MOVING CALIFORNIA FORWARD

HOW SMART GROWTH CAN HELP CALIFORNIA REACH ITS 2030 CLIMATE TARGET WHILE CREATING ECONOMIC AND ENVIRONMENTAL CO-BENEFITS

SUMMARY FOR POLICYMAKERS

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PREFACE

This document presents the summary findings of recently completed research. The full technical results are forthcoming.

(Cover photo: iStock)

SUMMARY FOR POLICYMAKERS

This past spring, Governor Jerry Brown set a goal of reducing California's carbon emissions in 2030 by at least 40% below the 1990 level of emissions (Executive Order B-30-15). This target, now reflected in the proposed legislation of Senate Bill 32, is both scientifically grounded and feasible. But achieving the target will require California to intensify its policy efforts across all sectors of the economy. This study analyzes the role of land use policy in achieving the emissions target. **Our results show that implementation of smart land use policy, in combination with technological advances in the energy sector, will be critical for the state to achieve its ambitious 2030 decarbonization target.**

We recommend that the California Air Resources Board (CARB) strengthen emissions reduction targets under SB 375 (California's regional land use planning law) as part of a 2030 Scoping Plan and complement these targets with substantial funding to support cities and regions so they can successfully implement the target-compliant land use plans they are tasked to develop. Along with reducing emissions, smart growth also delivers an impressive array of co-benefits: cleaner air, improved public health outcomes, lower water use, cost savings for households, reduced dependency on oil, more efficient provision of public infrastructure, reduced congestion, and the preservation of natural and working lands, which provide carbon sequestration and other ecosystem services. Smart growth will help expand the supply of housing most in demand. Increasingly, people want to live closer to work, in walkable neighborhoods that are well served by transit.[1]

Walkable, mixed-use places like San Diego's Gas Lamp District are in high demand. (Photo source)

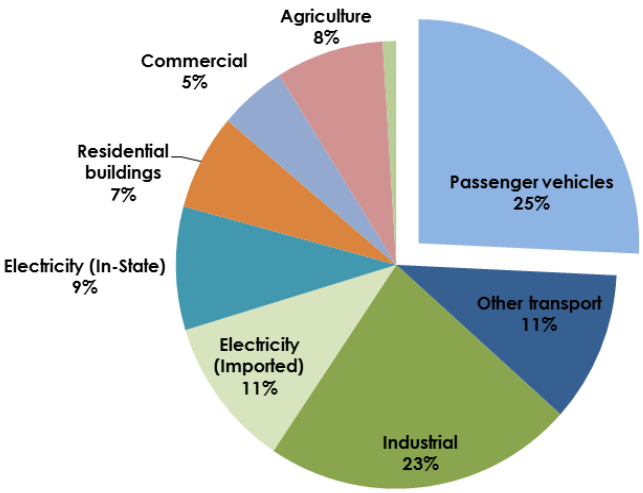
Land use patterns and transportation investments play a fundamental role in how far we travel and how we get from home to work, school, shopping, recreation, and other activities. The spatial layout of neighborhoods determines whether we have the option of walking, biking, and taking public transit, or whether we must drive. Offering choices provides relief from land use patterns that otherwise promote dependence on cars for most travel. These options increase travel efficiency, reduce congestion, and improve overall mobility. This is the fundamental cause-effect dynamic at work in the results that follow.

This dynamic is being put into practice in cities and regions across California. Statewide, the number of trips people take by transit, walking, and biking doubled between 2000 and 2012.[2] In Southern California, cities and the regional planning and transit agencies have collaborated and taken bold steps to rapidly build up a comprehensive transit system. These efforts are steering more housing and job growth to new and existing transit-connected locations. The Bay Area recently saw the nation's biggest reduction in the

[1] Nelson, Arthur C. (Urban Land Institute). 2011. *A New California Dream: How Demographic and Economic Changes May Shape the Housing Market*.
[2] California Department of Transportation. 2013. *2010-2012 California Household Travel Survey – Final Report*.

share of people commuting alone by car.[3] These changes are cutting emissions by reducing reliance on cars for everyday travel needs. This is a crucial step toward reducing emissions from passenger vehicles, the top source of carbon emissions in California (as shown in Figure ES-1).

