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February 27, 2015

State of California Air Resources Board
Research Division
FY2015-2016 Research Plan Implementation

RE: Draft Proposal entitled "*Assessing the Travel Demand and Co-Benefit Impacts of Affordable TODs*"
UC Berkeley Principal Investigator: Professor Karen Chapple
Period of Performance: 9/1/2015 – 2/28/18
Amount of Request: $300,000
UCB Proposal Number 6735

To Whom It May Concern:

On behalf of the Regents of the University of California, we are pleased to submit the above referenced proposal to the to the California Air Resources Board in response to the FY2015-2016 Research Plan Implementation solicitation.

Please note: An indirect cost rate of 10% has been included in this draft proposal on the assumption that any resulting award will contain terms that are consistent with the agreed upon Standard UC – ARB Interagency Agreement Terms. Should these terms not be used, an indirect cost rate of 25% would then apply which would increase the total amount requested.

The University representative to whom questions may be directed and with whom award negotiations may be conducted is Erin Lentz, who may be reached at erin.lentz@berkeley.edu or at (510) 643-2152.

Contract and grant documents should be issued in the University's corporate name:
The Regents of the University of California
c/o Sponsored Projects Office
2150 Shattuck Avenue, Suite 300
Berkeley, CA 94704-5940.

Award documents that are sent electronically should be forwarded to spoawards@berkeley.edu.

Thank you for your consideration of this proposal.

Sincerely,

Erin Lentz
Contracts and Grants Officer
Sponsored Projects Office

Draft Proposal

Assessing the Travel Demand and Co-Benefit Impacts of Affordable TODs

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June 4, 2013

February 27, 2015

Check if applicable:
Animal subjects _____
Human subjects __X__

Table of contents.

Abstract

The new Affordable Housing and Sustainable Communities (AHSC) program has great potential to positively impact the environment as well as the health and wellbeing of low income residents. A significant body of literature demonstrates the benefits of locating housing near transit in its reductions on private auto travel (Arrington and Cervero 2008; Lund, Cervero, and Wilson 2004; Zhang 2010; Nasri and Zhang 2014) as well as improvements in health due to increases in walking and bicycling trips to access transit and destinations (Pucher et al. 2010; Saelens, Sallis, and Frank 2003; Sallis et al. 2012) and economic benefits associated with reduced transportation costs (Zhou and Zolnik 2013). Emerging research is demonstrating the large benefits of developing affordable housing in TODs as well (Transform and CHPC 2014; Mallett 2012; Kroll and De La Cruz 2014). However, the existing methodology used in CalEEMod to account for the additional benefits of siting affordable housing in TODs does not reflect emerging research. This study will improve on previous and current research by conducting travel surveys and monitoring the VMT of affordable TOD residents using smart phones to track people's locations before and after they move into new developments. This much needed research will fill the hole in the literature and serve to improve the existing evaluation methodology used for the AHSC program.

Introduction

The new Affordable Housing and Sustainable Communities program has great potential to positively impact the environment as well as the health and wellbeing of low income residents. A significant body of literature demonstrates the benefits of locating housing near transit in its reductions on private auto travel (Arrington and Cervero 2008; Lund, Cervero, and Wilson 2004; Zhang 2010; Nasri and Zhang 2014) as well as improvements in health due to increases in walking and bicycling trips to access transit and other destinations (Pucher et al. 2010; Saelens, Sallis, and Frank 2003; Sallis et al. 2012) and economic benefits associated with reduced transportation costs (Zhou and Zolnik 2013). Researchers have identified many factors of the built and social environments beyond the proximity to transit stations that can contribute to travel behaviors, including land use characteristics such as high density and mixed use, employment densities, urban design characteristics such as block size and pedestrian friendliness, neighborhood crime rates, and even the whole metropolitan area's built environment pattern such as the number of destinations that can be reached by each transportation mode (Heath et al. 2006; Boarnet, Greenwald, and McMillan 2008; Nasri and Zhang 2014).

Emerging research is demonstrating the large benefits of developing affordable housing in TODs as well. In 2013, Transform and CHPC published initial findings from their ongoing research using the California Household Travel Survey showing that low income households drive 25-30% fewer miles when living within ½ mile of transit in comparison to those living in non-transit areas (Transform and CHPC 2014). Yet, this analysis did not take into consideration basic household characteristics like size and age that are strong predictors of travel patterns. Their soon to be released results looking at household income and proximity to rail and bus transit incorporates a wide range of control variables and explicitly analyzes neighborhood access, or location efficiency, by incorporating employment and housing density.

Forthcoming research from our team at UC Berkeley, as part of CARB project 13-310 analyzing the VMT impacts of displacement, analyzes both the CHTS as well as the National Household Travel Survey. Preliminary results confirm the positive association between income and VMT as well as proximity to rail transit; however, the impact of the combination of the two is more complex than other research suggests. Finally, new Caltrans-funded research led by Portland State University (Caltrans 2014; Clifton et al. 2014) and Strategic Growth Council-funded research led by the City of Los Angeles (City of LA 2014) are about to launch studies that will correct for the insufficiencies in standard evaluation methodologies that utilize the ITE trip generation data, by collecting on-site traffic count data at affordable housing sites. Despite the insight and usefulness of these efforts, their cross-sectional nature and omission of explicit controls do not lend themselves well to the project of analyzing the effects of affordable TODs as a greenhouse gas reduction strategy. Nor are they intended to evaluate the impacts of different types of households or subsidized housing.

Detailed information about the travel patterns of residents of subsidized housing developments has been collected in two Bay Area surveys and a smaller survey in Southern California. In 2011, the Non Profit Housing Association of Northern California (NPH) and a graduate student at UC Berkeley surveyed 695 households in 16 affordable housing developments in Santa Clara and San Mateo counties (Mallett 2012). Of these sixteen, six were single room occupancy (SRO)/special needs developments, four were senior housing, and six were multi-family affordable developments. The survey asked residents about their two most common trips as well

as how their travel patterns compared in their current residence from their previous residence on a qualitative basis. This study found that higher levels of transit service, fewer parking spaces and higher site density correlated with higher transit usage of affordable housing residents. Researchers found significant differences between the SRO, senior and multi-family residences, with residents in SROs and senior housing developments using transit the most frequently, however the distances traveled for each trip were not assessed. In terms of their change in transit usage upon moving to the sites, those located in areas with high levels of transit service (LOS) saw the largest increases in transit usage among their residents. These patterns differed by housing type – with seniors being most affected (positively) by LOS and SRO/special needs being relatively un-impacted by the LOS. Although data was collected on the proximity to transit and LOS of each development, they were not thoroughly analyzed. Furthermore, although distances were gathered for two trips, the VMT was not explicitly analyzed and there was no estimate of the VMT changes before and after their moves.

In 2011, a graduate student at California Polytechnic State University, San Luis Obispo studied the travel patterns of residents of 1) a market-rate TOD, 2) an affordable TOD, and 3) a market-rate non-TOD in Carlsbad, CA (Stiffler 2011). 54 surveys were collected and analyzed. Although the sample size was too small to reach conclusive results, the initial findings indicated that low-income TOD residents made more trips than both the market rate TOD residents and non-TOD residents. However, the research also showed that the residents made shorter trips, resulting in approximately 50% of the VMT of market-rate TOD residents and 35% of the VMT than market-rate non-TOD residents.

More recently, in 2014, researchers at ABAG and UC Berkeley surveyed 201 households living in five subsidized housing developments in four Bay Area cities of varying levels of transit orientation (Kroll and De La Cruz 2014). Surveyors asked residents to describe up to 6 typical travel destinations. Results from the survey indicate that car usage is higher for longer trips, trips to grocery stores, and when the household owns a car. Usage was lower for residents living in the transit-oriented sites in comparison to the developments more distant to transit. Furthermore, residents of TOD sites traveled shorter distances than residents in the non-TOD suburban site. When compared to their previous residence, respondents said that destinations were easier to reach than before, especially for shopping, entertainment and recreation. However, most respondents had moved to the residence prior to 2009, making it difficult to accurately assess change. Finally, through their open ended questions researchers learned about the significant co-benefits to residents of a special needs development in Berkeley. Although the change in their VMT was likely low, due to low travel patterns, the residents reported feeling happy about their ability to walk to places such as shops and entertainment—places they were unable to reach from sites distant from downtown centers.

