Golden Gate University Law Review

Volume 43 | Issue 2 Article 7

April 2013

Thirty Minutes or Less: The Inelasticity of Commuting

John Andrew Brunner-Brown
Golden Gate University School of Law

COMMENT

THIRTY MINUTES OR LESS: THE INELASTICITY OF COMMUTING

*JOHN ANDREW BRUNNER-BROWN**

INTRODUCTION

Unprecedented climate change[1] is a national security threat because, among other reasons, it strains infrastructure and resources, creates unpredictable weather patterns, causes severe droughts in already unstable foreign regions, and, domestically, it creates devastating hurricanes.[2] The scientific community overwhelmingly agrees that climate change is being caused by human actions.[3] Since the Industrial

* J.D. Candidate, 2013, Golden Gate University School of Law, San Francisco, CA; M.A. German, 2010, California State University Long Beach, Long Beach, CA; B.A. History, 2007, and B.A. German, 2007, California State University Long Beach, Long Beach, CA. This Comment owes much of its success to the support from family and friends, with a special debt of gratitude to Jered Elmore, Dr. Jeffrey L. High (CSU Long Beach), and those who enlighten the world for others.

[1] This Comment uses the term "climate change" instead of "global warming," because climate change is broader than global warming. Climate change describes long-term changes in weather events, such as warming trends, but also includes factors such as precipitation, extreme weather events, and droughts, whereas global warming only describes the increase in global temperatures. *See, e.g.*, Dan Stillman & Denise Miller, *What Are Climate and Climate Change?*, NASA (Oct. 26, 2011), www.nasa.gov/audience/forstudents/5-8/features/what-is-climate-change-58.html.

[2] *See, e.g.*, Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496, 66,498 (Dec. 15, 2009) (codified at 40 C.F.R. ch. 1) ("[C]oastal areas face other adverse impacts from sea level rise such as land loss due to inundation, erosion, wetland submergence, and habitat loss."); *see also* Mark E. Rosen, *Energy Independence and Climate Change: The Economic and National Security Consequences of Failing To Act*, 44 U. RICH. L. REV. 977, 1012 (2010); *see also* Jill Fitzsimmons, *15 Military Leaders Who Say Climate Change Is a National Security Threat*, MEDIA MATTERS FOR AMERICA (May 30, 2012, 2:55 PM), mediamatters.org/blog/2012/05/30/15-military-leaders-who-say-climate-change-is-a/184705.

[3] *Consensus: 97% of Climate Scientists Agree*, NAT'L AERONAUTICS & SPACE ADMIN., climate.nasa.gov/scientific-consensus (last visited Feb. 22, 2013); *see* Richard C. J. Somerville,

Revolution, the increase in pollution over the last two centuries has raised the atmospheric concentration of carbon dioxide from its historical maximum of 280 parts per million to over 380 parts per million.[4] The increase in carbon dioxide concentration creates a greenhouse effect that, in only the last 140 years, has caused a 0.6°C rise in the average global surface temperature.[5]

California's state government has already taken several legislative actions to begin reductions in carbon dioxide emissions.[6] In furtherance of these efforts, the legislature passed the Global Warming Solutions Act in 2006,[7] which set goals for reducing California's greenhouse gas emissions (GHGE) to the 1990 levels by the year 2020.[8] To help reach the goals of the Global Warming Solutions Act through land use incentives, in 2008 the California state legislature passed the California Sustainable Communities and Climate Protection Act (Sustainable Communities Act).[9] The Sustainable Communities Act aims to reduce

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Science, Politics, and the Public Perceptions of Climate Change, *in* CLIMATE CHANGE, INFERENCES FROM PALEOCLIMATE AND REGIONAL ASPECTS 3, 6 (André Berger et al. eds., 2012) ("Thanks to recent research, we have learned that by far the greatest part of the observed century-scale warming is due to human rather than natural factors (Lean and Rind 2008). These scientists analyzed the role of natural factors (e.g., solar variability and volcanoes) vs. human influences (e.g., added manmade greenhouse gases and aerosols) on temperatures since 1889. They found, for example, that the sun contributed only about 10% of surface warming in the last century and a negligible amount in the last quarter century, thus contributing far less than had been estimated in earlier assessments."); *see also* Prajit K. Dutta & Roy Radner, *Population Growth and Technological Change in a Global Warming Model*, 29:2 ECON. THEORY 251, 252 (2006).

[4] Dutta & Radner, *supra* note 3, at 252; *see also* James L. Olmsted, *The Butterfly Effect: Conservation Easements, Climate Change, and Invasive Species*, 38 B.C. ENVTL. AFF. L. REV. 41, 45-46 (2011); Somerville, *supra* note 3, at 8 ("The 2007 concentration of all greenhouse gases, both CO_2 and non-CO_2 gases, was about 463 ppm CO_2 equivalents. Adjusting this concentration for the cooling effects of aerosols yields a CO_2-equivalent concentration of 396 ppm.").

[5] Dutta & Radner, *supra* note 3, at 252.

[6] *See, e.g.*, CAL. HEALTH & SAFETY CODE § 43018.5 (Westlaw 2013) (enacting the first vehicle greenhouse gas legislation in the United States through California Assembly Bill 1493, requiring a 30% reduction in greenhouse gas emissions by 2016); *see also* Cal. Exec. Order No. S-3-05 (indicating executive support for these actions by establishing a goal of reducing greenhouse gases by 80% below 1990 levels by 2050), *available at* gov.ca.gov/news.php?id=1861.

[7] CAL. HEALTH & SAFETY CODE §§ 38500-38599 (Westlaw 2013).

[8] *See* Joanna D. Malaczynski & Timothy P. Duane, *Reducing Greenhouse Gas Emissions from Vehicle Miles Traveled: Integrating the California Environmental Quality Act with the California Global Warming Solutions Act*, 36 ECOLOGY L.Q. 71, 85 (2009); *see also* Cal. Exec. Order No. S-3-05, *supra* note 6 (Governor Schwarzenegger ordering "[t]hat the following greenhouse gas emission reduction targets are hereby established for California: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; by 2050, reduce GHG emissions to 80 percent below 1990 levels . . . .").

[9] OFFICE OF THE GOVERNOR ARNOLD SCHWARZENEGGER, FACT SHEET FOR SENATE BILL 375: REDESIGNING COMMUNITIES TO REDUCE GREENHOUSE GASES (Oct. 1, 2008), *available at* www.mwcog.org/uploads/committee-documents/bF5dXVhZ20081016085919.pdf [hereinafter FACT SHEET FOR SENATE BILL 375].

the vehicle miles traveled by California residents, which would reduce vehicular GHGE.[10]

Reducing driving is important because the single largest source of GHGE in California is the transportation industry: approximately 40% of GHGE come directly from the transportation industry; 30% alone come from automobiles and light trucks.[11] The legislature reasoned that "[w]ithout improved land use and transportation policy, California will not be able to achieve the goals of [the Global Warming Solutions Act]."[12] The Sustainable Communities Act establishes a state interest in making communities less dependent on automobiles for routine trips by aligning "transportation, housing, and regional land-use plans."[13] Essentially, this creates mixed zoning to reduce distances needed to travel and places housing closer to public transit options, which should reduce the vehicle miles traveled.

However, despite efforts to create sustainable communities, the California legislature has failed to effectively address the main reasons people choose to drive personal vehicles instead of choosing to walk, to bike, or to take public transportation. By providing roadway funding for efficient automobile transportation, the government continuously promotes individuals' reliance on personal automobiles as their primary mode of transportation.[14] Because land use policies do not address the underlying reasons people continue to drive personal automobiles, these policies will not significantly impact driving behavior.

In order to effectively decrease GHGE from the transportation industry, the legislature must change its transportation funding to manipulate travel time. By changing the funding structure for transportation, the legislature can decrease the accessibility of roads while simultaneously increasing the convenience and capabilities of public transportation and non-motorized travel methods. Decreasing

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[10] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) (amending CAL. GOV'T CODE §§ 65080, 65400, 65583, 65584.01, 65584.02, 65584.04, 65587, 65588; adding CAL. GOV'T CODE §§ 14522.1, 14522.2, 65080.01; amending CAL. PUB. RES. CODE § 21061.3; adding CAL. PUB. RES. CODE §§ 21159.28, 21155 et seq.); *see also* Malaczynski & Duane, *supra* note 8, at 75.

[11] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 1(a).

[12] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 1(c).

[13] FACT SHEET FOR SENATE BILL 375, *supra* note 9.

[14] Todd Litman, *Transport at the Millennium: Policy Implications of Full Social Costing*, 553 ANNALS AM. ACAD. POL. & SOC. SCI. 143, 152 (1997) ("[A]utomobile use encourages sprawl by degrading the urban environment and accommodating low-density development at the urban periphery. This creates a self-reinforcing cycle of increased automobile use, reduced travel options, urban blight, low-density land development, and automobile dependency."); *see also* Robert Cervero, *Growing Smart by Linking Transportation and Urban Development*, 19 VA. ENVTL. L.J. 357, 358-59 (2000) ("[S]prawl creates near total dependence on the private car. . . . Insidiously, sprawl and car-dependency feed off one another."); 23 U.S.C.A. § 134 (Westlaw 2013) (providing highway funding).

accessibility must be in terms of convenience and capacity, thereby increasing travel time. Accessibility should not be restricted through increases in costs, such as with excise taxes[15] and congestion pricing.[16] While excise taxes and congestion pricing increase the cost of transportation, these measures are only "controlling from the periphery, not dealing with the center of the matter."[17] Extra transportation costs do not work because instead of decreasing total transportation needs, drivers acclimate to the charges—incorporating higher transportation costs into their budget—and drivers plan schedules around congestion pricing.[18]

This Comment urges the legislature to manipulate travel time in order to reduce GHGE. Specifically, the legislature must incentivize mass transit by creating easier, quicker transit systems while simultaneously disincentivizing personal automobiles by increasing automobile travel time. By manipulating the travel time for various modes of travel, the legislature can effectively reduce GHGE while increasing individuals' quality of life by creating an infrastructure that costs less and provides transportation systems not dependent on the automobile.[19]

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[15] *See, e.g.*, Babak A. Rastgoufard, *Too Much Smoke and Not Enough Mirrors: The Case Against Cigarette Excise Taxes and for Gasoline Taxes*, 36 URB. LAW. 411 (2004) (describing historical use and practicality of excise tax on gasoline); *see generally* 26 U.S.C.A. § 4041 (Westlaw 2013) (imposing taxation on gasoline).

[16] *See, e.g.*, Sam Schwartz et al., *A Comprehensive Transportation Policy for the 21st Century: A Case Study of Congestion Pricing in New York City*, 17 N.Y.U. ENVTL. L.J. 580, 596-97 (2008) (describing the decrease in congestion in London and Stockholm as a result of congestion pricing); *see also* Michael H. Schuitema, Comment, *Road Pricing as a Solution to the Harms of Traffic Congestion*, 34 TRANSP. L.J. 81 (2007).

[17] Gabriel Dupuy, *From the "Magic Circle" to "Automobile Dependence": Measurements and Political Implications*, 6 TRANSPORT POL'Y 1, 2 (1999).

