



## Caltrans Sustainable Communities Grant to Southern California Association of Governments Overall Summary

The Potential of Broadband Ubiquitous Deployment and Universal Adoption  
to Reduce Vehicle Trip Generation to Decrease Greenhouse Gas Emissions

### Introduction and Overview

The California Department of Transportation (Caltrans) awarded a Sustainable Communities Grant to the Southern California Association of Governments (SCAG) to study the potential of broadband ubiquitous deployment and universal adoption to reduce vehicle trip generation, and associated vehicle miles traveled (VMT), to decrease greenhouse gas (GHG) emissions to help fight climate change. Broadband is a generic term for high-speed Internet infrastructure that includes both wireline and wireless technology networks. This study is a groundbreaking investigation of the potential of “broadband as a green strategy” to reduce traffic congestion and decrease impacts on the environment. The study included a comprehensive set of methodologies to determine with intellectual integrity a qualitative and quantitative projection of the potential for broadband to reduce VMT and GHG that can be used by policymakers and regulators. This is vital because the California Air Resources Board (CARB) has assigned to SCAG a target of reducing GHG by 19%. The Overall Conclusion is:

**Broadband is a “green strategy” to reduce VMT and GHG qualitatively  
with a quantitative benefit to reduce GHG by 1-15%.**

Therefore, SCAG may use this Overall Conclusion as part of a compendium of information and data to incorporate strategies for broadband ubiquitous deployment and universal adoption into the Regional Transportation Plan and the Sustainable Communities Plan.

## Study Research Partners and Scope of Work

The Caltrans Grant supported a Scope of Work that included SCAG and Civic Leadership Partners with expertise in closing the Digital Divide (the Challenge) through Digital Inclusion (the Process) to achieve Digital Equity (the Result). The Civic Leadership Partners included the 4 Regional Broadband Consortia (RBCs) funded by the California Public Utilities Commission (CPUC) in the SCAG Region and the California Emerging Technology Fund (CETF). The Civic Leadership Partners were responsible for: Data Collection; Community Outreach (including the establishment of an Expert Advisory Committee); Community Engagement and Stakeholder Surveys and Convenings; and Focus Groups and Surveys. The Grant also supported engagement of Technical Consultants to analyze Socio-Economic Data and Transportation System Performance Data.

### Civic Leadership Partners

- ❖ Inland Empire Regional Broadband Consortium (IERBC)
- ❖ Broadband Consortium of the Pacific Coast (BCPC)
- ❖ Los Angeles Digital Equity Action League (LA DEAL)
- ❖ Southern Border Broadband Consortium (SBBC)
- ❖ California Emerging Technology Fund (CETF)

### Technical Consultants

- ❖ Magellan Advisors
- ❖ DKS Associates

The Expert Advisory Committee was composed of 25 highly-respected professionals with an extraordinary spectrum of knowledge and experience collectively to ensure the integrity of the study methodologies and to peer review the findings and conclusions. Attached is a roster of the Expert Advisory Committee, which met 5 times, including a Peer Review Subcommittee. The Expert Advisors also reviewed interim work products to provide feedback and input.

It should be kept in mind that the Caltrans Grant with the original Scope of Work was awarded before the COVID-19 pandemic and issuance of emergency shelter-in-place orders. Thus, all activities that were planned to be in-person had to be revised to implement approximately equivalent approaches to obtain comparable results. SCAG, Civic Leadership Partners, and Technical Consultants were able to pivot and adjust to complete the study successfully.

## Study Research Findings

The Technical Consultants presented their analyses and conclusions in a Final Report titled Transportation Broadband Strategies to Reduce VMT and GHG which is Attachment A. The Technical Consultants concluded that the potential to reduce GHG emissions is 1-15%.

The Civic Leadership Partners research methodologies and findings are summarized below and the work products are inventoried in Attachment B. All of the results confirm there is a tangible potential to reduce vehicle trips with associated VMT and GHG through broadband ubiquitous deployment and universal adoption. The actual realized percentage of GHG reduction will depend upon the level and intensity of proactive leadership from the public and private sectors.

## Summary of Data Collection

The Regional Broadband Consortia (RBCs) and California Emerging Technology Fund (CETF) gathered the following data to inform the study. All of the data collected indicate a willingness by residents to reduce vehicle trips with significant segments still unconnected (not online) and/or underconnected (smartphone only) who would reduce trips if feasible.