These surveys provide insight into the impacts of TODs on affordable housing residents, indicating significant differences between the types of developments, neighborhoods, transit service and household types on transit usage and VMT. Yet specific VMT data was not collected prior to when residents moved into affordable TODs, making quantitative estimates of VMT reductions impossible. Furthermore, there are well-established limitations of the use of travel surveys, due to recall bias and under-reporting of short trips (Stopher and Greaves 2007), which could significantly underestimate the walking and bicycling trips of residents and therefore some of the co-benefits of living in a TOD.

The established methodology to estimate VMT and GHG reductions of affordable TODs used in the AHSC guidelines (SGC 2015) quantifies some of the benefits of living in a TOD including project density[1] and destination accessibility to a CBD or job center[2]. Yet the percentage of affordable units correction currently incorporated into CalEEMod only rewards up to 0.04% reduction in VMT per each % of the total units that are deed restricted affordable, regardless of the depth of subsidy, the total number of subsidized units, or the target population (e.g., senior, family, etc.) (CAPCOA 2010). This estimation is based on the 2002 study by John Holtzclaw and colleagues of the impacts of location efficiency on car ownership and use in Chicago, Los Angeles and San Francisco (Holtzclaw et al. 2002)[3], which did not specifically analyze data on residents of affordable TODs. Furthermore, the results from Holtzclaw and colleagues' study are significantly different from the results emerging from our CARB-funded research as well as those from CHPC and others. Finally, the lack of specification of development type (e.g., senior vs. family), and depth of the subsidies (e.g., affordable to extremely low income vs. moderate income), potentially result in significant errors.

This project aims to correct the methodological errors embedded in the CalEEMod model and will improve on previous and existing studies reviewed above by explicitly analyzing the VMT impacts of different residents of affordable housing located in TODs. We will improve on pre-existing surveys in three ways: 1) incorporating controls by either surveying residents before and after they move to affordable TODs, or through other designs discussed below 2) using GPS data to ensure that we accurately capture all (including short) trips, and 3) surveying developments that cater to different populations (e.g., income levels, age, disability status, families, etc.). We hypothesize that the target population of the affordable TOD will greatly influence the VMT impacts. For instance, one might expect that although residents of SROs might utilize transit more (as found by Mallett 2012), they may already be transit dependent and therefore the actual VMT reductions from moving to a TOD may be negligible. Therefore, for the purposes of estimating VMT reductions that will impact funding decisions, we believe it imperative to assess this dimension of affordable TODs. We will complement our surveys with focus groups to collect qualitative data on the co-benefits of living in affordable TODs. Results from this component will provide direction for future research and quantification on the health, economic and wellbeing co-benefits of these developments.

This project focuses on affordable TODs in the Bay Area and the Fresno Metropolitan Area to capture a wider breadth of development, neighborhood, and transit types that might be applying for AHSC support. Our team, which includes not only faculty researchers in transportation and housing at the Institute of Urban and Regional Development, but also the chief economist at the Association of Bay Area Governments in an advisory role, has strong expertise on this topic of research and we have strong connections to the affordable housing and transit communities in both regions. Furthermore, we have extensive experience in the design, application, and analysis of survey research.

[1] Adding 7% GHG reductions per percentage above 7.6 dwelling units per acre up to 30%

[2] adding 20% GHG reductions for every mile less than 12 miles from the CBD

[3] Using smog check odometer data, VMT was derived for 1990 to 1995 and assigned to a travel analysis zone using the vehicle registration zip code. Household income was derived from Census data. In their estimation of annual VMT per household, they found for Los Angeles that VMT went up by 4% per each extra dollar earned until income reached between $22,000 to $30,000, at which point the elasticity leveled off. The elasticity for San Francisco was weaker, with an increase of only 1.7%.

Study Objectives

This study will generate much needed data on the impacts of affordable housing developments in TODs that can be translated into correction factors for the greenhouse gas emissions methodology of CalEEMod. The secondary objective is to create parameters for the evaluation of co-benefits of such developments on the health, economics and wellbeing of low income residents.

Technical plan

Task 1 Literature Review

A literature review will revisit the literature on land use, urban form, and VMTs to identify the key variables associated with VMT reductions in affordable TODs. We will also examine the literature on the impact of residence in a TOD on public health, economics and wellbeing. We will pay specific attention to differences between types of areas (e.g., urban versus suburban versus rural), transit types (bus versus rail) and neighborhood characteristics (e.g., walkability, access to jobs, school quality, social services, amenities, etc.). We will also pay specific attention to studies that have incorporated income into their analysis.

Task 2 Develop Affordable TOD Typologies

We will develop affordable housing typologies that will be useful for policy analysis and to refine the survey design and instruments detailed in Task 3. Based on the limited existing literature reviewed above on affordable TODs we have reason to believe that VMT reductions will depend on the affordable housing type (e.g., depth and mix of subsidized units and target population – seniors, special needs, families, etc.), the neighborhood accessibility (e.g., pedestrian amenities, density, proximity to stores, schools, medical services, entertainment, etc.), and the transit characteristics (e.g., rail or bus, LOS and quality of the transit system – how many destinations does it access, etc.). However, neighborhood accessibility and transit characteristics are already incorporated into the CalEEMod methodology for estimating VMT reductions. Therefore, we will only focus this analysis on affordable housing types and their likely relationship to VMTs by re-analyzing existing datasets. This information will also help us target specific affordable TODs that promise to result in the greatest VMT reductions. We will then draw purposive samples from each affordable TOD site, which will allow for more tailored policy recommendations as well as streamlined analysis of VMT and GHG reductions by affordable TOD type.

We foresee using two potential datasets for this analysis: the CHTS or the ABAG and NPH surveys.

Task 2.1 Assess the Feasibility of Reanalyzing CHTS

Our team has extensive experience analyzing CHTS and subsidized housing datasets. In this task we will assess the feasibility of linking the two datasets. The California Housing Partnership Corporation attempted to do this in their analysis of the CHTS, but found few matches between subsidized housing datasets and household addresses in CHTS. There are many potential reasons for this low match including: a) the possibility of slight differences between the geocoding of

addresses between the two datasets, and b) multi-site developments listed as one address in the subsidized housing dataset, which may not match the address of residents that live at another site, etc. For this reason, we will assess the feasibility (both in terms of accuracy and computational complexity) of creating buffers around the subsidized housing developments and matching households in the CHTS to these buffers if they meet the income criteria of the development. If this method is deemed feasible, we will then create a matrix of VMT for different subsidized housing types both near and distant from transit as proxies for TODs. From this matrix, we will determine where the greatest differences lie, which will help us narrow potential sites to survey in Task 3

Task 2.2 Reanalyze the ABAG and/or NPH surveys

If we determine it infeasible to reanalyze the CHTS with affordable housing data, we will obtain the raw data from ABAG and/or NPH surveys and reanalyze them to specifically look at trip frequency, type, distance and mode by different affordable housing types. As mentioned above, ABAG surveyed 5 sites and NPH surveyed 16, providing us with a mix of target populations (e.g., SRO, special needs, senior, family, etc.) and affordability levels. We will combine this information with data we have gathered for the Bay Area as part of the CARB-13-310 study on TOD and residential displacement. For that project we've gathered a wide variety of data that will help us better characterize the neighborhood conditions of these developments such as walkability, employment density, non-profit density and other measures that will help us refine the types of affordable TODs. We will break down the survey data according to these different groups to better understand where significant differences may lie. From that we will determine which housing types will be most important to survey, which we will target in Task 3.