[18] *See* Jonas Eliasson, *Cost–Benefit Analysis of the Stockholm Congestion Charging System*, 43 TRANSP. RESEARCH PART A 467, 478 (2009) (suggesting that, despite the short-term benefit of a reduction in congestion, drivers acclimate to costs, and roads become filled with other users). "There are two reasons why the long-term effects could be smaller than the short-term effects. First, there is the 'acclimatisation' effect: after a while, people might get used to the charge, and consider it less important when making their travel choices. This could be especially important if it is, at first, a little difficult to pay the charge—and the extra 'cost' of actually making the payment might decrease with time. Second, the freed-up road space induces new traffic—travellers with higher values of time, or travellers making car trips not crossing the cordon. In fact, the latter effect was visible during the trial: there were, e.g. signs in one of the travel surveys that both the number of car trips outside and within the cordon increased somewhat, and that these trips to a larger extent were made during rush hours (there was less reason to avoid rush hours, since congestion had decreased so much)." *Id.*

[19] This Comment discusses the relative inelasticity of travel time below. These proposals do not include increasing fuel costs through excise taxation, because it is ineffective. *See* Jason DeBacker et al., *Estimating the Supply and Demand of Gasoline Using Tax Data*, 34 ENERGY ECON. 195, 199 (2012) (describing how increases in transportation costs will not change demand for transportation). Demand for gasoline and other transportation costs are relatively inelastic, meaning that even as prices rise, changes in demand are relatively small. This relative inelasticity indicates

This Comment explains why the Sustainable Communities Act will fail to significantly reduce vehicle emissions, and this Comment proposes legislative action to reach the goals established in the Global Warming Solutions Act. Part I of this Comment discusses the relationship between the automobile and urban decentralization in America. Part II discusses legislation in California targeting automobile emissions, including regional smart-growth measures and state legislative actions targeted at reducing GHGE.

Part III explains the impacts on travel mode choice from urban design, temporal components, and individual components such as attitude, preferences, costs, and the duration of the trip. To demonstrate the power of time, Part III also explains the inelasticity of travel time, the relationship between primary and substitute goods, and how different transportation modes have different values of quality.

Part IV proposes changes to make public transit a "close substitute" for the personal automobile and describes savings these policies can bring. Part V demonstrates the viability of these policies by discussing several cities with similar policies.

The Conclusion calls the California legislature to act by making funding changes. In order to make significant reductions in GHGE from the transportation industry, as set out in the Global Warming Solutions Act and in the Sustainable Communities Act, the legislature must make meaningful funding changes that significantly reduce automobile infrastructure while making other modes of travel more viable options.

I. BACKGROUND: URBAN POLICIES AFFECT AUTOMOBILE USE

In the nineteenth century, the rich lived in the center of the city with almost everything they needed accessible within a short distance, while the poor lived on the outskirts, which forced them to walk into the city to access stores, school, and work.[20] In general, cities were not "completely centralized" but rather utilized highly mixed zoning of housing and employment.[21]

Furthermore, dense cities throughout history have provided economies of scale,[22] making cities cheaper for governments to

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"that consumption of gasoline and resulting carbon emissions will be largely unaffected by marginal fuel tax increases, at least in the short-run." *Id.*

[20] *See* Kevin A. Bryan et al., *Evolution of City Population Density in the United States*, 93 ECON. Q. 341, 353-54 (2007).

[21] Peter Newman et al., *Can We Overcome Automobile Dependence? Physical Planning in an Age of Urban Cynicism*, 12 CITIES 53, 59 (1995).

[22] "Economies of scale occur when the average total cost of producing a good or service declines as output expands." Jack Alan Kramer, Note, *Vouching for Federal Educational Choice: If*

concentrate resources in one geographical area and for private companies to operate in cities.[23] With the concentration of resources, "dense cities . . . are the economic 'nucleus of an atom,' the central building block of development through their role in spurring human capital transfers."[24]

Town planning and technological developments in the late nineteenth century made it feasible to support inner-city transit networks of trains and trolleys, but the automobile completely changed population dynamics.[25] The automobile removed the constraints of traveling distances, allowing the rich to relocate to "less-dense suburban and exurban cities."[26] "Thus the car-based city saw residential areas scatter in all directions and employment slowly follow it."[27]

The automobile alone is not responsible for the decrease in density of cities. The Great Depression significantly damaged urban economies,[28] and World War II "undermined the hegemony of urban industrial society and culture by initiating the deconcentration of public resources and private capital."[29] Other factors include "federal mortgage insurance, the Interstate Highway System, racial tension, and schooling considerations."[30] As a result, cities have continuously decreased in density since 1940 in every area of the United States.[31]

You Pay Them, They Will Come, 29 VAL. U. L. REV. 1005, 1015 (1995) (citing DAVID N. HYMAN, MODERN MICROECONOMICS 237 (2d ed. 1989)) ("Economies of scale are the increases in input productivities that result from division of labor and savings in materials when a firm increases the scale of its operations.").

[23] *See* Bryan et al., *supra* note 20, at 352.

[24] *Id*. at 351.

[25] *See* Newman et al., *supra* note 21, at 59.

[26] Bryan et al., *supra* note 20, at 353-54.

[27] Newman et al., *supra* note 21, at 59.

[28] *See* Eric Avila, *Popular Culture in the Age of White Flight: Film Noir, Disneyland, and the Cold War (Sub)Urban Imaginary*, 31 J. URB. HIST. 3, 5 (2004).

[29] *Id.* at 5 ("Beginning in the early 1940s, the federal government actively promoted industrial decentralization as a strategy to protect a burgeoning military-industry infrastructure from the event of an air strike. When the Chrysler Warrant Tank Plant took advantage of federal incentives to open an undeveloped tract of land some fifteen miles north of downtown Detroit in 1941, for example, it augmented the suburban model of postwar industrial development that weakened the economic vitality of traditional urban centers.").

[30] Bryan et al., *supra* note 20, at 353.

[31] *Id.* at 355; *see also id.* at 343 (considering all cities over 2,500 persons according to the census, with "city" meaning any of three things: "legal city" is a "region controlled by the local government or a similar unincorporated region," "urbanized area" is a "region incorporating a central city plus surrounding towns and cities meeting a density requirement" and a "Metropolitan Statistical Area" is a "region incorporating a central city, the county containing that city, and surrounding counties meeting a requirement on the percentage of workers commuting to the center").

The combination of factors leading to decreased density in cities also led to the expansion of the road network, which has effectively "encourag[ed] car owners to drive more, [and] more people to buy cars."[32] Decreases in urban density correspond to increases in car ownership because individuals cannot perform daily functions without personal transportation, thus creating "automobile dependence."[33] Indeed, car ownership has outpaced population growth in the fifty years following World War II—"automobile stock and traffic have more than doubled in the United States and were multiplied by ten in Europe."[34]

As more people bought personal automobiles and began driving them more and more frequently, the government expanded the road network to facilitate the increase in traffic.[35] As more roadways were available for automobiles, the roadways created a network effect, which increased the utility of the automobile.[36] The increase in the utility of the automobile created more demand for automobiles.[37] Consequently, the United States has created a "magic circle" of automobile development.[38]

In the decades following World War II, automobile dependence increased and public transit ridership experienced a significant decline for trips to work and for total trips.[39] Overall, the raw number of transit users has not changed significantly, but the percentage of transit users has declined.[40] While an estimated 12.6% of Americans utilized public transportation to commute to work in the 1960s, only an estimated 3.5% of Americans utilized it to commute to work in 1995.[41] The number of workers who commute by private automobile, however, has increased

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[32] Dupuy, *supra* note 17, at 1.

[33] *Id.* ("[T]he expression 'automobile dependence' means that as individuals, we cannot live without cars, just as a smoker cannot live without cigarettes and a drug addict without drugs. This is what Ivan Illich denounced two decades ago as the 'radical monopoly' of automobiles, a monopoly which has negative effects even on those who do not own a car." (citation ommited)).

[34] *Id.* at 1 n.2

[35] *See id.*

[36] A network effect is when "the utility of using a certain mode of travel increases with its mode share. Therefore, the more people who use the mode, the more attractive this transport mode becomes for all other people." Frank Goetzke, *Network Effects in Public Transit Use: Evidence from a Spatially Autoregressive Mode Choice Model for New York*, 45 URB. STUD. 407, 408 (2008).

[37] *Id.*

[38] Dupuy, *supra* note 17, at 1 (The "magic circle" essentially describes two supply and demand relationships affecting one another: as the demand for automobiles increases, the supply of roadways increases; as the supply of roadway increases, the demand for automobiles increases.).

[39] *See* Bryan Dorsey, *Mass Transit Trends and the Role of Unlimited Access in Transportation Demand Management*, 13 J. TRANSPORT GEOGRAPHY 235, 235 (2005).

[40] BRIAN MCKENZIE & MELANIE RAPINO, U.S. DEP'T OF COMMERCE, COMMUTING IN THE UNITED STATES: 2009, 2-3, fig. 2 (2011).

[41] Dorsey, *supra* note 39, at 235.

from about 41 million in 1960 to about 120 million in 2009, constituting 86.1% of commuters in 2009.[42]

Simply put, American "transportation and land-use policies have made walking and cycling less feasible, less convenient, and more dangerous."[43] Some common policies include maintaining a relatively low cost of automobiles (in terms of ownership and use) and the low cost and ease of obtaining a driver's license.[44] These policies encourage American dependence on automobiles and fail to address the real or perceived physical danger of non-motorized transportation in America, such as cycling and walking,[45] thereby promoting automobile use and ownership[46] and perpetuating the "magic circle."[47]

Nevertheless, policies and conditions can reverse these long-term trends. For instance, because of changes in policy and legislative support,[48] as well as because of rising gasoline prices,[49] public transit ridership increased 34% between 1995 and 2009.[50] This increase in ridership outpaced both the change in population and the increase in personal automobile use on streets and highways.[51] Despite the progress, this increase in public transit ridership correlated to only 4.99% of workers commuting on transit in 2009.[52] Even with this increase of commuters on public transit, Americans utilize these transit options for only 2% of their total trips taken.[53]

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[42] MCKENZIE & RAPINO, *supra* note 40, at 2.

[43] John Pucher & Lewis Dijkstra, *Making Walking and Cycling Safer: Lessons from Europe*, 54 TRANSP. Q. 25 (2000).

[44] *See generally* Dupuy, *supra* note 17.

[45] *See* Pucher & Dijkstra, *supra* note 43, at 4.

[46] Methods of promoting personal automobile usage include continued development of road networks and lack of development in public transit.

[47] Dupuy, *supra* note 17, at 2.

[48] Dorsey, *supra* note 39, at 236 ("Increased ridership in the late 1990s can be attributed to policy change and legislative support, particularly from the landmark Intermodal Transportation Efficiency Act of 1991 (ISTEA), and the Transportation Equity Act for the 21st Century (TEA-21).").

[49] Press Release, Policy Dev. & Research Program at APTA, Ridership Increases in Third Quarter (Dec. 2011), *available at* www.apta.com/resources/statistics/Documents/Ridership/2011-q3-ridership-APTA.pdf.

[50] MATTHEW DICKENS & JOHN NEFF, 2011 PUB. TRANSP. FACT BOOK 1, 11 (62d ed. 2011). However, comparing Press Release, Policy Dev. & Research Program at APTA, *supra* note 49 (2,597,091 estimated passenger trips) with Press Release, Policy Dev. & Research Program at APTA, Transit Ridership Report (First Quarter 1996) (2,046,014 estimated passenger trips), indicates that the increase in ridership was only 25%.

[51] DICKENS & NEFF, *supra* note 50, at 11 (stating that population increased 15% and the use of personal automobiles on highways and streets increased 23%).

[52] *Id.* at 12.