- Broadband and Environmental Benefit Data and Literature Report  
Martha van Rooijen, Executive Director, Inland Empire Regional Broadband Consortium
- 2021 Statewide Survey on Broadband Adoption  
Conducted by the University of Southern California (USC) and Sponsored by CETF
- Report on the Digital Divide: Deep Analysis of American Community Survey Census Data  
Jamshid Damooei, Ph.D., (Damooei Global Research), California Lutheran University
- Online Access for Residents Receiving Medi-Cal, CalFresh, School Lunch Program Benefits  
Regional Broadband Consortia Outreach to Counties and County Offices of Education
- Collection of Other Relevant Studies  
Regional Broadband Consortia Identification and Analysis of Other Relevant Data

### Broadband and Environmental Benefit Data and Literature Report

This report, prepared by Martha van Rooijen, IERBC Executive Director, is a comprehensive review of all research literature and published articles about the relationship between vehicle trip reduction and decreases in GHG. It is a foundational work product required for the Caltrans Grant. The report is organized in 5 Sections:

1. Foundational Reference Documents for Caltrans Broadband Grant
2. California Specific Reports and Data (VMT, GHG, Broadband)
3. National Data, Articles, Research
4. Industry Centric Information
  - Telecommuting
  - Telehealth
  - Distance Learning
  - Broadband – Internet of Things
  - Energy
5. Online Data Tools

Major observations from the literature review include:

- There is data and research available supporting the use of the Internet based technologies to reduce VMT and GHG, yet there has been no significant rally from leadership, nor from business and government agencies, to strongly support or promote telecommuting, and other online services, as a high-value TDM strategy.

- The average person is not hearing about new innovative TDM policies and programs that focus on telecommuting, telehealth, and distance learning based on technology advancements derived from higher Internet service in order to reduce VMT, GHG and, ultimately, benefit climate change or other quality of life issues. The studies are not being elevated in public policy making.
- Although, the majority of the research over the past 20 years concludes it is clear telecommuting, made possible from increased and higher quality internet service, will reduce traffic congestion, VMT, and GHG, the rate of telecommuting has been stable at about 5% of all workers, including the self-employed and farmers.
- The instant drain on broadband service from all of these sectors moving online so suddenly, even in areas that had been perceived as served somewhat adequately, brings attention to the need to pursue higher level broadband service, and to start outlining as many benefits as possible of doing so, including the reduction of VMT and GHG to improve traffic congestion and the environment.
- It is therefore timely to be studying the concept of connecting broadband planning and deployment to transportation investments as a TDM strategy. It will be relevant to the community to be looking at how online activities, such as telecommuting and telehealth, that are possible through strong, reliable, and reasonably priced Internet service, could be utilized as a robust TDM strategy resulting in reduced VMT and GHG.

Examples of research literature and published reports informing these observation are:

*Understanding Travel Behavior Report*

Federal Highway Administration (FHWA)

University of California, Berkeley – Transportation Sustainability Research Center

Booz Allen Hamilton, March 2016

Abstract: This report presents a research scan of the state of knowledge in transportation, with 249 cited references and studies, to enhance understanding of travel behavior and various influencing factors on future travel. The report discusses emerging information technology and its impact on new mobility options.

Reference: [https://www.fhwa.dot.gov/policy/otps/travel\\_behavior\\_research\\_scan.pdf](https://www.fhwa.dot.gov/policy/otps/travel_behavior_research_scan.pdf)

*Does Telecommuting Reduce Vehicle Miles Traveled?*

University of California, Davis, Department of Civil and Environmental Engineering

Institute of Transportation Studies, July 2004

Abstract: This study examines the impact of telecommuting on passenger vehicle-miles traveled (VMT) through a multivariate time series analysis of aggregate nationwide data spanning 1966-1999 for all variables except telecommuting, and 1988-1998 for telecommuting. The study assessed the change in annual VMT per telecommuter as well as VMT per telecommuting occasion, *for 1998*. The models suggest that telecommuting reduces VMT, with 94% confidence. Together with independent external evidence, the results suggest a reduction in annual VMT on the order of 0.8% or less.

