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Transportation-Related Equity Indicators to Improve Mobility and Transportation System Access for Low-Income and Disadvantaged Communities

Requested by
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The Caltrans Division of Research, Innovation and System Information (DRISI) receives and evaluates numerous research problem statements for funding every year. DRISI conducts Preliminary Investigations on these problem statements to better scope and prioritize the proposed research in light of existing credible work on the topics nationally and internationally. Online and print sources for Preliminary Investigations include the National Cooperative Highway Research Program (NCHRP) and other Transportation Research Board (TRB) programs, the American Association of State Highway and Transportation Officials (AASHTO), the research and practices of other transportation agencies, and related academic and industry research. The views and conclusions in cited works, while generally peer reviewed or published by authoritative sources, may not be accepted without qualification by all experts in the field. The contents of this document reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the California Department of Transportation, the State of California, or the Federal Highway Administration. This document does not constitute a standard, specification, or regulation. No part of this publication should be construed as an endorsement for a commercial product, manufacturer, contractor, or consultant. Any trade names or photos of commercial products appearing in this publication are for clarity only.

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Background

In many parts of California, low-income and disadvantaged communities have less than equal access to transportation system services and opportunities. Limited access adversely impacts the mobility of people in these communities while also increasing travel costs, congestion and pollution in their neighborhoods. By determining equity indicators and incorporating them in policy analysis and decision-making, transportation agencies and service providers can provide more equitable access and better mobility for these communities.

California Department of Transportation (Caltrans) is seeking information about the practices that other state departments of transportation (DOTs) and California agencies have instituted and implemented (or plan to implement) to measure the impacts of proposed transportation policies, programs and projects, and ensure transportation equity for disadvantaged communities (including low-income communities, communities of color and tribal nations). Findings from this Preliminary Investigation will be used to inform Caltrans' development and implementation of tools and practices to incorporate equity into its long-range planning, project prioritization and asset management decisions.

Summary of Findings

Survey of Practice

An online survey was distributed to members of the American Association of State Highway and Transportation Officials (AASHTO) Committee on Planning. This committee's membership is national in scope and includes representatives from state DOTs in all 50 states and the District of Columbia. The survey distribution list also included a select group of California metropolitan planning organizations (MPOs) and other local and regional agency contacts.

Sixteen agencies responded to the survey. Of these, 11 reported on experience with equity indicators:

California State Agencies
California Air Resources Board (CARB)
California Energy Commission (CEC)

California MPOs
Association of Monterey Bay Area Governments (AMBAG)
Fresno Council of Governments (Fresno COG)
Santa Barbara County Association of Governments (SBCAG)

State Transportation Agencies
Delaware Transit Corporation (operating division of Delaware DOT)
Maryland Transit Administration (part of Maryland DOT)
Massachusetts DOT
Minnesota DOT
Rhode Island DOT
Wisconsin DOT

Defining Key Population Groups

The population groups considered in most, if not all, equity analyses include low-income and disadvantaged or underserved households or communities. Agencies often differ in how they define these population groups.

Several respondents define these population groups in the context of environmental justice (EJ) analyses conducted by state DOTs and MPOs to meet the requirements of Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629; 1994). Other respondents define *low-income* and *disadvantaged* using guidance provided by California state legislation.

Elements of the Equity Analysis

Population variables. Respondents are most likely to stratify population groups in their equity analyses using the following factors:

- Ethnic minority.
- Limited English proficiency.
- Low income.
- Racial minority.

Supplementing survey findings is information about the population stratification used in the equity analyses conducted by nine other MPOs. This data is culled from the recently published TCRP Research Report 214: Equity Analysis in Regional Transportation Planning Processes; Volume 2: Research Overview. (See page 53 for more information about TCRP Research Report 214.)

Spatial or geographic-based variables. Respondents offered little information about geographic-based variables that could supplement the population-based variables used in an equity analysis. (Additional details about the geographic bases for equity analysis can be found in TCRP Research Report 214.)

Numerical thresholds. Agencies may use numerical thresholds to identify concentrations of the population groups considered in an equity analysis. Some responding agencies described a general approach (Massachusetts DOT uses statewide average thresholds that are binary—either above or below the average; Minnesota DOT's thresholds vary by purpose), while others were more specific (SBCAG compares the top 20% of census block groups to the regionwide average; Fresno COG's last regional transportation plan considered traffic analysis zones that had a minority/low-income share of at least 35% to be EJ zones).

Analysis level. Agencies can apply equity analyses at varying levels of granularity. Respondents' application of equity indicators ranges from the most granular—at the project level—to a statewide assessment. Almost all respondents conduct programwide analyses and many conduct multilevel analyses.