[53] Manuel Frondel & Colin Vance, *Rarely Enjoyed? A Count Data Analysis of Ridership in Germany's Public Transport*, 18 TRANSPORT POL'Y 425, 426 (2011).

II. FOR SEVERAL DECADES, CALIFORNIA'S POLICIES HAVE TARGETED GHGE REDUCTIONS

California has taken legislative steps to counteract dependence on the automobile and the problems created by automobile dependence, mainly the impact of vehicle emissions on the environment.[54] Through these policies, the California legislature hopes to create walkable communities, thereby reducing emissions that contribute to climate change.[55]

A. LOCAL DEVELOPMENT OF SMART-GROWTH

In order to balance the transportation needs of residents with the goal of protecting the environment, governments have begun "smart-growth" regulation, which regulates land use with transportation in mind.[56] Typical smart-growth principles include providing a range of housing opportunities and choices; walkable neighborhoods; facilitating community and stakeholder collaboration; fair, predictable development decisions; zoning for mixed land uses (business and residential areas placed together); preserving natural land, open space, and farmland; providing a variety of transportation choices; infill developments, which develop or redevelop existing communities (as opposed to building in new areas); and encouraging compact building design when possible.[57] Various regions apply these smart-growth principles in accordance with their particular needs.

Policies limiting and shaping growth in California are not novel. Individual counties in California have developed and passed legislation to shape individual communities.[58] In the 1980s, dozens of elections across the state included slow-growth and community development initiatives.[59] For instance, out of concern for rising congestion and traffic issues, Los Angeles and San Francisco both passed initiatives to limit growth in certain regions.[60] Simi Valley, Moorpark, and San Diego

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[54] FACT SHEET FOR SENATE BILL 375, *supra* note 9.

[55] *Id.*

[56] *See generally Articles Collection, Smart Growth*, N.Y. TIMES, www.nytimes.com/keyword/smart-growth (last visited Apr. 11, 2013).

[57] SUSAN WEAVER ET AL., POLICY AND CODE AUDIT REPORT, EAST BATON ROUGE PARISH AND THE CITY OF BATON ROUGE 2 (2004).

[58] ROBERT GOTTLIEB ET AL., THE NEXT LOS ANGELES: THE STRUGGLE FOR A LIVABLE CITY 151 (2006).

[59] *Id.* at 152.

[60] Anthony Saul Alperin & Kathline J. King, *Ballot Box Planning: Land Use Planning Through the Initiative Process in California*, 21 SW. U. L. REV. 1, 1-2 (1992) ("In San Francisco, for example, land use concerns focus on the 'encroachment of office buildings into residential

passed legislation limiting residential growth.[61] However, these individual initiatives shaped the communities in piecemeal fashion and failed to create robust regional strategies to decrease automobile dependence and reduce harmful emissions.[62]

B. DEVELOPMENT OF STATEWIDE SMART-GROWTH LEGISLATION

Substantial change came at the state level in 2002 when the California legislature passed Assembly Bill 857 (AB 857).[63] Creating a statewide growth management plan, AB 857 established three planning priorities related to land development: "[1] promot[ing] infill development and social equity in existing communities; [2] protect[ing] and conserv[ing] environmental and agricultural resources; and [3] achiev[ing] more efficient use of land, transportation, energy, and public resources outside the infill areas."[64] Despite the good intentions and framework for rethinking land use policies, AB 857 was ineffective because it lacked any consequences for noncompliance.[65]

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neighborhoods.' There, voters approved Proposition M in 1986 and reduced by fifty percent the city's lid of 950,000 square feet of office development. In Los Angeles, concerns about increasing traffic congestion led to the passage of Proposition U, which cut in half the allowable density for approximately eighty-five percent of the city's commercial and industrial properties. Attacking the issue in terms of population growth, other cities have adopted initiative measures limiting new residential construction." (footnotes omitted)).

[61] *See* John Darakjian, Comment, *SB 375: Promise, Compromise and the New Urban Landscape*, 27 UCLA J. ENVTL. L. & POL'Y 371, 380 (2009) ("But the movement towards slow growth was not limited to Los Angeles, nor was it limited to commercial or urban projects; during the same election year a spate of slow-growth propositions appeared on ballots throughout the state. San Francisco residents placed an initiative on the ballot to limit downtown office development. Simi Valley and Moorpark voters came out to restrict residential growth."); *see also* GOTTLIEB ET AL., *supra* note 58, at 152.

[62] GOTTLIEB ET AL., *supra* note 58, at 153.

[63] CAL. ENERGY COMM'N, 2007 INTEGRATED ENERGY POLICY REPORT 214 (2007), *available at* www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF.PDF.

[64] *Id.*; *see also Infill Development*, ASS'N OF BAY AREA GOV'TS (June 2008), www.abag.ca.gov/planning/toolkit/27infill.html ("Infill development occurs on sites that have been bypassed by previous development or on developed sites where the current use is no longer optimal or desirable. Infill development projects vary in size from single-family dwellings and multi-family developments on scattered lots to large mixed-use developments covering a city block. Infill development can rejuvenate a neighborhood and provide more housing and other opportunities. . . . Implementation of an effective infill strategy will require use of a variety of related strategies, including mixed-use, second units, rezoning land for residential use, adaptive reuse, and redevelopment. An emphasis on infill will also require a finer-grain approach to planning and development, relying less on the availability of large parcels of undeveloped land and more on making better use of the land that is within the urbanized area.").

[65] CAL. ENERGY COMM'N, *supra* note 63, at 214.

The Global Warming Solutions Act[66] provides a major push by requiring a reduction in GHGE to the levels seen in 1990 by the year 2020.[67] Among other things, in order to reach this goal, the Global Warming Solutions Act tasked the California Air Resource Board to

> publish and make available to the public a list of discrete early action greenhouse gas emission reduction measures that can be implemented prior to the measures and limits adopted pursuant to Section 38562.
> . . .
> . . . The regulations adopted by the state board pursuant to this section shall achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions from those sources or categories of sources, in furtherance of achieving the statewide greenhouse gas emissions limit.[68]

Following this law, the California Air Resources Board identified early-action measures to reduce climate change.[69]

C. THE CALIFORNIA SUSTAINABLE COMMUNITIES AND CLIMATE PROTECTION ACT CHANGES THE PLACES WE LIVE

Even with the goals and targeted strategies of the Global Warming Solutions Act,[70] the California legislature realized that improvements to

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[66] CAL. HEALTH & SAFETY CODE §§ 38500-38599 (Westlaw 2013).

[67] Malaczynski & Duane, *supra* note 8, at 73. Governor Schwarzenegger also signed Executive Order S-3-05, directing "[t]hat the following greenhouse gas emission reduction targets are hereby established for California: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; by 2050, reduce GHG emissions to 80 percent below 1990 levels." Cal. Exec. Order No. S-3-05, *supra* note 6.

[68] CAL. HEALTH & SAFETY CODE § 38560.5(a), (c) (Westlaw 2012).

[69] *Assembly Bill 32: Global Warming Solutions Act*, CAL. ENVTL. PROT. AGENCY, AIR RES. BD., www.arb.ca.gov/cc/ab32/ab32.htm.olf (last visited Feb. 21, 2013) [hereinafter *Assembly Bill 32*] ("The Board identified nine discrete early action measures including regulations affecting landfills, motor vehicle fuels, refrigerants in cars, tire pressure, port operations and other sources in 2007 that included ship electrification at ports and reduction of high [global warming potential] gases in consumer products. Regulatory development for the remaining measures is ongoing."), *see also Early Action Items*, CAL. ENVTL. PROT. AGENCY, AIR RES. BD., www.arb.ca.gov/cc/ccea/ccea.htm (last visited Dec. 23, 2011) (early actions included low carbon fuel standard, landfill methane capture, reductions from mobile AC, semiconductor reduction, SF6 reductions, high global warming potential consumer products, heavy-duty measure, tire pressure program, and shore power).

[70] *See Assembly Bill 32*, *supra* note 69 ("Ensure early voluntary reductions receive appropriate credit in the implementation of AB 32 (HSC §38562(b)(3)). . . . Convene an Environmental Justice Advisory Committee (EJAC) to advise the Board in developing the Scoping Plan and any other pertinent matter in implementing AB 32 (HSC §38591). . . . Appoint an Economic and Technology Advancement Advisory Committee (ETAAC) to provide recommendations for technologies, research and greenhouse gas emission reduction measures (HSC §38591).").

land use and transportation policies are required to accomplish the goals set in the Global Warming Solutions Act.[71] Enhancing the California Air Resource Board's ability to achieve the Global Warming Solution Act's goals, the Sustainable Communities Act specifically targets land use policies with "emissions-reducing goals for which regions can plan, integrat[ing] disjointed planning activities, and provid[ing] incentives for local governments and developers to follow new conscientiously-planned growth patterns."[72] By using economic incentives and disincentives, the legislature designed the Sustainable Communities Act specifically to target land use in order to create walkable and transit-friendly communities.[73] This new coordination allows California to continue "to lead the nation and the world in its aggressive fight against global warming."[74]

Environmental regulations on automobiles have demanded and effectuated reductions in GHGE, but reducing GHGE per vehicle is only one step of the process. Despite the stricter emissions requirements for new automobiles in 2008 compared to 1990, the transportation sector still creates 39% of emissions, making it the single largest contributor of emissions in California.[75] In fact, "automobiles and light trucks account for 50 percent of air pollution in California."[76] Addressing this issue, the Sustainable Communities Act recognizes that "even taking [new vehicle technology] into account, it will be necessary to achieve significant additional greenhouse gas reductions from changed land use patterns and improved transportation."[77]

While the data regarding car ownership per capita and individual vehicle emissions are important, vehicle miles traveled (VMT) remains key to reducing GHGE,[78] and, until the Sustainable Communities Act, these data "have historically not received legislative attention."[79] The

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[71] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 1(c).

[72] FACT SHEET FOR SENATE BILL 375, *supra* note 9.

[73] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 1(g), *see also* FACT SHEET FOR SENATE BILL 375, *supra* note 9.

[74] FACT SHEET FOR SENATE BILL 375, *supra* note 9.

[75] CAL. ENERGY COMM'N, *supra* note 63, at 9.

[76] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 1(d).

[77] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 1(c).

[78] *See U.S. Highway Vehicle-Miles Traveled*, RESEARCH & INNOVATIVE TECH. ADMIN., BUREAU OF TRANSP. STATISTICS (Oct. 2012), apps.bts.gov/publications/multimodal_transportation_indicators/october_2012/html/highway_vehicle_miles_traveled.html ("Vehicle-miles traveled (VMT) are key data for highway planning and management, and a common measure of roadway use. Along with other data, VMT are often used in estimating congestion, air quality, and potential gas-tax revenues, and can provide a general measure of the level of the nation's economic activity.").