Reference: <https://escholarship.org/uc/item/74t9663f>

*Employer Transportation Demand Management (TDM) Programs*

Oregon Department of Transportation, Mosaic Transportation Planning Tool and Framework, 2010

Abstract: Employer TDM programs help meet local goals for vehicle miles traveled (VMT) and congestion reduction, environmental stewardship, and quality of life. The Oregon Dept. of Transportation includes Telecommuting as part of recommended TDM programs. Reference: <https://www.oregon.gov/ODOT/Planning/>

*Review of the Literature on Telecommuting & Its Implications for Vehicle Travel and Emissions*, Resources for the Future, Washington D.C., December 2010

Abstract: A review of 20 empirical studies of telecommuting, all of which focus on the trip reduction perspective. The studies include earlier ones with smaller datasets, such as some pilot studies of individual employers, and more recent studies based on broader surveys of both telecommuters and non-telecommuters.

Although an individual telecommuter may experience a sharp reduction in VMT, total benefits depend on how many people are telecommuting, how often they are doing so, and the duration of telecommuting. Note: Review included analyzing data from a 2002 SCAG Survey of telecommuters and non-telecommuters.

2021 Statewide Survey on Broadband Adoption

The Statewide Survey on Broadband Adoption was established by CETF in 2008 and conducted by independent research institutions to interview approximately 1,600 California households representative of overall population. The 2021 Statewide Survey was conducted by USC and included new questions specifically designed to provide data for the Caltrans Grant study regarding the willingness of residents to reduce vehicle trips by using the Internet. This work product (sample of 1,650 households) is an in-kind contribution (\$225,000) to the study.

Major relevant findings from the 2021 Statewide Survey on Broadband Adoption are:

- Southern California is catching up with statewide broadband adoption rates, but has significant potential to get more households online that can result in vehicle trip reduction.
  - Statewide Broadband Adoption Rate: 91% (6% Smartphone Only) – 9% Unconnected
  - Los Angeles County Region: 89% (8% Smartphone Only) – 11% Unconnected
  - Inland Empire Region: 92% (5% Smartphone Only) – 8% Unconnected
  - Orange and San Diego Counties Region: 89% (3% Smartphone Only) – 11% Unconnected
  - Low-Income Households: 82% (11% Smartphone Only) – 18% Unconnected
  - Latino Households: 84% (8% Smartphone Only) – 16% Unconnected
  - Spanish-Speaking Households: 75% (10% Smartphone Only) – 25% Unconnected
  - Seniors 65 Years or Older: 77% (5% Smartphone Only) – 23% Unconnected
  - High School Non-Graduates: 63% (12% Smartphone Only) – 37% Unconnected
- 53% respondents prefer to work remotely 3-5 days per week. 31% prefer to work remotely fulltime. Only 18% would chose traditional in-person workplace.
- However, 57% identified as “essential workers” with less ability to work remotely.

- Majority of low-income households (62%) are not aware of affordable broadband offers: only 38% are aware and just 24% of those households have subscribed (a net 9%).
- 95% Respondents say distance learning and telehealth will replace some vehicle trips.
- Los Angeles County shows the lowest level of telehealth participation at 46%. The Bay Area shows the highest level of telehealth engagement at 58%, followed in descending order by the Inland Empire, Orange and San Diego Counties and the Central Valley.

*“These 2021 Statewide Survey findings build momentum for the deployment of high-speed internet infrastructure so that we can not only offset vehicle trips, reduce greenhouse gas emissions, and relieve traffic congestion, but ultimately provide all of our communities equitable access to healthcare and the education that the internet provides.”*

Kome Ajise, Executive Director, Southern California Association of Governments

### Report on the Digital Divide: Deep Analysis of American Community Survey Census Data

This report is an extensive analysis of census data to determine associations between socioeconomic demographic factors and the Digital Divide, which identifies specific zip codes that comprise a roadmap for both ubiquitous deployment and universal adoption, especially outreach to get online all low-income households with appropriate computing devices. All RBCs contributed to the study conducted by Jamshid Damooei, Ph.D., (Damooei Global Research), California Lutheran University, to provide detailed data for their respective County or Counties.