Task 3 Site Selection and Survey Design

With the typology developed in Task 2, we will work with affordable housing partners in the Bay Area and Fresno to identify potential sites to study. The selection of sites and survey design are intertwined. There are two types of survey design options for this study: case-control or before-and-after surveys. For the case controls, we envision at least two options for controls – residents of affordable units outside of TODs, residents of market rate units in the same TODs as the affordable units. The benefits and challenges to each of the three options are listed in Table 1.

Table 1 Challenges and Benefits of Survey Design Options

Survey Design	Benefits	Challenges
Before / After	• Compare the same people to themselves and control for individual level factors • Observe the real impact of relocation to a TOD on low-income households	• Difficult to find developments that open during the timeframe of the study AND that fall within the typologies identified in Task 2 • Adjusting the results to fit the CalEEmod methodology may be more challenging than other methods.
Case / Control – Market Rate TOD Units	• Shorten time (and potentially cost) of study by conducting surveys of case and control	• It may be difficult to identify and recruit survey participants in market rate units.

	simultaneously. This will also control for exogenous factors related to time that could affect people's VMTs • The current CalEEmod estimates of affordable TODs is a correction for market rate housing. Therefore this comparison will provide us with factors that can be directly applied to the algorithms as they exist now with little adjustment to other factors.	• Matching affordable and non-affordable households along different characteristics may also be challenging • The comparison with market rate does not mirror actual decision making (i.e., nonprofit developers would likely be deciding between developing in a TOD versus not, rather than building market rate housing in the TOD)
Case / Control – Affordable non-TODs	• Shorten time (and potentially cost) of study by conducting surveys of case and control simultaneously. This will also control for exogenous factors related to time that could affect people's VMTs • This approach replicates the actual decisions that affordable housing developers may actually face (siting the development in a TOD versus a non-TOD)	• There may be other neighborhood level factors beyond just proximity to transit that could also affect the outcomes of the survey and collecting data to control for those factors will add cost and time to the study. • Adjusting the results to fit the CalEEmod methodology may be more challenging than other methods

The determination of the survey design and sites will largely depend on the timing of the study and developments as well as the selection of the affordable TOD types that we would like to survey based on Task 2. Upon beginning the project, we will work with affordable housing partners to get the full landscape of current developments and assess their timelines and target populations to ensure they fit within the typologies developed in Task 2. Only projects that will be placed in service a year preceding the end of the CARB study will be considered, allowing us time to collect data. We will also work with affordable housing partners to assess the feasibility of surveying the future residents before they move to these developments to conduct baseline surveys.

Our preference would be to conduct before/after surveys of residents and potential residents of new affordable TODs. There are at least 3 affordable TODs in the Bay Area that will be placed in service over the next two years: Macarthur Station being developed by Bridge Housing, San Leandro Family Apartments also being developed by Bridge Housing, and South Hayward BART Family & Senior Communities being developed by Eden Housing. Each of these developments target different populations and have different mixes and depths of affordability, so we believe that they would be likely candidates for the survey.

For Fresno, we will work with our colleagues at the Fresno Housing Authority and the City of Fresno to identify new TOD developments. Upon initial outreach, we believe there are several candidate developments that are at various stages of development either along existing high-serving bus routes or the future Bus Rapid Transit route along Blackstone and Kings Canyon corridors.

One of the biggest challenges of estimating the VMT reductions from TOD is the issue of self-selection (Cervero 2004; Lund, Cervero, and Wilson 2004; Cervero 2007), or the fact that people who choose to live in TODs do so because of their preferences for driving less and living in walking or biking distance of neighborhood amenities. One of the benefits of surveying residents of affordable housing developments is the possibility that the issue of self-selection may not be as prominent due to the limited availability of affordable housing, so the choice between neighborhoods based on amenities and access to transit may not be as relevant for residents of subsidized units. In addition, there are usually many more applicants for subsidized units than available apartments. Depending on our ability to access wait list data, we may be able to survey applicants that were not selected to live in the affordable TODs as control groups. This possibility will apply to both before/after and case/control survey design types, but the feasibility will rely more on our ability to identify and contact non-selected applicants, which we will assess with our affordable housing partners.

If the developments do not meet the three criteria identified above (i.e., a. falling into an affordable TOD type, b. placed in service one year months before the end of the CARB contract, and c. feasibility of contacting future tenants) or if we determine that no affordable TODs will likely open during the project period, then we will work with our affordable housing partners to find existing subsidized TODs in the different typologies identified for a case-control design. We will assess the relative feasibility of the two case-control survey design options with our affordable housing partners and pick sites accordingly.

Task 4 Survey Residents

Task 4.1 Adjust Existing Survey Instruments and Protocols

Travel diaries are commonly used by researchers and government agencies to assess people's travel modes, distances and frequencies for the purposes of transportation planning (P. R. Stopher and Greaves 2007). We will adapt standardly used travel diaries (e.g., California Household Travel Survey) which collect 1-day worth of travel information for each household included in the survey. We will also adapt survey collection and recruitment protocols and scripts from previous studies for the purposes of this research. Based on the demographics of residents in the affordable TODs, we will translate the instruments into other languages.

Task 4.2 Apply for IRB approval

We will submit the survey instruments, recruitment materials, protocols and research design to UC Berkeley's Committee for the Protection of Human subjects for IRB review. As with protocols used in earlier work done by members of this research team, an introduction will be written that describes the project, protocols for privacy protection, and the voluntary nature of participation. The designed description and consent forms will be sent through the IRB process. Documents will be sent to begin the review process immediately on hearing of the award, as the Berkeley IRB process can take approximately 4 months to review and receive approval. As our team has extensive experience in this area of research and have similar surveys and protocols already developed, we can begin task 4.1 before the official start of the project which will expedite the review process, allowing us to begin surveying residents in a timely fashion.

Task 4.3 Pre-test the Survey Instrument

We will pilot the survey with households in both Fresno and the Bay Area to determine if any adjustments need to be made prior to administering the survey. We will work with our affordable housing partners to identify residents of existing affordable developments that are similar to the future developments we include in the study.

Task 4.4 Survey Recruitment and Outreach

All future residents of the selected affordable TODs will be eligible to participate in the study. IRB-approved recruitment materials such as postcards, posters, and scripts will be used to outreach to future residents. An incentive will be offered to each household for participating in the survey, which will be included in recruitment materials. An appropriate amount will be determined based on the amount of time the surveys will take, which will be assessed during the pre-test. This amount will be high enough so that it will encourage residents to participate, but not so high that it will be deemed a coercion or non-choice for these low-income households. For the before and after survey, this amount will be offered twice.

Our aim is to sample approximately 100 households in the Bay Area and 100 households in Fresno, before and after the survey to provide sufficient statistical power for our analysis. To ensure that survey participants adequately represent the population of the developments, we will analyze the demographics of our participants mid-way through the survey recruitment process and compare them to the overall development to ensure that our sample is similar in terms of age, gender, income, race, and other factors that may influence our results. If we deem the sample too different, we will enhance efforts to get higher response from poorly represented groups.

Project researchers will maintain contact with the survey participants to ensure that we can conduct follow-up interviews upon their occupancy of the affordable TOD.

Task 4.5 Survey Residents and Quality Control

Contact with the residents will occur over a 3 day period for each survey. On day 1, the researcher will deliver the travel diary and GPS device (see below) to the household with associated instructions. The researcher read the script of the informed consent forms and will answer any questions the participant has about the project and protocol. On day 2, the participant will wear the portable GPS device and record their travel in the travel diary. On day 3, the researcher will return to pick up the GPS device and to review the travel diary with the participant to ensure its completeness and accuracy. Furthermore, the project manager will conduct the first surveys while the staff researchers observing. There will then be a trial period during which the research staff will conduct the interviews with the project manager monitoring to validate the accuracy and professionalism of the surveys.

Task 4.6 Data Entry and Quality Control

Data from the surveys will be entered at the end of each day by project researchers. A random sample of 10% of the surveys will be entered by two different project staff to determine data entry errors. Upon entry, data will be coded to remove identifiable information from the dataset, which will be stored in a secure location using procedures reviewed by UC Berkeley's IRB.