[79] Malaczynski & Duane, *supra* note 8, at 72; *see also* CAL. ENERGY COMM'N, THE ROLE OF LAND USE IN MEETING CALIFORNIA'S ENERGY AND CLIMATE CHANGE GOALS: FINAL STAFF

increase in VMT has averaged 3% per annum between 1975 and 2004, outpacing population growth in the same time period.[80] Regardless of clean technology developments, projections for California show a continually increasing population, reaching 46 million by 2030.[81] "More people means more cars, and more cars means more miles driven."[82]

In order to reduce VMT, the Sustainable Communities Act tasks each metropolitan planning organization with developing a "sustainable communities strategy."[83] Each sustainable communities strategy will create a housing and transportation corridor for its region by identifying current and projected land uses, identifying the transportation network needs, and creating a development pattern for the region that reduces emissions of automobiles and light trucks.[84] By designing transportation corridors, the metropolitan planning organizations will design the sustainable communities strategies to create "communities that rely less on automobiles and get Californians out of their cars for routine trips such as [traveling] to work and the grocery store."[85] Also, evidence "suggests that fewer cars are owned in areas with more walkable built environment features."[86]

D. URBAN DESIGN CAN INCREASE THE ACCESSIBILITY OF PUBLIC TRANSIT AND COMMON DESTINATIONS

California is striving toward accessibility with the Sustainable Communities Act by promoting smart-growth developments.[87] Smart-growth matches Americans' preferences for living in walkable communities.[88] Walkable communities and dense cities are desirable

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REPORT 9 (2007) (citing CAL. DEP'T OF FIN., RACE/ETHNIC POPULATION WITH AGE AND SEX DETAIL, 1970-2004 (1998); U.S. FED. HIGHWAY AUTH., HIGHWAY STATISTICS 1975-2004 (2005)).

[80] CAL. ENERGY COMM'N, *supra* note 63, at 208.

[81] FACT SHEET FOR SENATE BILL 375, *supra* note 9.

[82] *Id.*

[83] MONICA ALTMAIER ET AL., CTR. FOR A SUSTAINABLE CAL., INST. OF URBAN & REG'L DEV., UNIV. OF CAL., BERKELEY, MAKE IT WORK: IMPLEMENTING SENATE BILL 375, at 3 (2009), *available at* sustainablecalifornia.berkeley.edu/pubs/SB375-FULL-REPORT.pdf.

[84] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 4(b)(2)(B) (codified in scattered sections of CAL. GOV'T CODE and CAL. PUB. RES. CODE § 21155).

[85] FACT SHEET FOR SENATE BILL 375, *supra* note 9.

[86] Bahareh Sehatzadeh et al., *Walking Frequency, Cars, Dogs, and the Built Environment*, 45 TRANSP. RESEARCH PART A 741, 753 (2011).

[87] ALTMAIER ET AL., *supra* note 83, at 11.

[88] BELDON RUSSONELLO & STEWART LLC, THE 2011 COMMUNITY PREFERENCE SURVEY: WHAT AMERICANS ARE LOOKING FOR WHEN DECIDING WHERE TO LIVE 2-3 (Mar. 2011), *available at* www.realtor.org/sites/default/files/smart-growth-comm-survey-results-2011.pdf ("The 2011 Community Preference Survey reveals that, ideally, most Americans would like to live in walkable communities where shops, restaurants, and local businesses are within an easy stroll from their

because cities "are economically successful due to excellent *accessibility*."[89]

Accessibility stands in contrast to mobility, which was previously the determined purpose of transportation.[90] Mobility "refers to physical movement, including travel by walking, cycling, public transit, taxi, private automobile and other motorized modes. . . . [T]he more you can travel the more destinations you can reach. Mobility is evaluated based on travel distance and speed."[91]

However, after years of transportation policies focusing on promoting vehicle mobility, transportation policies are switching to smart-growth, which changes the goal of transportation to "accessibility."[92] Accessibility means "the ability to reach desired goods, services, activities and destinations (together called *opportunities*)."[93] Accessibility is more desirable than mere mobility because accessibility focuses on destinations while mobility focuses on distances.[94]

E. THE CALIFORNIA SUSTAINABLE COMMUNITIES AND CLIMATE PROTECTION ACT INCENTIVIZES LOCAL CHANGES

The emphasis on the local control of zoning and development has a long history in California.[95] Even though each metropolitan planning

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homes and their jobs are a short commute away; as long as those communities can also provide privacy from neighbors and detached, single-family homes. If this ideal is not possible, most prioritize shorter commutes and single-family homes above other considerations.").

[89] *Accessibility and Mobility Differences*, OREGON.GOV, www.oregon.gov/ODOT/SUS/Pages/accessibility_mobility.aspx (last visited April 13, 2013).

[90] Steve Winkelman et al., *Planning for Economic and Environmental Resilience*, 44 TRANSP. RESEARCH PART A 575, 579 (2010).

[91] *Accessibility and Mobility Differences*, *supra* note 89.

[92] Winkelman et al., *supra* note 90, at 579.

[93] *Accessibility and Mobility Differences*, *supra* note 89.

[94] *Id.* (describing factors affecting physical accessibility: "[*m*]*obility*, that is, physical movement[,] . . . [*m*]*obility substitutes*, such as telecommunications and delivery services, . . . [*t*]*ransportation system connectivity*, which refers to the directness of links and the density of connections in path or road network[, and] [*l*]*and use*, that is, the geographic distribution of activities and destinations").

[95] *See* CAL. CONST. art. XI, § 7 ("A county or city may make and enforce within its limits all local, policy, sanitary, and other ordinances and regulations not in conflict with general laws."); *see also* CAL. GOV'T CODE § 65800 (Westlaw 2012) (stating that the legislative intent behind state law regarding zoning regulations is "to provide only a minimum of limitation in order that counties and cities may exercise the maximum degree of control over local zoning matters"); Big Creek Lumber Co. v. Cnty. of Santa Cruz, 136 P.3d 821, 827 (Cal. 2006) ("Thus, when local government regulates in an area over which it traditionally has exercised control, such as the location of particular land uses, California courts will presume, absent a clear indication of preemptive intent from the Legislature, that such regulation is not preempted by state statute."); IT Corp. v. Solano Cnty. Bd. of Supervisors, 820 P.2d 1023, 1027 (Cal. 1991) ("The power of cities and counties to zone land use in

organization will design an appropriate sustainable communities strategy for the region, the Sustainable Communities Act provides that "city or county land use policies . . . are not required to be consistent with the regional transportation plan."[96] The California legislature has recognized the importance of local control over development because, in contrast with experiences of the "open and transparent"[97] "blueprint planning" process,[98] "top-down" policies often meet resistance.[99] In order to engage the local members of the community, the Sustainable Communities Act requires that each metropolitan planning organization hold workshops and public hearings.[100]

As a safeguard against noncompliance, when the sustainable communities strategy is not a feasible option for the metropolitan planning organization to meet the emission targets, the metropolitan planning organization can instead develop an "alternative planning strategy,"[101] consisting of "alternative development patterns, infrastructure, or additional transportation measures or policies."[102] Once the metropolitan planning organization identifies "the principal impediments to achieving the targets within the sustainable communities strategy,"[103] the alternative planning strategy will afford the metropolitan planning organization the "most practicable choices for achievement of the greenhouse gas emission reduction targets."[104] Although it affects transportation policies and development, the alternative planning strategy is not part of the regional transportation plan.[105]

Altogether, the Sustainable Communities Act attempts to reduce GHGE by tasking metropolitan planning organizations to create sustainable communities with transportation corridors.[106] These sustainable communities will provide mixed zoning in order to shorten the distances individuals have to travel as well as facilitate more-

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accordance with local conditions is well entrenched."); 76 Ops. Cal. Atty. Gen. 145 (1993) ("Traditionally, land use control in California has been a matter of local concern.").

[96] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) Preamble (1).

[97] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 1(e).

[98] ALTMAIER ET AL., *supra* note 83, at i ("[R]egional 'blueprint' planning innovation, developed by California [metropolitan planning organizations] during the past decade, [produces] collaborative regional/local plans that achieve preferred scenarios for future regional development.").

[99] *Id.*

[100] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) Preamble (1).

[101] *Id.*

[102] *Id.*

[103] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 4(b)(2)(H)(i).

[104] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 4(b)(2)(H)(iii).

[105] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 4(b)(2)(H).

[106] FACT SHEET FOR SENATE BILL 375, *supra* note 9.

walkable districts.[107] By creating an urban environment wherein people will travel shorter distances, the Sustainable Communities Act attempts to reduce VMT to reach the goals set by the Global Warming Solutions Act.[108]

III. CALIFORNIA'S POLICIES FAIL TO AFFECT TRAVEL BEHAVIOR

Despite the efforts and the intent of the California legislature, existing legislation has not and will not have a serious impact on VMT and GHGE levels. While incentivizing denser housing closer to transit stations may seem like an effective method to reduce VMT,[109] it ignores many of the reasons why people choose automobiles over other methods of transportation. By focusing on urban and neighborhood design, the legislature fails to address the issues that strongly affect transportation choices, including safety, access, mobility, and, most importantly, the inelasticity of travel time. Only by addressing these issues will the California legislature be able to reach its goals of reduced GHGE.

A. INDIVIDUAL AND TEMPORAL COMPONENTS SIGNIFICANTLY AFFECT TRAVEL BEHAVIOR

A focus on location-based planning "offer[s] an incomplete picture of access as experienced by most individuals."[110] Specifically, location-based measures ignore two major components of accessibility: (1) "an individual component, which reflects individual-level constraints and characteristics that might affect the measurement of accessibility" and (2) "a temporal component, reflecting the availability of opportunities at different times of day and available time to allocate to accessing these opportunities."[111] Without adequately addressing these components, the California legislature fails to meaningfully affect individual transportation decisions and will ultimately fail to reduce GHGE.

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[107] *See id.*

[108] *See id.*

[109] *See* Sehatzadeh et al., *supra* note 86, at 753 ("[I]n general, we find sufficient evidence that suggests fewer cars are owned in areas with more walkable built environment features.").

[110] Michael Iacono et al., *Measuring Non-Motorized Accessibility: Issues, Alternatives, and Execution*, 18 J. TRANSPORT GEOGRAPHY 133, 139 (2010).

[111] *Id.*

1. *The Individual Component*

Changing the physical environment through land use does not significantly affect the individual component of travel.[112] Numerous studies show that high-density communities have fewer VMT than low-density communities,[113] but statistical correlations between residential location and travel patterns "do not identify the proper direction(s) of causality."[114] Nevertheless, the Sustainable Communities Act uses incentives to change land use and neighborhood design,[115] such as creating transit-friendly communities.

Living near a transit station correlates to an increase in transit miles, but it does not necessarily correlate to a reduction in VMT.[116] In fact, "evidence strongly suggests that land use characteristics have little independent impact on travel behavior."[117] Even in the majority of the nation's fifty major metropolitan areas, urban residents utilize public transit (as a means of commuting) less frequently than the national average for public transit.[118] Simply put, "the magnitude of the link between the built environment and VMT is so small that feasible changes in the built environment will only have negligible impacts on VMT."[119]

a. Attitudes for Travel Mode Play Important Roles in Choices

Smart-growth makes sense because of the national preference for the "convenience of being within walking distance to shops and restaurants."[120] Making efforts toward smart-growth, the Sustainable

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[112] *Id.* at 140 (including "car ownership (or perhaps bicycle ownership), gender, household structure and other variables"); *see also* Yan Xing et al., *Factors Associated with Proportions and Miles of Bicycling for Transportation and Recreation in Six Small US Cities*, 15 TRANSP. RESEARCH PART D 73, 74 (2010) (individual factors affecting components of travel include "socio-demographics, attitudes, preferences, and beliefs, as well as comfort with bicycling" and cultural norms).

[113] Michael N. Bagley & Patricia L. Mokhtarian, *The Impact of Residential Neighborhood Type on Travel Behavior: A Structural Equations Modeling Approach*, 36 ANNALS REG'L SCI. 279, 280 (2002).

[114] *Id.*

[115] *See* 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 1(g); *see also id.* § 4(b)(4)(C).