Highlights of the study findings include:

- The impact of poverty is undeniable and is an impediment to progress. Lower educational performance is highly correlated with the level of household income. Having access to the Internet and the ability to use the necessary devices with high performance is, and will remain, a condition for receiving quality educational services.
- There are a large number of zip codes for which more than 30% of the households pay more for Internet service than is considered “affordable” in relation to income. Within these zip codes 65% of the households have a affordability problem.
- Latinos are at a far greater disadvantage than the white-alone ethnic group.
- Los Angeles County has the greatest severity of unaffordability.
- Imperial County is also faced with a disproportionate level of problems and obstacles.

### Online Access for Residents Receiving Medi-Cal, CalFresh, School Lunch Program Benefits

A major facet of investigation to determine the potential to reduce vehicle trips through broadband ubiquitous deployment and universal adoption is to assess the feasibility for those who are unconnected or underconnected, most of who are low-income households, to reduce vehicle trips. There are “3 big populations” who are unconnected and underconnected; they are households eligible for: Medi-Cal; CalFresh; National School Lunch Program (NSLP). A proxy for the untapped potential to reduce trips is the number (and percentage) of email addresses on file with responsible Public Agencies for these 3 big populations eligible for public assistance.

Each RBC reached out to their respective: (a) County or Counties to obtain data regarding Medi-Cal and CalFresh recipients; and (b) County Office of Education (COE) regarding NSLP students. The RBCs also requested information re NSLP students from large School Districts. USC estimates that 2.55M households in the SCAG Region were eligible for the Emergency Broadband Benefit (EBB) Program and, therefore, at least this many households are eligible for the new Affordable Connectivity Program (ACP). It is axiomatic that: (1) If low-income households are not online, then they cannot use the Internet to offset vehicle trips; and (2) If public agencies do not collect email addresses for households receiving public assistance, then they cannot communicate with them online to help reduce vehicle trips.

The following are the overarching observations from this data collection effort:

- Public Agencies generally don't obtain email addresses of recipients and don't communicate online with public assistance HHs. However, once engaged, Public Agencies are willing to consider changing policies and practices
- The collection and availability of email addresses online varies by County:
  - Imperial County: 20%-27%
  - Inland Empire (Riverside and San Bernardino Counties): 1%-18%.
  - Los Angeles County: 36% Medi-Cal; 53% CalFresh
  - Ventura County: 41%-52%
- Public Agencies could reduce vehicle trips for 50%-80% recipients if they collected email addresses (and assisted households without email addresses to get connected with affordable home Internet service such as ACP), and proactively communicated online with recipients.

### Collection of Other Relevant Studies

The Broadband Consortium of the Pacific Coast (BCPC) shared an analysis of Ventura County census data by Dr. Damooei regarding the nature of the Digital Divide and disadvantaged households which showed a lot of value from a deep dive into census data. Thus, each RBC contributed to a deep analysis of the census data for their County or Counties, as reported above.

Another example of other relevant studies identified by RBCs is that the Los Angeles Digital Equity Action League (LA DEAL), for which the Los Angeles County Economic Development Corporation (LAEDC) is the fiscal agent, conducted community questionnaires in the City of Lynwood and the unincorporated community of Willowbrook and found that low-income residents were paying approximately 5.2% of their public utility expenditures for home Internet service, which exceeds the national guidelines of 2%. This finding aligns with the study by Dr. Damooei.

## Community Engagement, Stakeholder Surveys and Stakeholder Forums

### Description of Methodology

CETF and the RBCs developed a comprehensive Stakeholder Survey which was approved by SCAG. To achieve comparable stakeholder input as envisioned in the original Work Plan, each RBC committed to obtaining 15 Surveys from each of 3 Primary Stakeholder Groups for a total of 45 Surveys and no less than 180 Surveys in the SCAG Region:

- Private-Sector Business
- Public Agency or Service Provider
- Education or Health Organization

Each RBC identified a target list of at least 15 Leaders in each Primary Stakeholder Group and distributed the Survey directly to them as well as to all their contacts. A total of 210 Surveys representative of the Primary Stakeholder Groups were obtained with a good cross-section geographically from the SCAG Region.