Task 5. Collect GPS Data using Smart Phones

As discussed above, the use of GPS devices to obtain travel details within the context of household travel surveys has become a common practice, due to numerous limitations and under-reporting when using surveys alone (Stopher et al. 2008). Given the importance of capturing shorter and also non-motorized trips, we will incorporate this technology into our study. While a number of travel surveys including the CHTS have used wearable GPS devices (in addition to on-board), researchers are migrating to the use of smart-phones because of their ubiquity and the ability to monitor data collection and correct for user error in real time (Wiehe et al. 2008; Su et al. 2015). Our team has experience in collecting and analyzing such data and we therefore intend to use smart phone technology to collect GPS data.

The collection of GPS data requires several steps including device acquisition, calibration, developing protocols, piloting, training users, and data collection. The analysis of the data will be covered in Task 6.

Task 5.1 Assess Participant cell-phone ownership and acquire others if needed

Given that smart phone ownership is lower for low-income groups, elderly and other populations we may be surveying (Smith 2013), we will assess survey participants access to smart phones. If they do not have access to a smart phone, we will provide them with a loaner acquired for the CalFit system used to assess air pollution exposures (de Nazelle et al. 2013). For households that already own smart phones, we will have them download a simple, low cost application (e.g., MapTrack) that will allow us to collect GPS data. We will pre-load these applications onto the smart phones that will be loaned to participants.

Task 5.2 Adapt existing protocols for data collection

Building off similar studies we have participated in, we will adapt existing protocols for smart phone deployment, participant training, quality control, and data retrieval. These protocols will also be reviewed by Berkeley's IRB (see task 4.2).

Task 5.3 Pilot the smart phone GPS data collection

The smart phone GPS data will be piloted with the same households participating in the survey pilots. The goal will be to recreate the same conditions we envision during the survey to predict any issues and make any necessary adjustments prior to the deployment of the devices. These pilots will also help us determine the optimal frequency of logging data (e.g., every 30 seconds). We will download the pilot data and analyze it to determine optimal settings.

Task 5.4 Collect GPS Data

As discussed in task 4.5, project researchers will make contact with participants on day 1 and day 3. On day 1, they will have participants download the GPS application or deliver the smart phone and give them instructions on its use. On day 3 they will return to pick up smart phones and note any complications that were encountered. Data from the smart phones will be downloaded

remotely, imported into the project database and processed by the research team to review and confirm the trip end locations and mode assignments.

Task 6. Analyze and Compare Survey and GPS Data

Task 6.1 Data Cleaning, Coding, and Preliminary Analysis

GPS data will be visually analyzed and coded for trips, starts, and stops using protocols created for other similar studies. The visual review will also allow us to screen out traffic delays and other falsely identified stops. Upon cleaning the GPS data, we can begin to match and compare it to the travel diary data for each household. Researchers will review each trip to confirm or update modal assignment, length, and where possible purpose. Summary statistics will be prepared by trip and household to begin to understand the data and its limitations.

Task 6.2 Statistical Analysis

Upon cleaning and coding the data, we will conduct statistical analyses on the matched pairs to using the Stata statistical package or R. We will build a multivariate regression model to determine the role of residence in a TOD location on VMT.

Task 7 Conduct focus groups to determine the parameters of co-benefits

To better assess the potential co-benefits of affordable TODs, we will conduct focus groups in each of the locations. Focus groups will involve planning the guide, recruitment of participants, facilitating the group and recording results, data entry, coding, analysis and interpretation of results.

Task 7.1 Develop the Focus Group Guide

Using the results from the literature review, we will develop a focus group guide to prompt participants to provide rich information about their experiences in the affordable TODs as they relate to their health, economics, and wellbeing.

Task 7.2 Recruit Participants

Recruitment materials (i.e., posters, post cards, announcements at meetings, etc.) will be developed and reviewed by UC Berkeley's IRB. Informed consent will be obtained from all participants prior to beginning the focus groups.

Task 7.3 Facilitate Focus Group and Record Results

The project manager will facilitate all focus groups and project researchers will attend to audio-tape and take notes on participant's behaviors and comments.

Task 7.4 Data Entry and Coding

Focus group notes will be transcribed and complemented with memos and audio recordings to ensure that the full range of responses were adequately captured. Notes and memos will be reviewed for major themes and coded accordingly using Atlas.ti.

Task 7.5 Analysis and Interpretation

Researchers will analyze the coded results to draw conclusions on the magnitude and significance of the co-benefits of affordable TOD.s

Task 8 Draft Final Report

We will produce a two-part final report. The first part will explain our research methods and findings, with a short executive summary (to be printed and distributed widely). The second part will consist of a short and useful guidance document, designed to be user-friendly for ARB, the Strategic Growth Council, HCD, and other government agencies involved in the analysis of greenhouse gas emissions reductions from affordable TODs.

Task 9 Amend Final Report

Upon receiving feedback on the draft report, we will respond to comments and edit the report for publication.

Data Management Plan

This project involves the analysis of existing survey data as well as the collection of data from travel diaries, GPS devices and focus groups. All data will be stored on computers at the Institute of Urban & Regional Development and backed up daily to a remote server.

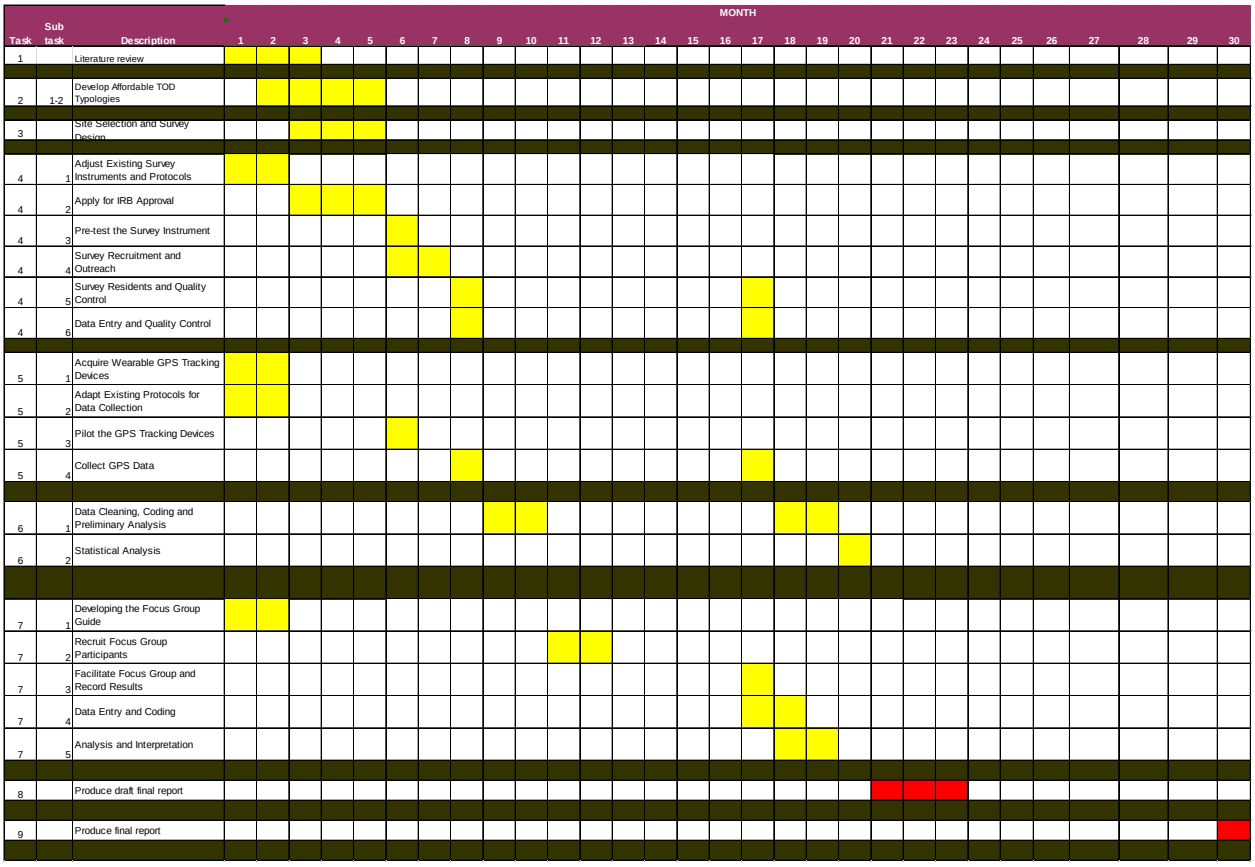
1. **Analysis of existing survey data**. We will analyze the California Household Travel Survey data in combination with data on affordable housing developments from HUD (LIHTC database) through the CHTS remote server using the R statistical package. Through our ARB-310 grant we have already applied for and been granted access to the remote server. We will write new code to analyze the data and determine the feasibility for using this data to develop and analyze affordable TOD types. If we determine the sample size too small, we will re-analyze the surveys collected by ABAG and/or NPH.
2. **Collection and analysis of travel diaries**. As described in task 4, we will be collecting travel diaries from residents of subsidized TODs. We aim to collect approximately 400 diaries to ensure sufficient sample size for statistical analysis. The project manager will train surveyors who will apply the travel diaries with residents. The initial survey will be conducted by the project manager with the research team observing, followed by a trial period during which the surveyors are observed by the project manager. The data will be recorded in hard copy and entered into a database. Data will be coded and all identifiable information will be coded and removed per the protocols developed for the IRB review. A 10% random sample of the surveys will be entered and coded twice to ensure accuracy.
3. **Collection and analysis of GPS data.** We anticipate an approximately 50/50 split between participants that have smart phones and those that don't. For those that do not, we have access to approximately 25 smart phones that have been acquired for the CalFit study (de Nazelle et al. 2013) and have been operated by members of our research team

