sharing, and creative thinking and risk taking, given that the future of transportation technology is changing rapidly. Regional collaboration and inter-jurisdictional coordination is fundamental to multimodal planning, because residents travel across jurisdictional lines and would benefit from an integrated system with seamless connections and services.

Finally, multimodal planning is fundamentally place-based. Just as certain trips are best suited to certain modes, different neighborhoods and corridors are best served by different options. For example, dense corridors near the downtown core may be served almost entirely through public transit, small compact neighborhoods are prime places for walking and biking, and rural and suburban areas may be best served through electric vehicles and commuter van pools. Suburban areas can simultaneously become more urban through retrofitting, as discussed above, which in turn requires better transit service. In other words, what works in Lancaster will be different than what works in Santa Monica, and the solutions for West Hollywood will be different than the solutions for Compton. Ultimately, entities like SCAG and Metro must support place-based transportation planning with the goal of zero-carbon fuels powering the region's transportation sector.

A truly multimodal transportation system is fundamental to reducing car dependence in Los Angeles, improving mobility, and reducing emissions. Collaboration can help to build partnership and identify opportunities with multiple benefits to assist in overcoming the political challenges of changing land use patterns. Partnerships between multiple jurisdictions agencies can leverage a more diverse set of funding and financing options to pay for needed changes. Finally, regional coordination can help create consistency across the region so that the system operates as a contiguous whole.

The actions listed below represent opportunities for collaboration and coordination that could increase multimodalism.

Action 1.1.1 — Integrate payment systems across agencies.

Action 1.1.2 — Establish public and private partnerships between car-sharing companies, bike-sharing companies and transportation agencies in order to test and improve synergies for users.

Action 1.1.3 — Design streets to increase the safety and reliability of multiple modes, not just cars (while also enabling multiple modes and revising road standards to create opportunities for

walking and biking by narrowing roads and breaking up large blocks in to smaller ones, among other strategies).

Action 1.1.4 — Promote telecommuting, "alternative" work schedules (4/40 or 9/80), and flexible work hubs.

Action 1.1.5 — Coordinate street signal syncing, to improve the service of multiple modes.

Strategy 1.2 — Adopt local policies that encourage alternatives to automobile use, such as reduced subsidies and excessive on-site requirements for parking

> *The cheap and abundant provision of parking incentivizes drivers to continue driving to their activities instead of considering other options of travel such as carpooling, taking transit, or working at home.*
>
> —Mohja Rhoads, PhD, South Bay Cities COG

> *Perhaps the greatest barrier to walkable, thriving commercial districts is mismanagement of public parking.*
>
> —Civic Enterprise, Los Angeles-based developer

The design and management of parking is one of the most critical areas of local land use policy in determining how much people drive. Current policies often encourage driving and discourage other modes by providing excessive and cheap parking. Better parking management will reduce driving and increase biking, walking, and transit use. Without changes in parking management, significant reductions in driving and increases in other modes are unlikely to occur.

FREE PARKING LEADS TO MORE DRIVING AND LESS TRANSIT, BIKING, AND WALKING

Ninety-nine percent of parking is free to motorists.[16] And while parking constitutes half of the cost for the typical commute to work, drivers rarely pay this cost.[17] Yet because drivers do not pay for the costs of building and maintaining parking lots, garages, and spaces, they are paid for through increased prices in goods and services throughout the economy. Since the cost of parking is "collectivized" (paid for by everyone), "no one can pay less for parking, by using less of it."[18] This has the effect of "skew[ing] travel choices toward cars and away from public transit, cycling and walking."[19] Furthermore, "free parking gives the largest subsidy per mile to the shortest vehicle trips – the ones that, without a parking subsidy, we would most likely make by walking, cycling, or public transport."[20] These subsidies and incentives, coupled with the lack of integrated alternatives, work against goals to reduce greenhouse gas emissions, improve air quality, and increase public transit, biking and walking.