Figure ES-1. California GHG Emissions by Sector in 2013[4]



THE ROLE OF LAND USE IN REDUCING EMISSIONS

Land use is a critical element of California's climate change efforts. Urban form shapes travel demand, and the quantity of passenger vehicle miles traveled (VMT) is a major determinant of California's carbon emissions. To this end, our study utilizes Calthorpe Analytics' RapidFire model[5] in combination with the Energy + Environmental Economics (E3) California Pathways study ("the E3 study")[6] completed in April 2015. The E3 analysis provides the energy technology specifications, as well as assumptions about variables such as future population and energy prices, that are needed as inputs for RapidFire. We align with the E3 work because it is a careful study providing comprehensive energy coverage, and it was commissioned by state policymakers to inform the setting of a 2030 carbon emissions reduction goal.

The E3 study explores a variety of 2030 scenarios, building on low-carbon technologies currently available in the marketplace. The fastest emissions reduction pathway mapped in the E3 study falls short of the 2030 goal. We test a hypothesis that smarter land use could make the difference in meeting or surpassing the 40% reduction. Our results indicate that smart growth can indeed serve California in achieving the 2030 goal while also yielding other valuable environmental, fiscal, and public health co-benefits.

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[3] U.S. Census Bureau. 2015. *Who Drives to Work? Commuting by Automobile in the United States: 2013*.
[4] 2013 are most recent data available. Sourced from: California Air Resources Board. 2015. *California Greenhouse Gas Inventory, 2015 Edition*.
[5] Calthorpe Analytics. Technical Summary available at www.calthorpeanalytics.com
[6] Energy + Environmental Economics, Inc. 2015. *California Pathways + GHG Scenario Results*.

Table ES-1 summarizes the land use inputs applied in the E3 study and the scenarios developed for this study.

Table ES-1: Land Use Scenarios Defined

Study	Scenario Name	Description
E3 California Pathways	Baseline	Representative of past trends, not taking into account actions under SB 375.
	Smart Growth	The main smart growth scenario used by E3 assumes significant VMT savings as compared to the Baseline land use/VMT applied with their Reference Case scenario. E3 also developed a more aggressive smart growth scenario used for sensitivity testing, but it was not applied in combination with their Early Deployment scenario.
Energy Innovation/ RapidFire	Past Trends	A continuation of past trends, not taking into account the impact of SB 375.
	Current Plans	Potential trajectory given current planning and policy actions in line with SB 375.
	More Compact	Stronger smart growth policy that prioritizes focused development in coordination with transit investments, and meets demand for housing in walkable, accessible communities.
	Infill Focus	Strongest smart growth policy, building upon the More Compact scenario with greater focus on infill. Going forward, 85% of new housing and jobs are added within existing urban boundaries.