(Su et al. 2015). Protocols will be developed to ensure the replicability of the procedures and the research team will train each of the participants in their use. Data will be downloaded remotely and visually observed to ensure accurate coding.

4. **Qualitative data.** The research will involve focus groups with residents to determine the variety of co-benefits from subsidized TODs. Six focus groups will be held (three in the Bay Area and three in Fresno) and run by the project researchers. Project assistants will attend the focus groups to take notes and they will be audio recorded. Project researchers will review and clean the notes, using the audio recordings as needed. Immediately following the focus groups they will also write field memos on the main findings and impressions. Notes and memos will be coded and analyzed using the qualitative analysis software Atlas.ti to find patterns in the data.

Project schedule

Task 1: Literature Review
Task 2: Develop Affordable TOD Typologies
Task 3: Site Selection and Survey Design
Task 4: Survey Residents
Task 5: Collect Travel Data using GPS Tracking Devices
Task 6: Analyze and Compare Survey and GPS Data
Task 7: Conduct focus groups to determine the parameters of co-benefits
Task 8: Draft Final Report
Task 9: Amend Final Report



Curricula vitae

Curriculum Vitae
Karen Chapple

ACADEMIC POSITIONS

Professor, City and Regional Planning, July 2014-present

Associate Professor, City and Regional Planning, July 2007-June 2014

Interim Director, Institute of Urban & Regional Development, July 2014-present

Associate Director, Institute for Urban & Regional Development, July 2010-June 2014

Visiting Scholar, Urban Institute, January 2013-June 2013

Acting Director, Institute for Research on Labor & Employment, August 2010-June 2011.

Faculty Director, Center for Community Innovation
University of California, Berkeley: July 2006 – present

Theodore Bo Lee and Doris Shoong Lee Chair of Environmental Design, July 2006-June 2009.

Assistant Professor, City and Regional Planning, July 2001-June 2007
University of California, Berkeley

Visiting Assistant Professor, City and Regional Planning
University of Pennsylvania: July 2005-June 2006

Assistant Professor of Planning and Public Affairs
Humphrey Institute of Public Affairs, University of Minnesota
January 2000-June 2001.

EDUCATION

Ph.D., City & Regional Planning, University of California—Berkeley, 2000.

M.S.C.R.P., Pratt Institute, 1994.

B.A. (*Phi Beta Kappa, Magna Cum Laude*), Urban Studies, Columbia University, 1989.

SELECTED GRANTS

California Air Resources Board. "Developing a New Methodology for Analyzing Potential Displacement." $696,000, 2013-15. (Chapple PI with co-PIs Chatman, Loukaitou-Sideris, Ong, and Waddell)

U.S. Department of Housing & Urban Development. "Investing in Institutions, Investing in Community: An Examination of the Eastern Bayview/Alice Griffith Comprehensive Transformation Plan." Chapple PI with co-PIs J.Corburn and M. Hutson, $131,000, 2012-14.

California Air Resources Board. "The Economic Costs and Benefits of Smart Growth Policies." Chatman PI with co-PIs Chapple and R. Crane, $330,000, 2012-14.

University of California Transportation Center. "TOD, infill housing, and car share: A feasibility study." Chapple PI, $59,000, 2010-2011.

San Francisco Foundation. "Technical Assistance for the Great Communities Collaborative Supporting Mixed-Income TODs in the Bay Area." Chapple PI, $250,000, 2006-2013.

California Public Utilities Commission, "California Needs Assessment of Workforce Issues in the Green Economy." Chapple PI with co-PI M. Reich, $1,126,000, 2010.

Economic Development Administration, "Innovating the Green Economy in California Regions." Chapple PI & co-PI Hutson, $206,000, 2008-09.

Association for Bay Area Governments, "Development without Displacement." Chapple PI, $30,000, 2008-2009.

University of California Transportation Center, "Why Build Affordable Transit-Oriented Development? A Toolkit for Educating Residents about TODs and Housing in the Bay Area." Chapple PI, $42,000, 2008-2009.

MacArthur Foundation, "Building Resilient Regions," M.Weir (PI), with M. Pastor, K. Foster, R. Pendall, K.Chapple, N. Hill, A. Fung, John Mollenkopf, and T. Swanstrom, $3,200,000, 2006-2010.

Center for Housing Policy, "Making Do: How Working Families Trade-off Housing and Transportation Expenditures and the Implications of that Tradeoff for Families and Communities." M.Wachs PI with co-PIs Chapple, Cervero, Landis, and Blumenberg, $200,000, 2005-2006.

SELECTED REFEREED ARTICLES

Chapple, K. 2014. The highest and best use? Urban industrial land and job creation. *Economic Development Quarterly*.

Wegmann, Jake and Karen Chapple. 2014. "Hidden density in single-family neighborhoods: Backyard cottages as an equitable smart growth strategy." *Journal of Urbanism*.

Chapple, K. and E. Goetz. 2011. Spatial justice through regionalism? The inside game, the outside game, and the quest for the spatial fix in the U.S. *Community Development: Journal of the Community Development Society*.

Chapple, K., S. Jackson, and A. Martin. 2011. Concentrating Creativity: The Planning of Formal and Informal Arts Districts. *City, Culture and Society* 1, 4: 225-234.

Chapple, K., C. Kroll, T. W. Lester, and S. Montero, 2011. Innovation in the Green Economy: An Extension of the Regional Innovation System Model? *Economic Development Quarterly* 25, 1:5-25.

Chapple, Karen and T. William Lester. 2010. The Resilient Regional Labour Market: The U.S. Case. *Cambridge Journal of Regions, Economy & Society* (Jan).

Chapple, Karen and Carrie Makarewicz. 2010. Is Infill Bad for Business in California? *Access* 34.

Chapple, Karen and Shannon Jackson. 2010. Arts, neighborhoods, and social practices: Towards an integrated epistemology of community arts. *Journal of Planning Education and Research* (June).

Goetz, E. & Chapple, K. 2010. "You Gotta Move: Advancing the Debate on the Record of Dispersal." *Housing Policy Debate* 20(2).

Chapple, K. 2006. "Overcoming Mismatch: Beyond Dispersal, Mobility, and Development Strategies." *Journal of the American Planning Association* 72(3): 322-336.