To illustrate the significance of parking subsidies to increased driving, a research study compared the parking supply to driving rates and found that "as a city went from 0.2 parking spaces per person to 0.5 per person, the share of car commuting went from 60 to 83 percent."[21] Another study found that commuters living in Queens were 45% more likely to commute by car than commuters living in neighborhoods with higher incomes, less transit, and greater car ownership (the factors usually correlated with more driving) because they had much greater access to parking.[22] Finally, another

study compared travel choices in D.C., Miami, Seattle, San Francisco, and New York and found that even when employees are offered the same financial benefit for parking as for transit, they are unlikely to take transit. As a result, "the net effect was more driving."[23] A reduction in car commuting only occurred in cases where employers provided a transit benefit but offered no free parking.[24] Put simply, "the power of the free parking spot…overwhelms transit benefits of any size," while the lack of density and viable alternatives to driving compounds the problem.[25]

PARKING IS CURRENTLY OVERSUPPLIED

In almost every location at most hours of the day, parking throughout Los Angeles County is oversupplied and underpriced. Current parking standards are determined based on peak demand for an individual space. As a result, for all other times outside the peak, more parking is available than needed.[26] The land set aside for excess parking increases urban heat islands, stormwater runoff, and air pollution, exacerbating the negative environmental and public health consequences. Furthermore, the oversupply of parking reduces opportunities to create places that mix housing, jobs, open space, and other destinations and that boost transit ridership.

PARKING INCREASES CAR OWNERSHIP

Most housing is bundled with parking, meaning the cost of a residential parking space is included with the cost of owning or renting a home. Local land use policies typically require a standard minimum parking amount for development, regardless of proximity to transit and without regard to other transportation options. While individual project developers may obtain variances from these minimum parking standards, they typically rely on costly studies to justify a lower parking rate and incur increased permitting costs to secure approval. The high parking requirements, therefore, increase the cost of development, impede rehabilitation of old buildings, and undermine the goal of more compact development, particularly near transit. A recent study by UCLA shows that the practice of requiring parking and bundling it in rental rates increases car ownership and driving and "that the odds of households being vehicle free are 50 to 75% lower than the odds of households without bundled parking." Furthermore, the study found that "households in dense center cities near transit are twice as likely to be without vehicles if they lack bundled parking." The research results support the growing movement to reduce or eliminate minimum parking standards."[27]

Since current parking policies increase car ownership and incentivize driving, efforts to reduce driving must include reforms to parking. Actions could include replacing *minimum* parking standards with *maximum* parking standards, unbundling the cost of parking from housing, and replacing employer parking benefits with transit benefits to provide individuals with information about the true cost of parking and the opportunity to reduce this cost by traveling less or by taking another mode. Shared mobility options may be key to reducing the demand for parking, because shared vehicles spend more time in motion moving people than they do parked. Sharing could be further enabled through technology advances ranging from software to autonomous vehicles.

PARKING POLICIES INCREASE THE COST OF WALKING, BIKING, AND TRANSIT

Parking spots take up 10% of all land in Los Angeles County.[28] Due to this massive footprint, parking supply dramatically shapes Los Angeles's land use patterns. All of this parking leads to greater

distances between destinations (urban sprawl) and wider streets that make walking less desirable and more dangerous. The following section lists actions to better manage the supply of parking.

ACTIONS TO BETTER MANAGE THE SUPPLY OF PARKING

Local governments implement most actions to manage the supply of parking, therefore 1) a coordinated approach undertaken by multiple cities will create the most meaningful reductions in driving while removing potential competition and conflicts; 2) the regional transportation infrastructure investments will not be successful at curbing driving without complementary parking policies; and 3) collaboration among multiple local jurisdictions, with the support of the Southern California Association of Governments or Los Angeles County Metro, can help to minimize competition among cities and increase the political feasibility of action on parking reform.

Actions to improve parking management include:

Action 1.2.1 — Unbundle the price of parking from the price of housing.

Action 1.2.2 — Remove or significantly reduce minimum parking requirements for new development.

Action 1.2.3 — Establish parking maximums for new development.

Action 1.2.4 — Allow different land uses to share parking spaces since different activities have different peak demand times.

Action 1.2.5 — Manage curb space for passenger loading near front doors, delivery zones, disabled parking, and car-sharing spaces as well as transit stops.