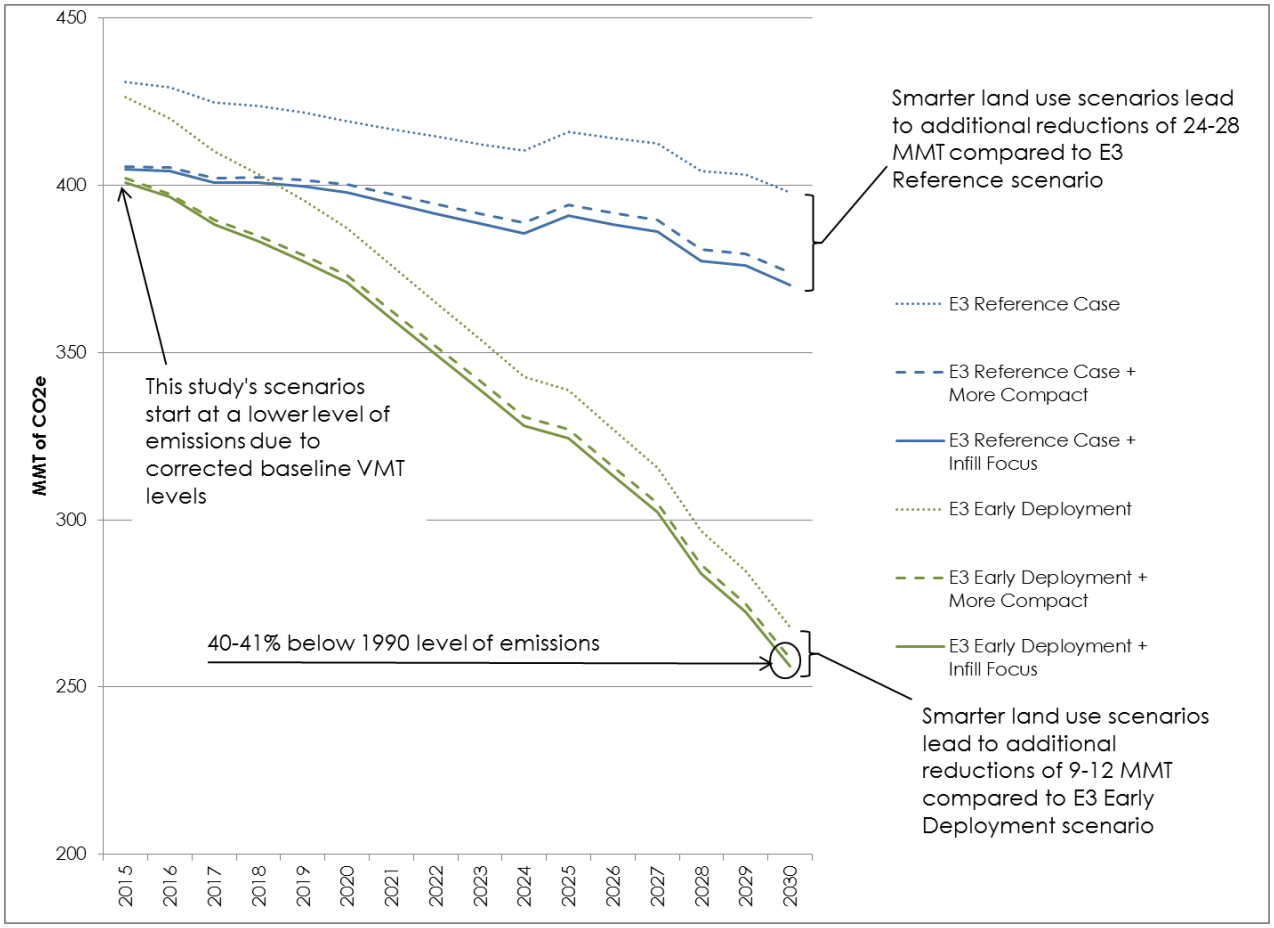
The land use scenarios are combined with two sets of energy technology assumptions from the E3 study:

1. **E3 Reference Case:** this scenario forecasts the technological pathway expected given current policy (e.g., 33% Renewable Portfolio Standard). The E3 Reference Case scenario applies the E3 Baseline land use assumption (described in Table ES-1). The scenario produces an economy-wide reduction equal to 8% below 1990 emissions by 2030.

2. **Early Deployment:** this is the deepest-reduction pathway to 2030 developed in the E3 study. It assumes aggressive technology deployment across sectors (e.g., 60% renewable electricity in 2030). Regarding land use, E3 assumes their Smart Growth VMT projection. The Early Deployment scenario reaches 38% below the 1990 level of carbon emissions in 2030.

Figure ES-2 brings these energy and land use assumptions together, showing the deeper reductions attributable to land use. The dotted lines show the original emissions reduction pathways traced by E3's Reference Case and Early Deployment scenarios. The dashed and solid lines illustrate further emissions reductions achievable with our More Compact and Infill Focus scenarios, respectively, in combination with the E3 energy technology assumptions.