Chapple, K., Thomas, J.V., Belzer, D., & Autler, G. 2004. "Fueling the Fire: Information Technology & Housing Price Appreciation in the SF Bay Area and the Twin Cities." *Housing Policy Debate* 15(2):347-83.

SELECTED REPORTS AND OTHER PUBLICATIONS

Chapple, K., J.Wegmann, A. Nemirow, & C. Dentel-Post. 2011. *Yes in My Backyard: Mobilizing the Market for Secondary Units*. IURD Working Paper.

Machell, Erin, Troy Reinhalter, and Karen Chapple. 2009. *Building Support for Transit-Oriented Development: Do Community-Engagement Toolkits Work?* Berkeley, CA: Institute of Urban and Regional Development.

Chapple, Karen. 2009. *Mapping Susceptibility to Gentrification: The Early Warning Toolkit*. Berkeley: Institute of Urban and Regional Development.

DANIEL G. CHATMAN

Education

Ph.D., Urban Planning, 2005, University of California, Los Angeles

Master in Public Policy, 1997 (Outstanding Thesis Award), Harvard University

B.A., Individual Studies: The English Language, 1991 (High Honors), University of California, Berkeley

Academic Appointments

Associate Professor, 2014-present, Department of City and Regional Planning, College of Environmental Design, University of California, Berkeley

Assistant Professor, 2008–present, Department of City and Regional Planning, College of Environmental Design, University of California, Berkeley

Assistant Professor, 2005–2009, Urban Planning and Policy Development Program, Edward J. Bloustein School of Planning and Public Policy, Rutgers University

Peer-Reviewed Journal Articles

Chatman, Daniel G. Estimating the effect of land use and transportation planning on travel patterns: Three problems in controlling for residential self-selection. *Journal of Transport and Land Use* 7.3 (2014): 47-56.

Chatman, Daniel G. Explaining the "immigrant effect" on auto use: the influences of neighborhoods and preferences. *Transportation* 41.3 (2014): 441-461.

Chatman, Daniel G., Nicholas Tulach and Kyeoungsu Kim. 2012. Evaluating the economic impacts of light rail by measuring home appreciation: A first look at New Jersey's River Line. *Urban Studies* 49 (3): 467-487. DOI: 10.1177/0042098011404933.

Chatman, Daniel G. and Robert B. Noland. 2011. Do public transport improvements increase agglomeration economies? A review of literature and an agenda for research. *Transport Reviews* 31 (6): 725-742. DOI: 10.1080/01441647.2011.58790.

Chatman, Daniel G. and Niels Voorhoeve. 2010. The transportation credit mortgage: A post-mortem. *Housing Policy Debate* 20 (3): 355–382.

Chatman, Daniel G. and Nicholas Klein. 2009. Immigrants and travel demand in the US: Implications for transportation policy and future research. *Public Works Management and Policy* 13 (4): 312–327.

Chatman, Daniel G. 2009. Residential self-selection and non-work travel: Evidence using new data and methods. *Environment and Planning A* 41 (5): 1072–1089.

Chatman, Daniel G. 2008. Deconstructing development density: Quality, quantity and price effects on household travel. *Transportation Research A* 42 (7): 1009–1031.

Boarnet, Marlon, Randall Crane, Daniel G. Chatman, & Michael Manville. 2005. Emerging planning challenges in retail: The case of Wal-Mart. *Journal of the American Planning Association* 71(4): 433-449.

Chatman, Daniel G. 2003. How workplace land use affects personal commercial travel and commute mode choice. *Transportation Research Record* 1831: 193-201.

Crane, Randall and Daniel G. Chatman. 2003. Traffic and sprawl: Evidence from US commuting, 1985 to 1997. *Planning and Markets*, 6 (1): 14-22.

Book Chapters

Chatman, Daniel G. and Nicholas Klein. 2011. Immigrants and automobility in the US: The role of spatial and occupational factors. In *Auto motives: Understanding car use*, edited by K. Lucas, E. Blumenberg and R. Weinberger. Bingley, UK: Emerald Group Publishing Ltd.

Crane, Randall and Daniel G. Chatman. 2004. Traffic and sprawl: Evidence from US commuting, 1985 to 1997. In *Urban sprawl in Western Europe and the United States*, edited by C. Bae and H. Richardson. Aldershot, Hampshire, UK: Ashgate.

Reports (selected)

Chatman, Daniel G., Robert Cervero, Emily Moylan, Ian Carlton, Dana Weissman, Joe Zissman, Erick Guerra et al. Making *Effective Fixed-Guideway Transit Investments: Indicators of Success*. Volume 1: Handbook, Volume 2: Research Report. No. Project H-42. 2014.

Chatman, Daniel G., Andrea Broaddus, Matt Klein, and Cheryl Young. 2012. *Are movers irrational? A pilot study of the happiness, commuting, housing, and social lives of undergraduates before and after a move*. Working paper, University of California Transportation Center, 56 pp. August 16.

Chatman, Daniel G., Robert B. Noland, et al. 2012. *Methodology for determining the economic development impacts of transit projects*. Project H-39, Transit Cooperative Research Program, Transportation Research Board, National Academies. 372 pp (2 vols). March 2.

Chatman, Daniel G., Nicholas Klein, and Stephanie DiPetrillo. 2010. *The impact of demographic changes on transit patterns in New Jersey*. Trenton, NJ: New Jersey Department of Transportation, 139 pp + appendices.

Chatman, Daniel G. and Stephanie DiPetrillo. 2010. *Eliminating barriers to transit-oriented development*. Trenton, NJ: New Jersey Department of Transportation, 75 pp.

Chatman, Daniel G. 2006. *Transit-oriented development and household travel: A study of California cities*. Sacramento: California Department of Transportation.

Research Grants (selected)

2013-15, co-Principal Investigator. *Developing a New Methodology for Analyzing Potential Displacement*. California Air Resources Board. $696,000.

2012–14 Principal Investigator. *The Economic Costs and Benefits of Smart Growth Policies*. California Air Resources Board. $330,000.

2010–13 Principal Investigator. *Psychological Economics, Travel Behavior, Residential Location Choice, and Sustainability: Possible New Rationales for Policy Intervention.* University of California Transportation Center. $158,796.

2011–12 Principal Investigator. *Evaluating the Effectiveness of Congestion-Priced Parking in California*. Multicampus Research Programs and Initiatives, Institute of Transportation Studies. $89,000.

2010–12 Principal Investigator. *An Exploration of Fixed-Guideway Transit Criteria Revisited*. Transit Cooperative Research Program, National Academy of Sciences. $500,000

2008–11 Principal Investigator. *Methodology for Determining the Economic Development Impacts of Transit Investments.* Transit Cooperative Research Program, National Academy of Sciences. $500,000

2008-10 Principal Investigator. *The Impact of Demographic Changes and Immigration on Transit Patterns in New Jersey*. New Jersey Department of Transportation. $286,000.

2002-06 Principal Investigator. *Transit-Oriented Developments and Travel in California.* California Department of Transportation. $355,000.