[116] Bagley & Mokhtarian, *supra* note 113, at 293-94 ("[R]esidential location type had little impact on travel behavior. . . . In particular, the results suggest that when attitudinal, lifestyle, and sociodemographic variables are accounted for, neighborhood type has little influence on travel behavior.").

[117] *Id.* at 295.

[118] MCKENZIE & RAPINO, *supra* note 40, at 6.

[119] David Brownstone, *Key Relationships Between the Built Environment and VMT*, *in* SPECIAL REPORT 298: DRIVING AND THE BUILT ENVIRONMENT: THE EFFECTS OF COMPACT DEVELOPMENT ON MOTORIZED TRAVEL, ENERGY USE, AND CO2 EMISSIONS 1 (2008).

[120] *See* BELDON RUSSONELLO & STEWART LLC, *supra* note 88, at 2-3.

Communities Act directly tasks the metropolitan planning organizations to "prepare and adopt a regional transportation plan directed at achieving a coordinated and balanced regional transportation system, including, but not limited to, mass transportation, . . . bicycle, [and] pedestrian . . . facilities and services."[121] In doing this, the Sustainable Communities Act reduces the personal automobile dependency at a time when America has developed a growing, "robust demand for compact, walkable development."[122]

Nevertheless, creating walkable communities is not enough. For instance, one study found that about a quarter of commuting trips were taken when transit was within a half mile; however, ridership of transit beyond the half-mile distance dropped substantially.[123] Other studies have demonstrated "travelers tend to prefer public transportation when they are able to combine the use of these facilities with their private vehicles."[124] The results of these studies suggest that transportation corridors developed by the metropolitan planning organizations will simply provide an opportunity to drive to the transit stop, partially defeating the goal of reducing VMT. The built environment may not only "affect the amount of time a walk trip takes, but also the comfort, safety, and enjoyment of the walking environment."[125] Therefore, in order for the metropolitan planning organizations to effectively create communities less reliant on personal automobiles, the metropolitan planning organizations will have to build a safe network for non-motorized transportation modes.

Furthermore, "attitudinal and lifestyle variables [have] the greatest impact on travel demand among all the explanatory variables."[126] Instead of utilizing whichever methods are available, individuals purposefully select neighborhoods where their preferred transportation

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[121] 2008 Cal. Legis. Serv. Ch. 728 (S.B. 375) § 4(a).

[122] Winkelman et al., *supra* note 90, at 579.

[123] Marshall Lindsey et al., *Relationship Between Proximity to Transit and Ridership for Journey-to-Work Trips in Chicago*, 44 TRANSP. RESARCH PART A 697, 698 (2010).

[124] Konstantinos Kepaptsoglou et al., *Optimizing Pricing Policies in Park-and-Ride Facilities: A Model and Decision Support System with Application*, 10 J. TRANSP. SYS. ENG'G. & INFO. TECH. 53, 53 (2010).

[125] *See* Sehatzadeh et al., *supra* note 86, at 742.

[126] Bagley & Mokhtarian, *supra* note 113, at 294; *see also* Xinyu Cao et al., *Do Changes in Neighborhood Characteristics Lead to Changes in Travel Behavior? A Structural Equations Modeling Approach*, 34 TRANSP. 535, 538 (2007) (while studies suggest "that when households' neighborhood accessibility changes, their travel behavior also changes," and that "the results should be interpreted with caution, as the changes in both neighborhood accessibility and travel behavior may be the result of changes in attitudinal predispositions toward the residential environment and travel choices").

modes are available.[127] Because neither residential location nor neighborhood type significantly affect travel behavior,[128] high-density communities located near transit stations will break neither the "magic circle" of automobile usage nor automobile dependence. By focusing only on changing urban design, the Sustainable Communities Act does not impact the individual component of transportation.

b. The Alternative to the Individual Component—Raising the Costs of Driving—Does Not Affect Driving Behavior

One proposed method of reducing VMT is through increasing the costs of automobile usage, which would immediately affect many drivers.[129] The easiest and quickest method of increasing costs of the personal automobile is through excise taxes on gasoline.[130] However, gasoline consumption is relatively inelastic, meaning that demand for gasoline is relatively unresponsive to fluctuations in price.[131] This relative inelasticity indicates that "consumption of gasoline and resulting carbon emissions will be largely unaffected by marginal fuel tax increases, at least in the short-run."[132] The cobweb theorem further demonstrates the inelasticity of fuel prices because of capital allocation in transportation infrastructure, which has yet to create close substitutes for driving. Because people must still drive between destinations, marginal price increases do not correspond to significant changes in driving behavior.[133]

i. *Excise Taxes Inadequately Affect Transportation Decisions*

Instead of marginal tax increases, some proposals call for an immediate and significant increase in the cost of gasoline to take advantage of a "shock value" to induce behavioral change.[134] However,

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[127] *See* Bagley & Mokhtarian, *supra* note 113, at 294.

[128] *Id*.

[129] Editorial, *The Clear Case for the Gas Tax*, N.Y. TIMES, Aug. 16, 2011, at A20, *available at* www.nytimes.com/2011/08/16/opinion/the-clear-case-for-the-gas-tax.html.

[130] *Id*.

[131] David Coyle et al., *Estimating the Supply and Demand of Gasoline Using Tax Data*, 34 ENERGY ECON. 195, 199 (2012).

[132] *Id*.

[133] *Id*.; *see also* Elisabeth Rosenthal, *In The U.S., Sticker Shock in Reverse*, NYTIMES.COM (Nov. 8, 2010), green.blogs.nytimes.com/2010/11/08/in-the-u-s-sticker-shock-in-reverse/.

[134] Remy Zimmerman, Letter to the Editor, *Sunday Dialogue: The Tax When You Fill Up*, N.Y. TIMES, Aug. 18, 2011, at SR2, *available at* www.nytimes.com/2011/08/21/opinion/sunday/sunday-dialogue-the-tax-when-you-fill-up.html. Currently, excise taxes are 18.4 cents per gallon federally and an additional 18 cents per gallon in California. *See* CAL. DEP'T OF TRANSP.,

because gasoline demand is inelastic, using excise taxes to increase the cost of personal automobile usage might result only in additional revenue for infrastructure.[135] Despite current taxes and the volume of gasoline purchased, the taxes are not enough to maintain infrastructure, which has a $72 billion backlog.[136] In order to prevent a backlog, gasoline taxes would have to be over 90 cents per gallon.[137] Furthermore, the steady increase in miles-per-gallon has resulted in an erosion of gasoline tax revenue per mile.[138]

Gasoline excise taxes, however, are regressive and disproportionately affect economically disadvantaged groups,[139] which could displace low-income individuals onto public transit.[140] Because public transit is subsidized,[141] gasoline taxes will need to be raised above infrastructural costs, thereby displacing even more drivers.[142] Instead of significantly decreasing VMT by reducing drivers from all economic groups, large excise taxes will displace low-income travelers from personal automobiles to public transit, thereby creating a burden on the public transit networks without eliminating enough drivers.[143]

ii. *The Cobweb Theorem Demonstrates How Excise Taxes Ignore Long-Term Infrastructure Plans*

The cobweb theorem describes a cyclically shifting market based on reactions to previous supply and demand data points.[144] Application of the cobweb theorem depends on the availability of the primary good and

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CALIFORNIA TRANSPORTATION PLAN 2025, at 11 (2006), *available at* www.dot.ca.gov/hq/tpp/offices/osp/ctp2025.html; *see also* Cynthia Lin and Lea Prince, *The Optimal Gas Tax for California*, 37 ENERGY POL'Y 5173, 5174 (2009). Overall, the average American pays an excise tax of 43 cents per gallon, when state excise taxes are included. Editorial, *supra* note 129 (noting that Europeans, on the other hand, pay an average of twice as much for gasoline).

[135] *See, e.g.*, IAN W.H. PARRY, MARGARET WALLS & WINSTON HARRINGTON, AUTOMOBILE EXTERNALITIES AND POLICIES 6 (June 2006), *available at* www.rff.org/Documents/RFF-DP-06-26-REV.pdf.

[136] Editorial, *supra* note 129.

[137] *Id*.

[138] PARRY, WALLS & HARRINGTON, *supra* note 135, at 6.

[139] Howard Chernick & Andrew Reschovksy, *Who Pays the Gasoline Tax?*, 50 NAT'L TAX J. 233, 233-59 (1997).

[140] Steven Raphael & Michael Stoll, *Can Boosting Minority Car-Ownership Rates Narrow Inter-Racial Employment Gaps?*, *in* THE BROOKINGS-WHARTON PAPERS ON URBAN ECONOMIC AFFAIRS 99, 103-04 (2001).

[141] *See, e.g.*, Mark Garrett & Brian Taylor, *Reconsidering Social Equity in Public Transport*, 13 BERKELEY PLANNING J. 6 (1999).

[142] Raphael & Stoll, *supra* note 140, at 103-04.

[143] *Id*.

[144] Jonathan P. Caulkins & David Baker, *Cobweb Dynamics and Price Dispersion in Illicit Drug Markets*, 44 SOCIO-ECON. PLANNING SCI. 220, 222 (2010).

close substitute goods.[145] For instance, after an excess supply (surplus) causes a drop in market price, the producer supplies less in the following season in order to maintain profitability.[146] This then raises the market price, inducing greater production in the following cycle, and the process begins again.[147] Usually the corrections diminish in magnitude with each cycle until the market reaches a stable equilibrium. This creates an inward spiral pattern much like a cobweb, hence the name.[148] The opposite can and does occur when markets are not perfectly competitive, such as in a price war. Except in non-competitive markets, equilibrating shifts in market price and quantity supplied resolve temporary distortions (shortages and surpluses).[149]

Every day, people make decisions about transportation in response to prevailing prices and availability of transportation infrastructure and associated goods, such as gasoline.[150] Because these decisions occur so frequently, prices of non-capital complementary goods (*e.g.*, commodities like gasoline) are able to react quickly and precisely to market demands, thereby following a convergent cycle in which no anti-competitive pricing occurs.[151] On the other hand, transportation infrastructures in urbanized societies are long-term capital investments, for which supply decisions are made far less frequently.[152]

Where capital allocation has created imbalanced transportation markets, prices are less effective in regulating mode selection and the cross-price elasticity between modes is far lower.[153] Therefore, adjusting prices (or travel time) does not effectively regulate travel mode decisions when there is no close substitute.

Conversely, where capital has been allocated to provide balance, prices regulate effectively and cross-price elasticity is higher; individuals can switch travel modes to adjust for changes in prices (or travel time).[154] Therefore, in order to change modes, capital allocation must provide individuals with a close substitute in travel mode options.

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[145] *Id.*

[146] Frank Westerhoff & Cristian Wieland, *A Behavioral Cobweb-Like Commodity Market Model with Heterogeneous Speculators*, 27 ECON. MODELING 1136, 1136 (2010).

[147] Caulkins & Baker, *supra* note 144, at 222.

[148] *Id.*

[149] *Id.*

[150] Colin G. Pooley et al., *Household Decision-Making for Everyday Travel: A Case Study of Walking and Cycling in Lancaster (UK)*, 19 J. TRANSPORT GEOGRAPHY 1601, 1601 (2011).

[151] *Contra* Andrew Caplin & John Leahy, *Equilibrium in a Durable Goods Market with Lumpy Adjustment*, 128 J. ECON. THEORY 187, 188 (2006).