Action 1.2.6 — Ensure employers offer financial incentives to employees to use alternative modes to work (such as the Parking Cash-Out Program (PCOP) created by AB 2109 (1992) and implemented until recently by the Southern California Air Quality Management District).

Action 1.2.7 — Create variable priced street and off-street parking based on demand.

Action 1.2.8 — Allow project developers to substitute bicycle parking for vehicle parking.

Action 1.2.9 — Encourage car-to-go or other short term vehicle rental programs to develop an infrastructure in the region

Strategy 1.1.3 — Leverage advances in car- and bike-sharing technology, as well as autonomous vehicles, to encourage more transit, biking, and walking

> *Transportation will change more in the next decade than it has in the past half-century. LA must have the right plans and policies in place to ensure that these changes help support our environmental sustainability goals.*
>
> —Juan Matute, UCLA Lewis Center

After decades of relative stagnation, the transportation sector is experiencing rapid innovation. Information and communication technologies are opening up new options for ride sharing and making

it easier for people to gain accurate information about transportation options, locations and real-time schedules. Some experts believe that fully autonomous vehicles may be the norm within a few decades, while partial autonomy has already arrived.[29] This technology could entail significant impacts for the environment, both negative and positive, but could be deployed to reduce the need for car and bicycle ownership (and with it the need for parking and bicycle storage). Lower car ownership rates mean less driving and less parking, which could free land (and garages) for other purposes.

These technology changes, however, are not guaranteed to produce greater sustainability and fewer carbon emissions. Planners, advocates, and decision-makers should, therefore, be active participants in the transportation technology revolution. Emerging issues could include the need for new governance and financing, closed versus open business models and data access, concerns about labor equity, and the role of private companies in providing transportation services that have traditionally been public.

Changes are already happening across Los Angeles, although without coordinated planning. Through the "GoLA" app, created through a partnership between the City of Los Angeles and Xerox, Angelenos can now choose the cheapest and fastest mode for any particular trip based on real-time information on their smart phone. Metro's Office of Extraordinary Innovation and the City of Los Angeles's Office of Innovation were recently established to integrate advanced technology and innovation into planning efforts. The South Bay Cities COG is also actively engaged in efforts to incorporate advanced technologies into planning and is currently testing the viability of small electric vehicles as a means to meet Senate Bill 375 targets.

Innovation has the potential to greatly reduce the environmental impact of travel while improving safety, reliability, and efficiency. While agencies and municipalities will continue to advance efforts, the regional nature of the transportation system requires regional coordination and collaboration, which can leverage resources and make sure that the system works seamlessly across geography and jurisdictions. The following four technological advances should form an integral part of transportation planning and collaboration in Los Angeles.

1. Shared mobility
2. Autonomous vehicles and connected vehicles
3. Vehicle electrification
4. Data access and information

Each of these is discussed briefly below.

SHARED MOBILITY

Shared mobility includes ride sharing through companies such as Lyft and Uber, car sharing through companies such as Zip Car, and bike sharing, such as the Breeze program in Santa Monica and the recently launched program by Los Angeles Metro. Shared mobility enables individuals to pay for mobility on demand, reducing the need to own a car and making alternative modes of travel, including walking, more feasible.

In order to take advantage of existing and emerging strategies, Los Angeles should refocus its employer-based transportation demand management program to facilitate adoption of long-standing services

(vanpools), new options (car and ride sharing and bike sharing), and emerging shared ride services (shuttles, point-to-hub first/last-mile solutions versus point-to-point). These options can leverage the maturing market for shared rides, which introduces more travelers to alternative modes.

AUTONOMOUS AND CONNECTED BATTERY ELECTRIC VEHICLES

Autonomous vehicles or "driverless cars" are being developed and tested around the world. While fully autonomous vehicles may be years away from being market ready and legal, nearly every major auto-maker and several technology companies, such as Google, are developing and testing these vehicles now. Connected vehicles are vehicles with a wireless internet connection that allows them to connect with data and information services, such as traffic information, and also to other vehicles on the road (which helps prevent accidents). Connected vehicles are on the market today and the technology continues to expand.