Figure ES-2. Updated Smart Growth Analysis Shows Statewide Reductions Reaching 40-41% Below 1990 Emissions in 2030[7]



In combination with the E3 Early Deployment scenario, the RapidFire smart growth scenarios yield additional reductions of 9-12 million metric tons (MMT) of carbon dioxide equivalent (CO_2e). This leads to statewide reductions of 40-41% below 1990 emissions, in line with the proposed 2030 target. The additional avoided emissions stem primarily from differences in passenger VMT, with some savings also attributable to reduced building energy demand. The results demonstrate that smart land use is integral to achieving California's 2030 decarbonization targets.

[7] The graph shows the results of two of E3 scenarios as originally estimated, and then updates these with the More Compact and Infill Focus scenarios developed for this study. E3's study began before a more recent state transportation evaluation known as EMFAC 2014 was completed. E3 took steps to try to correct for this, but their Baseline VMT levels – those expected under current conditions without additional smart growth action – still appear to be too high. As the graph illustrates, in correcting for the higher VMT, baseline emissions are reduced to levels that are lower than is likely today. The statewide inventory shows a total of 459 MMT of CO_2e in 2013, the most recent year reported. We hypothesize that the E3 study's inflated VMT was offset by assumptions on fuel economy. With respect to interpretation of smart growth impacts, this means that our estimates of avoided carbon emissions are likely on the conservative side. Better vehicle fuel economy reduces the benefit of each mile of travel demand avoided.

SIGNIFICANT CO-BENEFITS

Smart land use does more than "close the gap" in achieving target carbon reductions. Compact land use patterns, developed in coordination with transportation investments, will meet Californians' increasing demand for housing in walkable, transit-accessible communities and create valuable co-benefits. We quantify these co-benefits given current policy (assuming the E3 Reference Case energy assumptions). Table ES-2 summarizes the benefits by 2030 of the Current Plans, More Compact, and Infill Focus scenarios as compared to the Past Trends scenario. Cumulative impacts reflect results from 2015 to 2030, while annual impacts reflect results in 2030.

Table ES-2. Co-Benefit Impacts in 2030, Annual and Cumulative

	Current Plans	More Compact	Infill Focus
Economic impacts quantified (2015$)			
Household cost savings[a]			
Cumulative to 2030	$28.9 billion	$72.1 billion	$91.1 billion
Annual per average household in 2030	$600	$1,600	$2,000
Avoided public health costs[b]			
Cumulative to 2030	$2.6 billion	$6.4 billion	$8.2 billion
Annual in 2030	$321 million	$853 million	$1,040 million
Infrastructure cost savings[c]			
Cumulative to 2030	$9.3 billion	$12.4 billion	$18.5 billion
Environmental impacts quantified			
Criteria pollutant emissions avoided[d]			
Cumulative to 2030	217,000 tons	532,000 tons	686,000 tons
Annual in 2030	19,000 tons	50,000 tons	61,000 tons
Residential water savings[e]			
Cumulative to 2030	52,600 acre-feet	124,200 acre-feet	154,900 acre-feet
Annual average per new household in 2030	9,300 gallons	21,900 gallons	27,300 gallons
Land conservation[f]			
Cumulative to 2030	270 sq mi	490 sq mi	700 sq mi

[a] Household costs include those for auto fuel, ownership, and maintenance; and residential energy and water.

[b] Public health costs include those related to air pollutants from passenger vehicle transportation, including cases of mortality; respiratory-related ER visits; upper, lower, and acute respiratory symptoms; exacerbated asthma attacks; heart attacks; hospitalization from respiratory and cardiovascular illness; and lost work days.

[c] Infrastructure costs include one-time capital costs for building local roads, water, and sewer infrastructure; and ongoing annual operations and maintenance costs.

[d] Criteria pollutant emissions include NO_x, SO_x, CO, VOC, PM-2.5, and PM-10 from passenger vehicles.

[e] Water use includes indoor and outdoor use, with outdoor irrigation being the primary cause for variation.