[152] *See id.*

[153] *See id.*

[154] *See id.*

iii. *Excise Taxation Should Be Avoided*

Excise taxes are not the solution to transportation preference and automobile congestion because they are simply ineffective. Excise taxation discounts the variety of other externalities that affect transportation selection and fails to recognize real alternatives. If the solution is to raise costs without price discrimination,[155] then the increased costs may impose a large, disproportionate burden on those least able to pay them.[156]

Forcing a poor person out of a personal automobile and onto a bus may diminish welfare because it would decrease the personal mobility and access to any destination—if a bus is even available—whereas a rich person could afford to pay more for gas and keep driving his or her car.[157] This is not consistent with policy goals, but rather conflicts with optimal transportation mode composition because it forces only economically disadvantaged individuals out of driving—without a choice—while creating no meaningful change in the driving behavior of others. Without affecting driving behavior, there will not be a meaningful change in VMT.

2. *The Temporal Component Plays a Large Role in Travel Choice*

The temporal component of travel affects each traveler and is a strong determinant in transportation choice.[158] By affecting the travel time between destinations, the legislature can create a meaningful change in VMT.

a. Travel Times Average Thirty Minutes Across the Decades

For several decades, research data have indicated that individual travel time changes very little across a population, hovering around one

[155] Raising prices discriminately would increase prices progressively for individuals, similar to the earned income tax structure, whereas raising prices indiscriminately would create regressive rates as a share of income.

[156] *See* CAL. DEP'T OF TRANSP., *supra* note 134, at 11. Nationally, the very poorest families spend nearly 40% of net income on transportation; the working poor spend about 10% of net income on commuting expenses, and those earning over $45,000 spend a mere 2% on commuting expenses. Combined, the national average is just under 4%, but the poor and working poor are most vulnerable to changes in transportation prices. *Id*.

[157] *See id.*

[158] Piet Rietveld & Vanessa Daniel, *Determinants of Bicycle Use: Do Municipal Policies Matter?*, 38 TRANSP. RESEARCH PART A 531, 533 (2004).

hour per person per day.[159] Research predating 1980 points out that "average journey to work times throughout history have been around 30 minutes, whatever the mode."[160] Nationwide, the average commute time to work in 2009 was 25.1 minutes, one-way.[161] Even in Los Angeles, a city renowned for its traffic issues, the commute time conforms to the national and historic static commute time: over 75% of commuters spend thirty-four or fewer minutes traveling to work, with a total average commute time of 29.5 minutes.[162]

These numbers are not incident of geography, but rather are reflective of personal preferences: 78% of Americans "consider being within 30 minutes of work important in choosing where to live," and 59% "would choose a smaller house and lot if it meant a commute time of 20 minutes or less."[163] Furthermore, Americans adjust housing to keep a similar commute and relocate residences to accommodate workplace changes.[164]

b. The Inelasticity of Travel Time

The constancy of commute times suggests that the journey-to-work (JTW) time is inelastic, with time as the primary measure of "price." Elasticity describes the effect a change in the price of a good has on the quantity demanded of that good.[165] As JTW time rises past thirty minutes, demand drops off abruptly.[166] Therefore, policies increasing the JTW of passenger car transportation—but not increasing JTW of other modes of transportation—will increase the quantity demanded of

[159] David Metz, *Travel Time: Variable or Constant?*, 38 J. TRANSPORT ECON. & POL'Y 333, 342 (2004).

[160] Newman et al., *supra* note 21, at 60.

[161] U.S. CENSUS BUREAU, STATISTICAL ABSTRACT OF THE UNITED STATES: 2012, at 691, tbl.1100 (2012).

[162] *Average Commute Times for Your City, Courtesy of the Census Bureau*, THE SOURCE (Oct. 29, 2009), thesource.metro.net/2009/10/29/average-commute-times-for-your-city-courtesy-the-census-bureau/.

[163] *See* BELDON RUSSONELLO & STEWART LLC, *supra* note 88, at 4 (noting that this strong preference to live within thirty minutes of work makes it the second of the "most important factors tested, behind privacy," which is considered "very important" or "somewhat important" by 87% of Americans).

[164] David M. Levinson, *Job Housing Tenure and the Journey to Work*, 31 ANNALS REGIONAL SCI. 453, 469 (1997).

[165] *See generally* IVAN PNG, MANAGERIAL ECONOMICS 56-95 (2d ed. 2002).

[166] Metz, *supra* note 159, at 342.

other modes of transportation (OMT),[167] when OMT are readily available as close substitutes.[168]

The current problem, however, is that passenger cars and OMT are frequently only imperfect substitutes for one another.[169] The suitability of OMT as a substitute for automobile transportation varies from place to place and person to person, but consistent patterns may be observed and explained.[170] Specifically, across regions and travel modes, the average commute remains constant at thirty minutes.[171] Because commuters will maintain the duration of the commute regardless of transportation mode, OMT need to become close substitutes or the primary mode for transportation.

i. *Close Substitutes Create Meaningful Choices*

The supply of the primary good affects the demand of close substitute goods.[172] As the availability of automobile transportation increases, the demand for OMT decreases; conversely, as the availability of automobile transportation decreases, the demand for OMT increases, provided it is a close substitute.[173] Because travel time is relatively static, demand for transportation is more persistent than demand for any particular mode.[174]

London, for example, maintains two viable modes of transportation and has infrastructure in place to influence the demand for each: the automobile and public transit.[175] An automobile toll, a form of congestion pricing,[176] allows London to regulate the relative prices of

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[167] For efficiency, "OMT" will mean public transit and non-motorized transportation.

[168] *See* PAUL ANTHONY SAMUELSON, ECONOMICS 873 (19th ed. 2010). *Contra* RICHARD A. IPPOLITO, ECONOMICS FOR LAWYERS 37 (2005).

[169] Modes of transit are viewed as complementary if the likelihood to make any given trip increases because of the simultaneous availability of both modes, as in park and ride stations for light rail, whereby those who would not make long trips will do so by driving a short distance and riding the remainder. *See generally* PNG, *supra* note 165, at 56-95.

[170] *See* Metz, *supra* note 159, at 341.

[171] *See id.*

[172] *See* NEVA R. GOODWIN ET AL., MACROECONOMICS IN CONTEXT 78 (2008).

[173] *See id.*

[174] *See, e.g.*, Metz, *supra* note 159.

[175] Michael A. Kemp, *Some Evidence of Transit Demand Elasticities*, 2 TRANSP. 25, 34 (1973).

[176] *See What Is Congestion Pricing?–Congestion Pricing: A Primer*, FED. HIGHWAY ADMIN. (May 30, 2008), ops.fhwa.dot.gov/publications/congestionpricing/sec2.htm ("Congestion pricing—sometimes called value pricing—is a way of harnessing the power of the market to reduce the waste associated with traffic congestion. Congestion pricing works by shifting purely discretionary rush hour highway travel to other transportation modes or to off-peak periods, taking advantage of the fact that the majority of rush hour drivers on a typical urban highway are not commuters. By

each mode, either to allow each mode fair competition with the other or to promote one mode over the other.[177] Using prices to inhibit driving, for instance with a flat fee during non-peak hours, London encourages travelers toward transit and away from automobiles.[178] Instead of basing congestion pricing on historic demands, if London were to use truly variable congestion pricing, price would float freely based upon present demand to regulate congestion. Either way, if the market reaches a reasonable balance, options allow individuals to make informed choices of transportation modes based on personal preferences.[179]

However, if a substitute is unavailable or is of poor quality—and therefore not a reasonable substitute—markets are less-perceptibly responsive.[180] That is, when the price of a primary good rises, demand for a substitute builds without an outlet.[181] Two extremes demonstrate the differences of impact on the substitute good when the substitute is not a *close* substitute: New York City and the Los Angeles Basin.[182] The primary mode of transportation in New York City—the complex and developed Metropolitan Transportation Authority—is able to transport vast amounts of individuals on a daily basis with relative ease.[183] Because of the city's density, personal automobiles are not a close substitute; New York City would need hundreds of additional

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removing a fraction (even as small as 5%) of the vehicles from a congested roadway, pricing enables the system to flow much more efficiently, allowing more cars to move through the same physical space. Similar variable charges have been successfully utilized in other industries-for example, airline tickets, cell phone rates, and electricity rates.").

[177] Kemp, *supra* note 175, at 34.

[178] *Id*.

[179] GOODWIN ET AL., *supra* note 172, at 79.

[180] *Id*. at 78.

[181] *Id*.

[182] Each of these metropolitan areas has invested heavily enough in a primary mode of transportation to create network effects in that mode. "A product displays positive network effects when more usage of the product by any user increases the product's value for *other* users (and sometimes all users)." Arun Sundararajan, *Network Effects*, STERN SCHOOL, N.Y. UNIV. (2003-2006), oz.stern.nyu.edu/io/network.html. The network effects of automobile infrastructure heavily increase the feasibility and convenience of using a personal automobile. *See* ROMAN BECK, THE NETWORK(ED) ECONOMY: THE NATURE, ADOPTION AND DIFFUSION OF COMMUNICATION 41 (2006) ("network effect" occurs when the utility of the consumption of a good—the use of infrastructure—increases when others consume the same good—using the same infrastructure). Just the same, when transit does not sufficiently or conveniently provide access to desired destinations, individuals will be more inclined to use alternate modes of transportation—such as a personal automobile—or seek a different destination. *See, e.g.*, Hilda Blanco et al., *Hot, Congested, Crowded and Diverse: Emerging Research Agendas in Planning*, 71 PROGRESS IN PLANNING 173, 173 (2005).

[183] *See generally* John F. Kain & Gary R. Fauth, *The Impact of Urban Development and Auto Ownership and Transit Use*, 6 REAL ESTATE ECON. 305 (1978).

bridgeways to provide capacity just for the morning commute.[184] In Los Angeles, millions of individuals rely almost exclusively on personal automobiles as the primary mode of transportation.[185] Although there are some transit connections in Los Angeles, there is no substitute infrastructure adequate to accommodate a large increase in use.[186] Because there is no close substitute for the primary good in either of these situations, any significant increase in price or in time delays would simply build an unmet demand.[187]

Other increases in costs associated with automobile travel face similar effects. Increases in the prices of other non-capital complementary goods—such as gasoline and insurance—produce an increase in demand for OMT as well.[188] However, when transit is unavailable or is not a viable substitute for automobile transportation, people will pay higher prices for fuel and other associated transportation costs.[189] Instead of switching to OMT, because it is not a close substitute, individuals will simply limit their travel in response to the increase in costs.[190]

ii. *By Making OMT a Close Substitute or the Primary Good, California Can Reach the Goals of the Global Warming Solutions Act*

If OMT were able to reach network effects of utility through long-term capital investment, OMT could become either a close substitute for personal automobiles or the primary method of transportation. The network effects of automobile infrastructure heavily increase the feasibility and convenience of using a personal automobile.[191] Similarly, the typically less-extensive public transit infrastructure, especially light rail, directly decreases the viability of reliance on public transit, so these modes are usually imperfect substitutes. When transit does not sufficiently or conveniently provide access to desired destinations,

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[184] Tom Vanderbilt, *Moving Beyond the "Windshield View,"* ROOM FOR DEBATE, NYTIMES.COM (July 7, 2011, 2:07 PM), www.nytimes.com/roomfordebate/2011/06/28/car-clash-europe-vs-the-us/moving-beyond-the-windshield-view.

[185] *See generally* Kain & Fauth, *supra* note 183.

[186] *See generally id.*

[187] GOODWIN ET AL., *supra* note 172, at 78.