Both autonomous and connected vehicles have the potential to reduce traffic congestion and automobile accidents. They also have the potential to shift Americans' relationships with their cars. As people ride in cars more than drive them, vehicle ownership could decrease while shared mobility could increase.

At the same time, they may have significant impacts on employment and the environment through increased vehicle miles traveled. Policy makers, therefore, need to analyze the technology carefully with a fully engaged social process of decision making around its deployment. They should plan for a future where the technology will allow people to own fewer cars and travel by alternative modes more, rather than one in which people consider congestion more productive or less strenuous time and thus increase vehicle miles traveled. By partnering with car and technology companies, requiring more battery electric vehicles and related infrastructure, and developing infrastructure and land use patterns that support more sustainable options, decision makers have the capacity to increase the likelihood of increased environmental and public health benefits. They should also encourage more car-sharing and less vehicle ownership with these technologies, allowing private companies to maintain and operate a network of shared, on-demand, and "right-sized" electric and autonomous vehicles for each trip. They can also consider transitioning from a gas tax to a vehicle miles traveled fee to discourage long commutes and excess driving.

ACCESS TO DATA AND INFORMATION

The ability to share data and information can transform how people travel. Individuals can now access real-time travel data to inform decision making on a trip-by-trip basis. Travelers can compare the cost, time and availability of different modes for a particular trip using their smart phones, provided they can afford the phones and the charges. Platforms that provide information across multiple transportation agencies and mode service providers, such as Google transit, enable travelers to move between modes and across jurisdictions more easily. Transportation planners should continue to improve these services by providing real-time data and by creating incentives for more environmentally friendly modes.

In addition to making data available to travelers, transportation agencies and companies can benefit from sharing data among themselves. Open data facilitates coordination among agencies and between

the private sector and government, such as to ensure better service across agency jurisdictions to meet demand, in addition to allowing individuals and groups to access relevant information from third parties. The data flowing among traditionally siloed organizations and disciplines can help accelerate Los Angeles's pursuit of reduced emissions and climate resilience.

BRINGING THE PIECES TOGETHER

Each of these technological innovations have the capacity to spur significant change. Yet taken together, these technologies can synergistically meet the Framework's transportation strategies. Better management of parking will encourage shared mobility. Shared mobility and autonomous vehicles will decrease demand for parking. Car sharing, ride sharing, and access to information all support an efficient multimodal transportation system. Yet while these technological advances are inevitable to some extent, the path to greater sustainability and reduced greenhouse gas emissions will depend on strong policies, shaped by innovative thinking and smart investment in decarbonization technologies and programs.

The section below lists actions that will leverage technology for greater sustainability.

Action 1.3.1 — Provide easy access to real time transportation options and costs across multiple modes and providers, including for private transportation providers and multiple transit agencies.

Action 1.3.2 — Enable data access between transportation agencies and partners.

Action 1.3.3 — Develop plans, strategies, and partnerships at the county level, such as through the Los Angeles County Metro or a joint agency consortium, to build a system of shared mobility.

Action 1.3.4 — Develop public private partnerships that prioritize sustainability.

Action 1.3.5 — Plan and develop an integrated system of electric vehicle charging stations across the region that is coordinated with public transit and other modes.

Strategy 1.1.4 — Decarbonize vehicle fuels by encouraging consumer adoption of battery electric vehicles (and low-carbon biofuels and hydrogen where necessary) through improved charging infrastructure and other incentives

VEHICLE ELECTRIFICATION

Battery electric vehicles (including electric motorcycles and bicycles) emit fewer greenhouse gas emissions than internal combustion engines. And if charged with electricity from renewable sources such as wind or solar, the emissions decrease even further. California has set a goal of putting at least 1 million electric vehicles on the road by 2023, and electrification of transportation is essential to meeting the state's Assembly Bill 32 and Senate Bill 32 (Pavley, 2016) emission reduction goals. As battery prices decrease and range increases, and with automakers developing more diverse options for zero-emission vehicles, consumer adoption will likely increase.