[f] Land conservation refers to the savings of undeveloped "greenfield" land, including open space and agricultural lands.

Smarter land use patterns beyond the Current Plans scenario would save households $1,000 to $1,400 annually (2015 dollars), mostly through lower auto-related spending. In addition to household savings, the costs borne by cities to build and maintain local roads, sewers, and water infrastructure is also reduced significantly, with $12-$18.5 billion in cumulative savings through 2030 due to more compact growth. Avoided health costs related to pollution from passenger vehicle travel are also substantial, with cumulative savings of $2.6-$8.2 billion through 2030.[8] The benefits of smarter land use build over time and will be even larger in 2035 and 2050.

POLICY IMPLICATIONS

In addition to bolstering the case for the proposed 2030 emissions goal, this report also performs two other analyses that are relevant to current policy questions. These analyses are related to SB 375, the state's pioneering land use law, and the target to use 50% less oil for transportation, as specified by SB 350.

The California Air Resources Board (CARB) is currently considering whether to deepen future SB 375 targets. Our results indicate that stronger targets, combined with funding and implementation support, could be a deciding factor in achieving the 2030 goal. The More Compact and Infill Focus scenarios would yield reductions below the 2014 VMT per capita level of 9-12% in 2030 and 12-15% in 2035.

Our analysis of the potential for oil use reductions for transportation in 2030 pertains to the passenger vehicle segment, which makes up three-quarters of all on-road emissions. Our analysis indicates that a 2% reduction from today's total VMT levels would accomplish a 50% reduction in oil use (using the E3 Early Deployment scenario for other assumptions). Under the Infill Focus scenario, total VMT in 2030 rises by about 1% from today's level while population increases by 14%. Though this reduction is slightly higher than that of any of the scenarios we model, we would expect such an outcome to be achievable in combination with other evolving mobility options, such as ride-hailing companies (e.g., Uber, Lyft), micro-transit (private companies operating like public transit agencies over smaller areas, e.g., Chariot, Leap), bike sharing and e-bikes, and investments in safe active transportation infrastructure (i.e., to support cyclists and pedestrians). These emerging transportation choices fit well with more compact and mixed land use patterns where homes, services, and jobs are nearby.

[8] Avoided health cost assumptions developed by Environmental Defense Fund/American Lung Association in California/Tetra Tech for their recent study, *Driving California forward: Public health and societal economic benefits of California's AB 32 transportation fuel policies* (May 2014).

CONCLUSION

Building mostly within our existing urban boundaries won't be simpler, but it will pay off with economic, environmental, and soci al benefits. The smarter growth patterns modeled in this study deliver more transportation choices, better mobility, and an upgraded quality of life for millions of Californians. This report quantifies the carbon emissions reductions and a selection of the co-benefits associated with smarter development. The land use patterns studied here could lead to even larger carbon emissions reductions than estimated because they will also preserve more land in California for carbon sequestration.

More focused growth is easier to serve with quality public transit, like this Bus Rapid Transit line, the San Bernardino express. (Photo source)

In conjunction with technological innovation, comprehensive land use planning is crucial to meeting the larger goals for economy-wide emissions reduction and reducing oil consumption by 50%. CARB should set stronger SB 375 goals that are consistent with the Governor's Executive Order to reduce statewide carbon emissions 40% below 1990 levels by 2030. CARB should also set stronger requirements for smart growth actions by local governments to qualify for funding from auction revenues.

California's population is expected to hit 50 million by 2050, up from 39 million today. As the state's population and economy expand, it is vital to think about future growth patterns and their implications. Land use patterns, once established, are long-lasting and can be costly to reverse or retrofit. Rather than emphasize the downside of past patterns, this report prefers to focus on the potential upside to redoubled smart growth efforts. There is a golden growth opportunity to be seized. The state should further advance its efforts to encourage patterns that will help the state meet its health, climate, energy, water, and fiscal challenges. The world's cities, like California's, are bursting with energy. California, as a policy leader and America's most urbanized state, is poised to benefit from this new age of enlightened urbanism.