Carol J. Galante **Curriculum Vitae**
1130 Winsor Ave. Piedmont CA 94610 (415)-509-2164 carol.galante@berkeley.edu

Education

University of California, Berkeley
Masters of City and Regional Planning (1976-1978)
Ohio Wesleyan University **(**1972-1976)
BA, Politics and Government/Urban Studies Phi Beta Kappa,
Licensed California Real Estate Broker (inactive)

Professional Experience

University of California, Berkeley (current)
College of Environmental Design, Department of City and Regional Planning
I.Donald Terner Distinguished Professor in Affordable Housing and Urban Policy,
Faculty Director of the Berkeley Program in Housing and Urban Policy,
Co-Chair of the Policy Advisory Board of the Fisher Center of Real Estate and Urban Economics

U.S. Department of Housing and Urban Development
Commissioner of Federal Housing Administration (FHA) and Assistant Secretary for Housing (2011-2014)
Deputy Assistant Secretary, Office of Multifamily Housing Programs (2009-2011) Washington, DC

Appointed by President Obama and confirmed by the U.S. Senate as FHA Commissioner charged with administration of FHA and its trillion dollar mortgage insurance portfolio. Major accomplishments to date as FHA Commissioner include:

- Implemented a comprehensive risk management program to ensure FHA has the capabilities and policies necessary in the future and to price and manage current risks
- Created innovative strategies like the Distressed Asset Stabilization Program and Back to Work to give homeowners more options for home retention and new home purchase while simultaneously strengthening FHA's financial position and stabilizing communities

Major accomplishments as Deputy Assistant Secretary for Multifamily Housing:

- Managed growth of annual lending from $2.5 billion in 2008 to over $10 billion in 2010, in spite of staff reductions, by creating new streamlined and risk based lending procedures and reorganizing staff roles
- Developed major improvements to programs for the elderly and disabled to enable the programs to operate more cost effectively, to leverage private debt/equity, and expand to provide greater ability to serve more vulnerable and frail elderly at a reduced cost
- Developed and implemented Choice Neighborhoods initiative and key participant in Rental Assistance Demonstration program to enable public housing authorities to use market-based real estate finance tools to recapitalize projects and preserve them as affordable housing

BRIDGE Housing Corporation

President and CEO (1996-2009)
Executive Vice President (1987-1996)
San Francisco, CA

President and Chief Executive of California's largest non-profit housing development corporation and its affiliate companies, including BRIDGE Property Management Company, BRIDGE Economic Development Corporation, Bay Area Senior Services, BRIDGE Urban Infill Land Development (BUILD),

and HomeBricks. BRIDGE uses the best private business practices and entrepreneurial ideas to build and sustain affordable homes and apartments. Major responsibilities and accomplishments included:

- Building 13,000 homes and apartments and more than 300,000 square feet of related urban retail and community service space with annual construction of approximately 1,000 homes and apartments in California's high cost and difficult to develop areas
- Developed BRIDGE into a financially sustainable family of companies with more than 300 employees, annual revenues of more than $115 million, assets over $1 billion (and market value of assets well over
  $3 billion)
- Created BUILD to invest $175 million of equity from CalPERS-the state public employees retirement system-in smart growth urban infill and mixed income developments
- Created HomeBricks to help new homebuyers purchase affordable homes
- Developed BRIDGE into the première developer of revitalized neighborhoods, including the transformation of troubled public housing projects into vibrant new communities
- Leadership role in state and national housing policy including California's Proposition 1C- a $2.1 billion bond measure for urban infill, transit-oriented, affordable housing projects

Major responsibilities and accomplishments as Executive Vice President included:

- Led two major mixed-use, mixed income, ownership and rental neighborhood transforming projects- Richmond City Center and Marin City USA
- Formed a property management company to provide high-quality property management services to BRIDGE properties
- Developed a new BRIDGE affiliated company to lease and operate a continuing care community for seniors

Honors

National Journal- 100 top Washington Decision-Makers, 2013
Housing Wire Magazine- Influential Women in Housing- 2012
California Alumni Association, Excellence in Achievement Award-2011
Executive of the Year- Multifamily/Developer Magazine- 2008
Bay Area Business Leader Hall of Fame-2008
California Home Building Hall of Fame-2008
Non Profit Housing Association, Inspirational Leader, 2007
Builder Magazine-Top Most Influential People in Homebuilding- 2006
SF Business Times-Deal Maker of the Year; Most Influential Women in the Bay Area
UC Berkeley College of Environmental Design- Distinguished Alumnae Award- 2002
California Housing Consortium- Leadership Award and Hall of Fame

Elizabeth Deakin
Professor of City and Regional Planning and Urban Design University of California
228 Wurster Hall Berkeley, CA 94720---1850 Tel. 510/642---4749
E-mail: edeakin@ berkeley.edu

Education:
Massachusetts Institute of Technology, S.B., (Political Science); S.M., (Civil Engineering Transportation Systems), Boston College Law School, JD

Work History:
Dept. of City and Regional Planning, UC Berkeley, 1985---present

Affiliated faculty, Energy and Resources Group, UC Berkeley, 1990---present
Director, UC Transportation Center, 1999---2009
Co---Director, Global Metropolitan Studies Center, 2005---2008

Deakin Publications last five years only

Chapters in Books

1. Schipper, Elizabeth Deakin, and Carolyn McAndrews, Carbon Dioxide Emissions from Road Transport in Latin America, in Daniel Sperling and James Cannon, eds., *Climate and Transportation Solutions: Findings from the 2009 Asilomar Conference on Transportation and Energy Policy*. UC Davis, 2010 Also at http://creativecommons.org/licenses/by---nc---nd/30
2. Elizabeth Deakin, The Bicycle Industry, review article, in *The Business of Sustainability,* Berkshire Press, 2010.
3. Elizabeth Deakin, Public Transportation, review article, in *The Business of Sustainability*, Berkshire Press, 2010.
4. F. Creutzig, A. Thomas, D. M. Kammen, E. Deakin , Co---Benefits of a City Toll in Chinese Cities: Barriers, Potentials and the Need for Responsible Institutions, In E. Zusman, A. Srinivasan, and S. Dhakal, eds., *Low Carbon Transport in Asia: Capturing Climate and Development*,. , Earthscan, London, 2010
5. A. Berube, E. Deakin, and S. Rafael, Socioeconomic Differences in Household Automobile Ownership Rates, Implications for Evacuation Policy, in John M. Quigley and Larry A. Rosenthal, *Risking House and Home*, Berkeley Public Policy Press, 2008, pp. 197---222

Selected Journal Articles

1. Marsden, Gregory, Karen Trapenberg Frick, A.D. May, and Elizabeth Deakin."Bounded Rationality in Policy Learning amongst Cities: Lessons from the Transport Sector," *Environment Planning A*, forthcoming.
2. Ian Barnes, Karen Trapenberg Frick, Elizabeth Deakin and Alex Skabardonis. "Impact of Peak and Off Peak Tolls on Traffic in the San Francisco---Oakland Bay Bridge Corridor," *Transportation Research Record: Journal of the Transportation Research Board,* forthcoming. (Also published in the Transportation Research Board Conference Compendium, November 2011.
3. Gregory Newmark and Elizabeth Deakin. A Climate Change for Modeling: California's Innovative Legislation Heats up a 'Frozen' Practice, *Transportation Research Record: Journal of the Transportation Research Board,* forthcoming. (Also published in the Transportation Research Board Conference Compendium, November 2011.)
4. Elisa Barbour and Elizabeth Deakin, Smart Growth Planning for Climate Protection: Evaluating California's Senate Bill 375, *Journal of the American Planning Association*, forthcoming.
5. Marsden, Gregory, Karen Trapenberg Frick, A.D. May, and Elizabeth Deakin."How do cities approach policy innovation and policy learning? Implications for Policy and Practice," *Transport Policy*, 2011, vol. 18, pp. 501– 512.
6. Elizabeth Deakin; Karen Trapenberg Frick; Kevin M Shively: Markets for Dynamic Ridesharing? Case of Berkeley, California. Transportation research record. no. 2187, (2010): 131---137
7. SangHyun Cheon; Elizabeth Deakin Supply Chain Coordination for Port Sustainability Transportation Research Record: Journal of the Transportation Research Board, v2166 n---1): 10---19
8. Noreen C McDonald; Elizabeth Deakin; Annette E Aalborg 2010. Influence of the social environment on children's school travel Preventive Medicine, v50 (: S65---S68