One of the keys to successful adoption of electric vehicles is well-planned and abundant charging infrastructure. "Fast chargers" in particular, which can charge 80% of a typical battery in 30 minutes,

will help with intercity travel and enable longer-range travel. Local and regional planners will play an important role in the siting of charging stations. They can streamline permitting for these stations and develop incentives for installation. They can also install public chargers and purchase electric vehicles for municipal fleets.

GOAL 2 — Design and redesign transportation infrastructure to improve public health and air quality through more transit, pedestrian and bicycle infrastructure, and redesign of existing automobile infrastructure to encourage vehicle-sharing, carpooling, and alternative travel modes

One quarter of Los Angeles's land area is used for parking (14%) and roadways (10%).[30] These impervious surfaces increase water pollution, storm water runoff, and heat islands. This runoff contains pollutants from oil, gas, and chemicals that impair Los Angeles's water quality by seeping into the groundwater supply and flowing into impaired water bodies. Impervious surfaces also inhibit groundwater recharge, a natural process essential to future water supply.

Local leaders have the opportunity to transform this infrastructure to ensure it improves rather than hinders efforts to reduce carbon emissions and increase resilience to extreme climate impacts. Policy makers can reduce heat islands through concerted and coordinated efforts on increasing cool surfaces and promoting and implementing standards for low-impact development and living streets, roads, and parking lots. Cooler roads and parking lots will keep parked cars cooler, which will reduce off-gassing and the need for air conditioning.

Most of the actions to meet this strategy fall within other sectors and are discussed in detail in other sections of this report. For example, the discussion of the heat island effect and how infrastructure can be used to cool rather than heat ambient temperatures, is discussed in the public health and energy sections. The water section of this report provides details on how impermeable surfaces (including alleyways and parking lots) can be transformed to assist in water filtering and groundwater re-charge. The energy section of this report discusses how fleet electrification will impact overall grid stability and the potential for more renewable energy.

However, due to the tremendous impact the transportation infrastructure has on climate resilience, this section contains an overview of these issues as well. The impacts of the transportation system go beyond travel, and the benefits of a more sustainable system will also be far-reaching. The transportation system should not only be resilient on its own but should support the resilience of other regional and urban systems.

Strategy 2.1. — Transform Los Angeles's transportation infrastructure into a system that improves climate resilience and public health

Collaborative regional action will be necessary for innovation and success. Roads and parking lots span multiple cities and, thus, coordination among cities will be necessary. Furthermore, multiple actors are

responsible for the construction and maintenance of roadways, including municipal general service and public works departments, Los Angeles County Metro, CalTrans, and others. These entities are not typically responsible for focusing on public health and environmental outcomes. Partnerships among environmental departments, public health agencies, transportation organizations, nonprofits, and agencies could enable the funding and knowledge base needed for successful implementation.

The actions listed below will build collaboration among agencies and across jurisdictions to transform the transportation infrastructure into one that improves public health and climate resilience.

Actions for greater collaboration to improve transportation infrastructure resilience and public health outcomes:

Action 2.1.1 — Create and fund an inter-agency working group between Los Angeles County Metropolitan Transportation Authority and the Los Angeles County Department of Public Health. This group will work to identify appropriate indicators for measuring the interaction of public health and transportation (focusing on those stressed by climate impacts), quantify those indicators, set future goals, work across the two agencies and with other departments to coordinate action and integrate goals, and track progress towards successes, as well as regularly reevaluating goals as needed.

Action 2.1.2 — Identify urban heat island priority areas to target efforts.

Action 2.1.3 — Identify and apply for co-funding opportunities to retrofit and upgrade permeable surfaces and develop new codes to encourage retrofits of privately owned surfaces.

Action 2.1.4 — Coordinate research and development efforts to develop rating systems and guidelines for appropriate materials. A joint research and development effort can secure funding for product development and enable pilot projects to be tested under a variety of conditions. Public facilities (such as parking lots, access roads, etc.) provide a tremendous opportunity to test new product durability and safety standards.