[188] *Id.*

[189] Coyle et al., *supra* note 131, at 199.

[190] *Id.*

[191] *See* BECK, *supra* note 182, at 41 ("network effect" describes how the utility of a good increases when others consume the same good (e.g., the utility of infrastructure increases from other individuals using the same infrastructure)).

individuals will be more inclined to use an alternate mode (such as a personal automobile) or seek a different destination.

Only by becoming a close substitute will OMT provide individuals with a meaningful choice between modes of travel to maintain the constant commute time.[192] By becoming a close substitute, OMT can provide a significant decrease in GHGE as individuals make personal choices for transportation needs based on time and costs.[193]

The California legislature can make OMT the primary mode of transportation—or at least a close substitute to automobile transportation—with legislation that redirects capital investment to infrastructure, which would allow California to reach its GHGE goals as specified in the Global Warming Solutions Act.

B. TRAVEL TIME HAS DIFFERENT VALUES AMONG DIFFERENT MODES

The "qualitative" measurements of time in transit can also be measured, and they influence transportation mode choice.[194] For instance, personal automobiles can give a "benefit to the commuter from the additional speed, convenience, comfort or prestige they gain."[195] Using statistical modeling to show the qualitative benefits of each mode, the results of the car mode implies a benefit to the car user outside of the travel time that is greater than the relative opportunity cost.[196] Therefore, the benefit of timesavings, mobility, and the extra comfort of the car outweigh the additional expenses of the car, such as fuel, maintenance, and purchase price. Moreover, the difference in qualitative benefits—such as privacy, comfort, and enjoyment—in switching modes from bus to car produces an even greater net benefit, "even if this involves the same outlay of time and cost per trip."[197]

While public transit is cheaper than using a car, public transit often lacks qualitative benefits. However, the qualitative benefits of public transportation can be improved by funding public transit capital investment and infrastructure. Such investment would diminish the net

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[192] *See* GOODWIN ET AL., *supra* note 172, at 78.

[193] *See id.*

[194] Truong P. Truong & David A. Hensher, *Measurement of Travel Time Values and Opportunity Cost from a Discrete-Choice Model*, 95 ECON. J. 438, 438 (1985); *see, e.g.*, VICTORIA TRANSPORT POL'Y INST. TRANSPORTATION COST AND BENEFIT ANALYSIS II—EVALUATING TRANSPORTATION BENEFITS 7-4, *available at* www.vtpi.org/tca/tca07.pdf (stating that qualitative benefits of various modes include such factors as "comfort, interest, aesthetics, and physical exercise").

[195] VICTORIA TRANSPORT POL'Y INST., *supra* note 194.

[196] Truong & Hensher, *supra* note 194, at 446.

[197] *Id.*

benefit of the automobile. For instance, if the time spent in transit can be converted to a different activity, such as work or leisure time while in motion,[198] a net benefit would apply to bus and train modes while a net loss would apply to the car mode.[199] Similarly, investment in the infrastructure for OMT, such as walking and bicycling, can create safer, more enjoyable travel while also providing personal exercise, thereby also diminishing the net gain of the qualitative benefits of a car. Therefore, OMT need to be of sufficient quality to provide ease and leisure during transit.

IV. THE SOLUTION IS TO REDUCE PERSONAL AUTOMOBILE TRAVEL SPEEDS THROUGH FUNDING POLICIES

In order to reach the goals established by the Global Warming Solutions Act and sought by the Sustainable Communities Act through reductions in VMT, the state legislature must induce the entire state to transform driving habits through dramatic changes in policies affecting transportation funding. These changes will dramatically decrease the speed of a personal automobile—making automobile travel times increase—while increasing the speed and enjoyment of non-motorized travel and public transit—making OMT travel times decrease. Because travel time is a constant, policies affecting the travel time between destinations will induce individuals and companies to relocate in order to utilize the available transportation infrastructure that conforms to travel time preferences.

Creating substantial change will receive pushback from the community of individuals comfortable in the culture and lifestyle of driving everywhere.[200] Many people may not like the following proposals because these proposals will increase travel time for personal automobiles.[201] However, while limiting vehicular road space and convenience, these proposals will not completely eliminate the utility of a personal automobile. Instead, these proposals will redesign transportation infrastructure to deemphasize personal automobiles. The proposals will allow for transportation by personal vehicles when

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[198] E.g., reading a book, reading the newspaper, watching a video, relaxing.

[199] Truong & Hensher, *supra* note 194, at 446.

[200] *See, e.g.*, Sam Staley, *The Right To Travel*, ROOM FOR DEBATE, NYTIMES.COM (July 7, 2011, 4:27 PM), www.nytimes.com/roomfordebate/2011/06/28/car-clash-europe-vs-the-us/the-right-to-travel; *see also* Wendell Cox, *California Declares War on Suburbia*, WSJ.COM (Apr. 9, 2012), online.wsj.com/article/SB10001424052702303302504577323353434618474.html.

[201] *See* Laurie Volk & Todd Zimmerman, *Not in Our DNA, Yet*, ROOM FOR DEBATE, NYTIMES.COM (June 28, 2011), www.nytimes.com/roomfordebate/2011/06/28/car-clash-europe-vs-the-us/car-aversion-is-not-in-our-dna-yet; *see also* Cox, *supra* note 200.

necessary, while simultaneously decreasing the desire to use automobiles for normal trips when personal vehicles are not necessary.[202]

A. AUTOMOBILES MUST HAVE LESS SUPPORTING INFRASTRUCTURE: REDUCE ROAD SPACE, DECREASE SPEEDS, AND INDUCE CONGESTION

According to transportation preference studies, individuals will adjust places of residence and work to conform to the travel time.[203] Furthermore, when deciding among transportation modes, travelers will choose the option most beneficial in their situation (matching monetary or temporal constraints).[204] In order to conform to these data and properly target VMT, the legislature should significantly increase funding and road resources for public transit and non-motorized transportation systems while simultaneously decreasing driving speeds and available roadways for personal automobiles.

By changing funding, some policies will directly target personal automobiles. Some potential funding changes include reducing the amount of existing roadway infrastructure available to personal automobiles in order to increase congestion and decrease speed, reducing driving speeds and preventing the flow of traffic with traffic lights designed to slow cars down, and limiting funding for new roadway infrastructure development so that new lanes and roadways are not developed unless absolutely necessary. These proposed policies may result in increased congestion on existing roadways, which would reduce the relative incentive to drive and increase the relative incentive to take public transit. Because there is a static JTW time of approximately thirty minutes, these policies would also create an incentive for individuals to reduce commuting distance.

Simultaneously, other policies must target OMT, namely public transportation and non-motorized travel.[205] For any policy affecting travel behavior to be effective, the legislature must provide adequate

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[202] Trips that necessarily require a personal automobile are trips that transport more than persons and small things, e.g., a trip to The Home Depot or relocating a disabled person. Trips that do not necessarily require a personal automobile include a level of comfort or privacy with the automobile but could be accomplished by other modes, e.g., trips around town, commuting to work.

[203] Levinson, *supra* note 164, at 469.

[204] *See, e.g.*, Ming Zhang, *Exploring the Relationship Between Urban Form and Nonwork Travel Through Travel Time Use Analysis*, LANDSCAPE & URB. PLANNING 73, 244-61 (2005) (concluding that accessibility is strongly correlated with travel decisions).

[205] *I.e.*, policies that dramatically increase public transit infrastructure, create roadways/infrastructure for exclusive or nearly exclusive use of public transit, increase network connectivity, increase available routes, decrease travel times among destinations, increase non-motorized travel safety, and increase non-motorized travel routes.

funding and infrastructural support for "an alternative that is convenient to use."[206] Therefore, the legislature should create funding policies that dramatically increase public transit infrastructure to increase accessibility of residences and businesses; designate existing roadways and infrastructure for the exclusive or nearly exclusive use of public transit, which would increase transit speed and efficiency while utilizing existing infrastructure; increase public transit network connectivity by increasing the number of available routes and the frequency of service on each route; decrease transit travel times among destinations; increase the comfort of riding on public transit; increase non-motorized travel safety and perceived safety by creating accessible, comfortable, and convenient pathways and roadways exclusively designated for non-motorized travel, as well as entire roads designated only for non-motorized travel and public transit; and increase non-motorized travel routes.

Regardless of speed increases or decreases, the number of trips people take and the time they spend traveling is relatively static.[207] Increasing automobile speed, for instance, does not afford more trips to account for the potential timesaving; instead, each trip traveled is simply longer in distance and lacks timesaving.[208] If roadways are reduced, people will not be able to drive as far or as much without facing time constraints.[209] Therefore, redesigning infrastructure to reduce capacity for personal automobiles will increase the travel time. Overall, these policies will decrease travel time and increase the comfort and convenience for modes of transportation other than the personal automobile, thereby creating a relatively convenient close substitute and possibly even shifting the primary mode of travel.

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[206] Carolyn O'Fallon et al., *Constraints Affecting Modes Choices by Morning Car Commuters*, 11 TRANSPORT POL'Y 17, 28 (2004).

[207] *See* Metz, *supra* note 159, at 341 (stating that "the overall number of trips per person has remained constant over the past 30 years" and that there has been "a constant average travel time of 1 hour per person per day").

[208] *See id.* (suggesting that increasing traffic speeds only increases distances traveled: "Given a constant average travel time of 1 hour per person per day, the average distance travelled before the improvement is 20 miles per person, and afterwards 22 miles. Induced traffic is therefore 10 per cent, proportional to the increase in average speed. This simple approach to the phenomenon of induced traffic, based on constant travel time, yields quantitative predictions, at the upper end of the range identified by the SACTRA report.").

[209] *Contra* Robert B. Noland & Lewison L. Lem, *A Review of the Evidence for Induced Travel and Changes in Transportation and Environmental Policy in the United States and the United Kingdom*, 7 TRANSP. RESEARCH PART D 1, 2 (2002) ("Any increase in highway capacity (supply) reduces the generalized cost of travel, especially on congested highways, by reducing the time cost of travel."); *see also, e.g.*, Robert B. Noland & William A. Cowart, *Analysis of Metropolitan Highway Capacity and the Growth in Vehicle Miles of Travel*, presented at 1999 Association for Public Policy and Management Annual Research Conference, Washington, D.C. (pointing out that a change in supply of roadways results in a change in demand for using the roadways because of the change in price, which is the price—the travel time—of vehicle travel).

B. REALLOCATING MONEY FROM ROADWAYS TO PUBLIC TRANSIT WILL DECREASE TOTAL COSTS

Investments in mass transit can significantly decrease costs for the average American as well as for transportation infrastructure. One study by the American Public Transportation Association showed that commuters can save an average of $9,797 annually ($816 monthly) by traveling via transit rather than personal automobile.[210] In California, the average savings in major metropolitan regions are even higher: $13,059 in San Francisco, $10,714 in Los Angeles, and $10,373 in San Diego.[211] Gasoline purchases alone averaged $4,155 in 2011, constituting 8.4% of median income.[212]

State and local governments will also reduce costs as resources are consolidated and economies of scale come into play. The current expenditures for highways are astounding, and they are increasing. After California spent about $20 billion on all transportation in fiscal year 2006,[213] total disbursements for highways alone in California exceeded

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[210] Press Release, Am. Pub. Transp. Ass'n, Riding Public Transit Saves Individuals $9,797 Annually (Nov. 18, 2011), *available at* www.apta.com/mediacenter/pressreleases/2011/Pages/111118_transit_savings.aspx. The statistics provided by the American Public Transportation Association are adopted by the U.S. Department of Commerce. *See* U.S. CENSUS BUREAU, STATISTICAL ABSTRACT OF THE UNITED STATES: 2012, at 699, tbl.1116 (2012).