9. Carolyn McAndrews; Elizabeth Deakin; Lee Schipper (2010). Climate Change and Urban Transportation in Latin America: Analysis of Recent Projects Transportation research record. no. 2191, (2010): 128
10. Tao, W., S. Mehndiratta, and E. Deakin. 2010. Compulsory convenience? How large arterials and land use affect midblock crossing in Fushun, China. Journal of Transport and Land Use, 3(3):61–82. doi: 10.5198/jtlu.v3i3.11 2009---10
11. Gregory Marsden, Karen Trapenberg Frick, A.D. May, and E. Deakin, Good Practice in the Exploitation of Innovative Strategies in Sustainable Urban Transport , *Transport Policy*, 2010,
12. Elizabeth Deakin, 2010. Climate Change and Sustainable Transportation: the Case of California. *Journal of Transportation Engineering*.
13. Elizabeth Deakin, Bus Rapid Transit: A Brief Review And Commentary On Prospects For The New York Metropolitan Area, For The Symposium *Catching The Next Ride: The Potential For Regional Bus Rapid Transit Systems*, New York University, New York, NY February 24, 2010; published by NYU Press.
14. Syed, Sarah, Aaron Golub, and Elizabeth Deakin, Response of Regional Rail Park---and---Ride Users to Parking Price Changes: Systemwide Results and a Detailed Study of Two Stations , *Transportation Research Record*: Volume 2110, 2009, pp. 155---162
15. Thomas, Alainna and Elizabeth Deakin, Land Use Challenges to Implementing Transit---Oriented Development in China: Case Study of Jinan, Shandong Province Transportation Research Record: Journal of the Transportation. Volume 2077, 2009
16. Elizabeth Deakin, Transportation Technologies for the 21st Century, (for the Hewlett Foundation). *Access 34,* Spring 2009
17. Cornelius Nuworsoo, Elizabeth Deakin, and Aaron Golub, Analyzing the Equity Impacts of Transit Fare Changes: A Case Study of AC Transit, Transportation Research Record conference paper (submitted for presentation only); published in *Evaluation Studies Journal*, 2009

Selected Research Grants

2012-13 City of Berkeley, Parking Management Evaluation Project, $120,000
2008-12 Energy Foundation, Sustainable Development Strategies for China, $800,000 2010---11 Metropolitan Transportation Commission, Bay Bridge Congestion Pricing, $250,000
2010-11 World Resources Institute, International Analysis of Transportation and Carbon $68,000,
2009-11 California Energy Commission: Energy Implications of SB375 and AB 32, $250,000 2010---11 EMBARQ, Quick Response Analysis Methods for Developing Countries, $103,000
2009-10 Institute of Transport Policy Studies (Tokyo): CO2 Scenarios, 2005---2050, $136,500
2008-10 World Resources Institute, Analysis Methods for Carbon Reduction in Transportation $120,000

Preliminary cost proposal

Estimated Cost By Task

Task	Labor	Employee Fringe Benefits	Subs, Cons.	Equip.	Travel	EDP	Copy Print	Mail Phone Fax	Materials and Supplies	Analyses	Misc	Overhead	Total
1	$ 7,755	$ 3,736							$ 70			$ 1,407	$ 12,968
2	$ 15,511	$ 7,472							$ 140			$ 2,814	$ 25,936
3	$ 15,511	$ 7,472							$ 140			$ 2,814	$ 25,936
4	$ 31,022	$ 14,943			$ 13,759				$ 279			$ 5,628	$ 65,632
5	$ 31,022	$ 14,943							$ 279		$ 20,000	$ 5,628	$ 71,872
6	$ 15,511	$ 7,472							$ 140			$ 2,814	$ 25,936
7	$ 15,511	$ 7,472			$ 6,880				$ 140			$ 2,814	$ 32,816
8	$ 15,511	$ 7,472							$ 140			$ 2,814	$ 25,936
9	$ 7,755	$ 3,736							$ 70			$ 1,407	$ 12,968
	$ 155,109	$ 74,717	$ -	$ -	$ 20,639	$ -	$ -	$ -	$ 1,395	$ -	$ 20,000	$ 28,140	$300,000

Bibliography

Arrington, G. B., and Robert Cervero. 2008. “TCRP Report 128: Effects of TOD on Housing, Parking, and Travel.” *Transportation Research Board of the National Academies, Washington, DC* 3.

Boarnet, Marlon G., Michael Greenwald, and Tracy E. McMillan. 2008. “Walking, Urban Design, and Health toward a Cost-Benefit Analysis Framework.” *Journal of Planning Education and Research* 27 (3): 341–58.

Caltrans. 2014. *Affordable Housing Trip Generation Strategies and Rates: Research Initial Scope of Work*. Project P350/Task 2465. Caltrans.

CAPCOA, California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*.

Cervero, Robert. 2004. *Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects*. Vol. 102. Transportation Research Board.

———. 2007. “Transit-Oriented Development’s Ridership Bonus: A Product of Self-Selection and Public Policies.” *Environment and Planning A* 39 (9): 2068–85. doi:10.1068/a38377.

City of LA. 2014. *Focus Area 2: Sustainable and Equitable Planning for Infill in Transit Priority Areas (Planning for Infill)*.

Clifton, Kelly, S Handy, Robert Schneider, and Dawn Boatman. 2014. *Affordable Housing Trip Generation Strategies and Rates*. Proposal to Caltrans.

De Nazelle, Audrey, Edmund Seto, David Donaire-Gonzalez, Michelle Mendez, Jaume Matamala, Mark J. Nieuwenhuijsen, and Michael Jerrett. 2013. “Improving Estimates of Air Pollution Exposure through Ubiquitous Sensing Technologies.” *Environmental Pollution (Barking, Essex: 1987)* 176 (May): 92–99. doi:10.1016/j.envpol.2012.12.032.

Heath, Gregory W., Ross C. Brownson, Judy Kruger, Rebecca Miles, Kenneth E. Powell, Leigh T. Ramsey, Task Force on Community Preventive Services, and others. 2006. “The Effectiveness of Urban Design and Land Use and Transport Policies and Practices to Increase Physical Activity: A Systematic Review.” *Journal of Physical Activity & Health* 3: S55.

Holtzclaw, John, Robert Clear, Hank Dittmar, David Goldstein, and Peter Haas. 2002. “Location Efficiency: Neighborhood and Socio-Economic Characteristics Determine Auto Ownership and Use - Studies in Chicago, Los Angeles and San Francisco.” *Transportation Planning and Technology* 25 (1): 1–27.

Kroll, Cynthia, and Carlo De La Cruz. 2014. *Effects of TOD Location on Affordable Housing Tenants: Travel Behavior, Access to Jobs and Services Preliminary Survey Results*. ABAG.

Lund, Hollie M., Robert Cervero, and Richard W. Wilson. 2004. *Travel Characteristics of Transit-Oriented Development in California*. publisher not identified.

Mallett, Zakhary. 2012. *Land Use and Transportyation Policies for Sustainable Housing*. Professional Report. UC Berkeley.

Nasri, Arefeh, and Lei Zhang. 2014. "The Analysis of Transit-Oriented Development (TOD) in Washington, DC and Baltimore Metropolitan Areas." *Transport Policy* 32: 172–79.

Pucher, John, Ralph Buehler, D. Bassett, and A. Dannenberg. 2010. "Walking and Cycling to Health: Recent Evidence from City, State, and International Comparisons." *American Journal of Public Health* 100 (10): 391–414.

Saelens, Brian E., James F. Sallis, and Lawrence D. Frank. 2003. "Environmental Correlates of Walking and Cycling: Findings from the Transportation, Urban Design, and Planning Literatures." *Annals of Behavioral Medicine* 25 (2): 80–91.

Sallis, James F., Myron F. Floyd, Daniel A. Rodríguez, and Brian E. Saelens. 2012. "Role of Built Environments in Physical Activity, Obesity, and Cardiovascular Disease." *Circulation* 125 (5): 729–37.

SGC, Strategic Growth Model. 2015. *Affordable Housing and Sustainable Communities Program Guidelines*.

Smith, Aaron. 2013. *Smartphone Ownership — 2013 Update*. Pew Research Center.

Stiffler, Natalie. 2011. "The Effect of Transit-Oriented Development on Vehicle Miles Traveled: A Comparison of a TOD versus a Non-TOD Neighborhood in Carlsbad, CA." Thesis, California Polytechnic State University, San Luis Obispo.

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