GOAL 3 — Adopt land use patterns that channel all new growth into the already built urban area, with compact development near transit and retrofitting of existing single-family suburban neighborhoods to be more walkable, bikeable, and transit-oriented, and to accommodate second units and extended families

To further reduce vehicle miles traveled and the emissions that result, land use choices will play a central role. The Los Angeles region needs to make land use and planning decisions that accelerate and support the transformation of energy and transportation strategies while accommodating a growing and thriving economy. As identified in the recently released draft state strategy paper *Vibrant Communities and Landscapes: A Vision for California in 2050*, "As the State works toward its 2030 and 2050 climate change goals, its land base, including natural, working, and developed areas, is recognized as foundational and integral to the State's climate policy, economy, and quality of life."[31]

Prioritizing infill development to grow healthy, equitable, and sustainable communities, and conserving natural and working lands that both avoid carbon emissions and provide carbon storage, are essential to meeting climate goals. Co-benefits from choosing a more compact development pattern include reduced pressure on natural and working lands in the region, increased transportation choices through modest increases in density, lower emissions from more compact development, reduced cumulative infrastructure costs, lower household costs for energy, and reduced health care costs.[32]

Yet all infill is not equal in terms of carbon reduction benefits. Recent studies have identified the importance of prioritizing affordable housing to achieve VMT reduction near transit.[33] Tailoring infill incentives to the Los Angeles region will be essential to identify and implement strategies that capitalize on and maintain existing quality of life, avoid displacement of families and existing affordable workforce housing, and maintain the fabric of neighborhoods and communities, including historic resources.

> *Every future net zero home or neighborhood located on a greenfield takes the region farther from achieving climate goals and other co-benefits.*
>
> —Geof Syphers, Sonoma Clean Power

Strategy 3.1 — Identify and prioritize through public investment and financing mechanisms infill development in previously developed areas

Action 3.1.1 — Create and fund an inter-agency working group among Los Angeles County regional leaders to initiate a comprehensive and detailed infill locator study for the region. The effort can use information already developed by SCAG, the county, and cities within the county. Those data can provide a foundation for tailored policies to prioritize infill in terms of location and type (e.g. housing affordability range and mix of uses to foster walkability and transportation investment and choices). The study should make use of a platform capable of supporting broad stakeholder engagement, transparency of results, and durability of the information for implementation and monitoring. The regional effort can be modeled on the 2005 infill locator study conducted by UC Berkeley for the state's Business, Transportation and Housing Agency.[34]

Action 3.1.2 — Set regional infill goals regionally and locally, based on the study and achievement of minimum densities to support transit and walkability.

Action 3.1.3 — Tailor incentives, including public investment, policy and ordinance changes, and financing mechanisms to identified infill areas in the study and evaluate the potential to pool funding regionally to accelerate infill in priority locations. Local leaders should consider leading-edge infill strategies including but not limited to: maximizing land use potential within transit walksheds; increasing walkability through the strategic location of essential daily services in existing neighborhoods by right; identifying policy and implementing ordinances to allow additional unit formation in single-family neighborhoods where transportation choice addresses potential traffic impacts; and regionally and locally tailored by-right options for infill where impacts are addressed.

Strategy 3.2. Initiate a regional assessment and broad-based dialogue of the importance of protected lands as carbon sinks

This effort should produce strategies to enhance the ability of these landscapes to store additional carbon. It can follow the example set by the Coastal Conservancy to explore opportunities to offset emissions from protected coastal landscapes and operations.[35] It should also include discussion of voluntary strategies and incentives to conserve the region's natural and working lands. Such action could help store carbon and avoid emissions associated with development through more compact development patterns.

Yet carbon storage is only one of the benefits of additional conservation of natural and working landscapes in the region. Other co-benefits include:

- preservation of grasslands, agricultural lands, forests, and wetlands
- enhanced water quality and quantity
- safeguards against fire, flood, and erosion
- habitat for refugia and critical landscape linkages for species and natural communities increasingly stressed by climate change
- enhanced recreational and tourism opportunities and revenue
- improved air quality
- job creation associated with working lands, recreation, and tourism

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