### Findings

The complete findings from the Stakeholder Surveys are included in Attachment B. The following are the highlights most relevant for the promulgation of public policy:

- All Stakeholders support a level of remote working; hybrid and flexible work arrangements are preferred, rather than a specific number of days weekly.
- Private-Sector Business Leaders identified their top strategy to reduce trips as “Construction of high-speed internet infrastructure throughout the region to connect all locations.” followed by “Employer Tax Credits to implement Telecommuting.”
- Public Agencies or Service Providers and Education or Healthcare Leaders identified their top strategy as, “Assisting clients, customers, students and patients with securing affordable home internet service and a computing device.”
- Overall, “Policymakers” in each Primary Stakeholder Group are taking a lead in identifying top trip reduction strategies with “Policy Advisors” either slightly ahead of them or having to catch up to the Policymakers, depending on the Stakeholder Group.
- Lack of high-speed Internet infrastructure limits the number of employees who can work remotely for all Stakeholder Groups: 40.6% Private-Sector Business; 50.6% Public Agencies or Service Provider; and 56.4% Education or Health Organization.
- There is potential for additional vehicle trip reduction among all Primary Stakeholder Groups.
- Top-Rated Strategies for reducing vehicle trips reflect need for both “deployment” and “adoption”—both high-speed Internet infrastructure and assistance to get all households online with affordable home Internet service and a computing device.

All respondents to the Survey were invited to an online Stakeholder Forum to discuss the results and explore strategies for reducing vehicle trips to reduce GHG and help fight climate change. The results of the Stakeholder Forums are summarized as part of the record for the Grant. Overall, the Stakeholder Forums underscored the value of engaging Civic Leaders to think together about actions to reduce vehicle trips to help fight climate change.



## Focus Group Interviews

### Description of Methodology

CETF and the RBCs developed a Focus Group Interview Questionnaire and Guide to obtain input from at least 20 low-income households in each area, or at least 80 Interviews in the SCAG Region. The purpose of the Interviews was to assess the willingness of low-income households to reduce vehicle trips if they were connected at home to high-speed Internet service at an affordable price with sufficient digital proficiency. To achieve comparable input as in-person Focus Groups envisioned in the original Work Plan, each RBC committed to conducting at least 10 Interviews from 2 distinct and geographically-diverse segments of low-income residents. Interviewees were provided a \$20 gift card for participating. As a result, a total of 91 Interviews were completed.

### Findings

The complete findings from the Focus Group Interviews are included in Attachment B. The following are the finding highlights most relevant for the promulgation of public policy:

- The majority (74.7%) of low-income households interviewed who are connected to the Internet pay more than \$25 per month. Only 20.9% subscribe to an affordable offer.
- Less than 20% of those not subscribing to an affordable home Internet service have heard about an affordable offer (such as EBB or ACP, LifeLine, or ISP offers).
- For those interviewed households aware of affordable offers but who had not subscribed, only 1% said the offers were too costly. The most-frequently cited reason (12.1% of households interviewed) was that it was unclear how to sign up, followed by: lack of trust in the ISPs; had been upsold; and didn't get sufficient help from ISPs.
- Interviewed households rated the importance of the following factors or assistance in subscribing to home Internet service (on a scale of 1-5, with 5 being the highest):
  - Affordable Home Internet Service: 3.38
  - Improved Internet Infrastructure: 3.35
  - Affordable Computer: 1.67
  - Digital Literacy Training for Family: 1.25
- Significant percentages of interviewed households said they could reduce vehicle trips by being connected to the Internet, ranging from 70.3% for paying bills to 20.9% for getting public benefits.

Overall, the Focus Group Interviews confirmed that there is a significant potential to reduce vehicle trips by getting online all low-income households with ubiquitous deployment and universal adoption, notwithstanding the fact lower-income residents are disproportionately classified as essential workers with less flexibility to work remotely. Low-income residents recognize the potential to reduce vehicle trips for a wide range of purposes aside from work. However, there needs to be both improved deployment of high-speed infrastructure into high-poverty census tracts and substantive assistance for low-income households to achieve broadband adoption, including: (a) increased public awareness about available affordable home internet service, such as ACP; (b) computing devices; and (c) digital literacy training.