[211] Press Release, Am. Pub. Transp. Ass'n, *supra* note 210. Explaining the methodology for calculating savings:

> APTA calculates the average cost of taking public transit by determining the average monthly transit pass of local public transit agencies across the country. This information is based on the annual APTA fare collection survey and is weighted based on ridership (unlinked passenger trips). The assumption is that a person making a switch to public transportation would likely purchase an unlimited pass on the local transit agency, typically available on a monthly basis.
>
> APTA then compares the average monthly transit fare to the average cost of driving. The cost of driving is calculated using the 2011 AAA average cost of driving formula. AAA cost of driving formula is based on variable costs and fixed costs. The variable costs include the cost of gas, maintenance and tires. The fixed costs include insurance, license registration, depreciation and finance charges. The comparison also uses the average mileage of a mid-size auto at 23.4 miles per gallon and the price for self-serve regular unleaded gasoline as recorded by AAA on November 18, 2011 at $3.38 per gallon. The analysis also assumes that a person will drive an average of 15,000 miles per year. The savings assume a person in two-person household lives with one less car.
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> In determining the cost of parking, APTA uses the data from the *2011 Colliers International Parking Rate Study* for monthly unreserved parking rates for the United States.

Id.

[212] *Percentage of U.S. Family Income Spent on Gas Highest in 30 Years*, NJ.COM (Dec. 20, 2011, 6:45 AM), www.nj.com/news/index.ssf/2011/12/percentage_of_us_family_income.html.

[213] LEGISLATIVE ANALYST'S OFFICE, CALIFORNIA TRAVELS: FINANCING OUR TRANSPORTATION 16 (Jan. 2007), *available at* www.lao.ca.gov/2007/ca_travels/ca_travels_012607.pdf.

$21 billion in 2009[214] for about 172,000 miles of roadway.[215] Of the expenditures from state and federal funds, about 80% are spent on the highway program, while less than 10% are spent on mass transportation.[216] But roadways can be replaced with mass transit systems that conduct more passengers for greater social benefits than roadways.[217] In New York, for example, the investment in mass transit capital and infrastructure is easily noticed: "if the morning subway commute were to be conducted by car, we would need 84 Queens Midtown Tunnels, 76 Brooklyn Bridges or 200 Fifth Avenues."[218] By investing in mass transit infrastructure, California can reduce roadway costs.

Combining the personal savings and the governmental savings, the legislature can reduce or eliminate the deficit in the transportation budget.

V. EXAMPLES OF CITIES' POLICIES RESTRICTING AUTOMOBILES AND PROMOTING OMT

There are already examples of policies from cities around the world that effectively reduce personal automobile usage and promote other modes of travel. Especially in Europe, transportation infrastructure encourages far less dependence on personal automobiles, and European countries actively promote other modes of transportation. As a result, averages in the use of public transit in European nations range between 8% and 12% of total trips taken.[219] Therefore, Europeans utilize public transit four to six times more than Americans.[220]

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[214] U.S. CENSUS BUREAU, STATISTICAL ABSTRACT OF THE UNITED STATES: 2012, at 687, tbl.1095 (2012).

[215] *Id*. at 684, tbl.1089.

[216] CAL. DEP'T OF TRANSP., *supra* note 134, at 31.

[217] *See, e.g.*, Patrick Moulding, Note, *Fare or Unfair? The Importance of Mass Transit for America's Poor*, 12 GEO. J. ON POVERTY L. & POL'Y 155, 176-77 (2005) ("Also, several studies suggest a far greater return on investment in mass transit systems than one might expect. At least one study suggests that a city can generate seven dollars in social benefits and cost savings for every dollar invested in public transit.").

[218] Vanderbilt, *supra* note 184.

[219] *See* Frondel & Vance, *supra* note 53, at 426 ("According to figures compiled by Bassett et al. (2008), the percentage of trips taken by public transit in Germany is 8%, which, while considerably higher than the 2% share for the US, is on par or slightly lower than that of many of its European neighbors, including the UK (9%), Sweden (11%), Switzerland (12%), and Spain (12%). Moreover, the share of total travel undertaken with transit has been remarkably stable over the past decades, hovering around 8.7% since the early 1990s, compared with slightly over 80% by car (BMVBS, 2006).").

[220] *Id*. at 426.

European cities also provide examples of urban design creating accessibility: the average European city is three times as dense as the average American city, reducing trip lengths by half.[221] This density also makes the above-mentioned public transit ridership possible through economies of scale and network effects. Urban Europeans are also more likely than urban Americans to use non-motorized modes of transport such as walking or cycling.[222] Overall, many European countries use non-motorized travel for nearly one quarter or more of trips taken—more than four times as often as America.[223] The following examples serve to demonstrate that efforts are underway and that policies can effectively alter personal behavior.

A. FREIBURG IM BREISGAU: HIGH STANDARDS WITHOUT HIGH CAR OWNERSHIP

In Germany, the city of Freiburg im Breisgau demonstrates the possibility of pairing high incomes and high standards of living without developing high rates of automobile ownership.[224] Despite increases in wealth and standards of living, automobile ownership remained nearly flat, increasing only 1.2%, while total trip-making across all modes increased 30% between 1976 and 1991.[225] As public transit use increased 50% and bicycle use doubled, automobile use dropped from a 60% to a 47% share of the non-pedestrian trips.[226] Freiburg's local policies shaped its residents' transportation choices: "First, it has sharply restricted auto use in the city. Second, it has provided affordable, convenient and safe alternatives to auto use. Finally, it has strictly regulated development to ensure a compact land use pattern that is conducive to public transport, bicycling and walking."[227]

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[221] Pucher & Dijkstra, *supra* note 43, at 5.

[222] *See id*.; Brownstone, *supra* note 119, at 6 (stating that European cities with higher density might have a correlation between the built environment and VMT because, "[i]n particular, many dense foreign cities have much lower incomes and therefore much lower automobile ownership rates than in the U.S.").

[223] Pucher & Dijkstra, *supra* note 43, at 4 (noting also that even Canada uses almost twice as much non-motorized travel).

[224] Newman et al., *supra* note 21, at 56.

[225] *Id*.

[226] *Id*. at 57.

[227] *Id*.

B. VAUBAN, A VILLAGE FOR THE VOLK

The small-scale experiment of Vauban—a suburb of Freiburg—has influenced 70% of the 5,500 residents to live without cars.[228] Vauban focuses on three techniques: restricting access to parking; prohibiting automobiles from the streets (except for the main thoroughfare and a few streets along the edge); and generally forbidding personal garages.[229] These restrictions also help shape the urban design of the village—instead of expanding outward from a city center, Vauban is narrow, providing walking access to the tramcar for most residents.[230] Freiburg and its suburb of Vauban demonstrate that personal automobile ownership and use are not necessary in the twenty-first century if a close substitute or other primary mode of travel is available.

C. ZURICH ATTEMPTS LARGE-SCALE CHANGES

More drastic and exemplary methods for a large city are found in Zurich, where "the municipal Traffic Planning Department . . . has been working overtime in recent years to torment drivers."[231] In addition to prohibiting automobiles from certain streets and areas of the city, the Traffic Planning Department has prioritized other modes of travel by synchronizing red traffic lights, changing traffic lights to green for public transit vehicles, and reducing automobile speed limits on many streets to allow pedestrians free access to use the street.[232] These policies, and similar policies in many European cities, are all relatively new and in reaction to the growing automobile ownership and use that began to replicate America's experience.[233]

D. SAN FRANCISCO WINS AWARDS FOR PRIORITIZING PEDESTRIANS

San Francisco has already initiated policies that improve roadways for bicycles and pedestrians. The WalkFirst project establishes criteria

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[228] *See* Elisabeth Rosenthal, *In German Suburb, Life Goes On Without Cars*, NYTIMES.COM (May 11, 2009), www.nytimes.com/2009/05/12/science/earth/12suburb.html.

[229] *Id.*

[230] *See id.*

[231] *Id.*

[232] *Id.*

[233] *Id.* *But see* Robert Bruegmann, *Moving Out in Madrid*, ROOM FOR DEBATE, NYTIMES.COM (June 29, 2011, 10:52 AM), www.nytimes.com/roomfordebate/2011/06/28/car-clash-europe-vs-the-us/growth-on-europes-urban-periphery. A city individually concentrating on frustrating drivers might encourage suburbanization, which, while increasing the pedestrian opportunities in the city, produces more need for personal automobiles, not less. *See id.*

for prioritizing and improving pedestrian access.[234] The Green Connections project creates a network of "green" streets to improve pedestrian and bicycle access.[235] And the Better Streets Plan seeks to produce a balanced distribution of roadway access for all users while putting a special emphasis on streets as a public space for pedestrians.[236] The Better Streets Plan even won a Charter Award from the Congress for New Urbanism.[237]

CONCLUSION: RESTRUCTURING FUNDING PRIORITIES TO REDUCE AUTOMOBILE INFRASTRUCTURE WILL REDUCE GHGE

In order to reduce GHGE in the transportation industry, the total number of VMT must decrease significantly. By passing the Global Warming Solutions Act and the Sustainable Communities Act, the California Legislature has expressed clear intentions of reducing VMT by promoting "sustainable communities." However, by primarily targeting urban design and promoting alternative methods, the Sustainable Communities Act only provides more transportation *options* without affecting transportation *behavior*. In order to effectively change travel behavior, the state legislature must enact policies that affect travel time because studies repeatedly show the inelasticity of travel time demand: commute times average thirty minutes each way.[238]

To affect the entire state, the California legislature must change the funding structures for transportation: decreasing funding for infrastructure that caters to personal automobiles and automobile convenience, while simultaneously increasing funding for other modes of travel, particularly public transit. Public transit is currently not a close substitute for the personal automobile—traffic congestion, mechanical problems, costs, and other automobile inconveniences create an unmet demand for an alternative.[239] Incentivizing personal change by providing mobility options is not enough because it does not affect travel mode decisions.

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[234] *WalkFirst*, SAN FRANCISCO PLANNING DEP'T, www.sf-planning.org/index.aspx?page =2568 (last visited Feb. 21, 2013).

[235] *Green Connections*, SAN FRANCISCO PLANNING DEP'T, www.sf-planning.org/index.aspx? page=3002 (last visited Feb. 21, 2013).

[236] *Better Streets San Francisco*, BETTER STREETS SAN FRANCISCO, www.sf-planning .org/ftp/BetterStreets/index.htm; *see also San Francisco Better Streets Plan*, CONGRESS FOR THE NEW URBANISM (Mar. 2, 2011, 2:34 PM), www.cnu.org/resources/projects/san-francisco-better-streets-plan-2011.

[237] *Better Streets San Francisco*, *supra* note 236; *see also San Francisco Better Streets Plan*, *supra* note 236.

[238] Metz, *supra* note 159, at 342.

[239] *See* GOODWIN ET AL., *supra* note 172, at 78.

Travel decisions are based on attitude, convenience, and travel time. Dramatically affecting the speed and convenience of both automobiles and public transit, the legislature can allocate funding to reshape transportation in California by creating a close substitute or by replacing the primary mode of transportation. By supplanting the automobile as the primary mode of transportation through infrastructural funding, the California Legislature can reach its emissions goals established in the Global Warming Solutions Act and targeted in the Sustainable Communities Act.