## Overall Observations and Conclusions

All of the activities associated with this study reveal an emerging sense of a “new normal” among stakeholders and residents that access to the Internet is essential and that Digital Equity is an imperative. Further, all of the data collection and analysis by the Technical Consultants and Civic Leadership Partners conclude there can be tangible reduction in vehicle trips and associated decreases in VMT and GHG as a result in broadband ubiquitous deployment and universal adoption. However, the amount of GHG decrease to help address climate change that can be derived from broadband “as a green strategy” depends on policy and practice leadership from public and private stakeholders through a focused initiative with quantified goals.

The following are the 10 Overall Observations and Conclusions:

- There are high levels of interest, engagement, and urgency by stakeholders with an imperative to develop both regional and local broadband strategies.
- There is a need for a regional strategy to include and embrace local governments that are willing to work together on middle-mile and last-mile deployment and adoption.
- All sectors in the SCAG region support a level of remote working, with a preference for hybrid and flexible work arrangements rather than a specific number of days each week.
- The private sector identified the top strategy to reduce trip generation as “Construction of High-Speed Internet Infrastructure Throughout the Region to Connect All Locations”.
- The private sector next top-rated strategy is “Employer Tax Credits to Implement Telecommuting”.
- Public Agencies, Service Providers, Education, and Healthcare Sectors Identified the top strategy to reduce trip generation as “Assisting Clients, Customers, Students and Patients with Securing Affordable Home Internet Service and a Computing Device”.
- Land use planning must accommodate broadband as part of essential infrastructure and community amenities to ensure public safety and quality of life. This will require land use planners and regulators to think about incorporating broadband into all new projects to help reduce trip generation and ensure Digital Equity.
- Low-income individuals, who are more likely to be frontline “essential” workers and have less opportunity to work remotely, could reduce trips and VMT with more awareness and education about how to access affordable home Internet services and sufficient digital skills proficiency to navigate the Internet to access services.
- There is still a need for more education with both the public and private sectors to optimize vehicle trip generation. People are just now beginning to “connect the dots” between broadband and air quality.
- Caltrans and CARB should jointly fund additional analysis to refine the estimate of the potential for decreasing GHG emissions through reduction of trip generation because of broadband ubiquitous deployment and universal adoption.

These Overall Observations and Conclusions point to “push” and “pull” strategies for both broadband deployment and adoption. The concept of “push” relates to public and private policy to provide an external force to change practice. The concept of “pull” relates to public and private organizational internal practices to shape and reinforce policy to become the “norm” or societal culture. The following Recommendations embrace both “push” and “pull” strategies.

## Recommendations

The following 5 Recommendations promote policy “push” and community “pull” strategies for broadband ubiquitous deployment and universal adoption.

- Affirm substantively that telework (especially hybrid and flexible work arrangements) are here to stay. Validate that public and private employers have embraced this concept as the “new normal” and there is no desire or intent to return to old behaviors (post pandemic). Optimize telehealth and distancing learning for both reduction of trip generation and quality experiences for participants.
- Accelerate deployment of high-speed Internet infrastructure. Evaluate the perceived gap in broadband infrastructure by the private sector to determine and quantify if the need is middle-mile construction (connecting facilities) or last-mile deployment (connecting employees to work)—or both—and identify the obstacles and solutions.  
[Deployment: Policy Push]
- Incent employers to achieve target outcomes. Consider fostering a “tipping point” for telework to be the “new norm” and the extent to which it can be triggered locally or needs to occur at higher levels.  
[Deployment: Community Pull]
- Develop and adopt policies, strategies and programs to promote adoption of technology and home Internet use to optimize opportunities to reduce vehicle trips. Identify specific processes for how municipalities, hospitals, and schools can accelerate use and support training for digital skills competency.  
[Adoption: Policy Push]
- Design and implement a pilot project (and then expand if demonstrated to be effective) a true stakeholder-driven, collaborative approach to transforming neighborhoods that achieves and accelerates adoption to get online all households. Ideally, use investment in middle-mile infrastructure as a catalyst for last-mile deployment and adoption.  
[Adoption: Community Pull]

Caltrans should fund the next phase of work to engage relevant State Agencies to work with SCAG, CARB, Transportation Agencies, Regional Broadband Consortia, and public and private stakeholders to develop and implement a strategic plan to achieve an agreed-upon reduction of greenhouse gas emissions through ubiquitous deployment and universal adoption of broadband as a “green strategy” to reduce vehicle trips.