Geographic unit of analysis. Most respondents reported the use of census tracts and census block groups in their equity analyses.

<u>Examples of Equity Indicators</u>

Respondents described equity indicators in the following categories:

- Accessibility.
- Affordability.
- Connectivity.
- Efficiency.
- Environment.
- Health.
- Housing.
- Jobs.
- Mobility.
- Safety.
- Travel time.
- Vehicle miles traveled (VMT).

Tables 8 through 19, beginning on page 28, present the equity indicators described by respondents in these 12 categories. Table 20 on page 34 presents equity indicators that did not fall into one of the categories above.

A limited literature search identified equity indicators used by California agencies not responding to the survey: Metropolitan Transportation Commission (San Francisco Bay Area) and Los Angeles County Department of Regional Planning.

<u>Conducting Equity Analyses</u>

Analysis method. Respondents identified the analysis methods used by their agencies to conduct the equity analysis from among the following:

- Activity-based.
- Geography-based.
- Population-based or population-weighted.
- Project mapping.
- Ridership-based.
- Travel demand model.
- Use-based.

All respondents use more than one method when conducting the analysis, most commonly geography, population and project mapping.

Data sources. The most common sources used to inform and support respondents' use of equity indicators derive from U.S. census data. Some respondents cited specific census data while others reported on internal data sources that include customer satisfaction surveys.

Tracking tools. Respondents use a variety of tools in their equity analyses:

- Esri ArcGIS.
- Integrated Transport and Health Impact Model (used by public agencies to assess health).
- PopulationSim (used for population synthesis and survey weighting).
- Remix (mapping software used to review routes in connection with demographic data).
- StreetLight Data (used to perform different types of analysis from speed averages along segments of highway to more complex analyses).
- Tableau (used to visualize performance measures that guide decision-making).
- Trapeze (trip data derived from transit scheduling and operational software used to calculate daily miles and trip volumes).

<u>Assessing Equity Analyses</u>

Evaluating effectiveness. Respondents reported on practices to evaluate the effectiveness of the equity indicators they use, with several noting ongoing efforts to strengthen and expand their use. Among the more notable efforts is Minnesota DOT's Advancing Transportation Equity Initiative. The initiative includes individualized transportation equity labs that help Minnesota DOT offices identify and pilot equity strategies and evaluate their effectiveness.

Equity indicator successes. Informing decision-making and encouraging interest were among the successes respondents reported in connection with the use of equity indicators.

Equity indicator challenges. Among the challenges or roadblocks respondents encountered when developing and applying the equity indicators are competing interests, data challenges and working with partners.

Recommendations. Highlighted below are recommendations respondents offered for other agencies planning to implement equity indicators in transportation policy analysis and decision-making:

- Identify opportunities to use qualitative and/or community-specific metrics when possible. A lot of quantitative data doesn't tell the full equity story (CARB).
- Conduct state cross-agency equity indicator meetings. Leverage breakouts for cross-agency chats and questions (CEC).
- If possible, remove as much arbitrariness from the analysis as possible, such as determining concentration thresholds. While sometimes arbitrariness is unavoidable, limiting it will lead to a more defensible methodology (Fresno COG).
- Make sure that there is widespread buy-in for the definitions, evaluation measures and applications, especially from senior leadership. Buy-in is also important when it comes to the overall justification or impetus for the integration of equity indicators (Massachusetts DOT).
- If possible, build the equity analysis using a reasonable number of meaningful measures from reliable sources that are updated frequently (Minnesota DOT).
- Help the public understand the importance of equity-related data (Rhode Island DOT).

<u>Agencies Not Supporting Equity Indicators</u>

Five responding agencies are not currently employing equity indicators in transportation planning and decision-making:

California MPOs
Sacramento Area Council of Governments (SACOG)
Shasta Regional Transportation Agency

State DOTs
Colorado DOT
Delaware DOT
Washington State DOT

The SACOG respondent provided the most significant level of detail about ongoing and future efforts related to equity analysis (see page 50 for details).

Supporting Documents and Related Research and Resources

Citations for publications and other resources appear throughout this Preliminary Investigation, as supporting documents after a topic area and in a collection of related research and resources that begins on page 53. The tables beginning on page 8 organize these publications and resources by topic area (background information, for example) or agency type, and provide a brief summary of content. Listed below are the table categories:

- Background information.
- California MPOs.
- California state and county agencies and related organizations.
- State DOTs.
- Data sources and analysis products and tools.
- Related resources.

Gaps in Findings

While the survey received a fairly robust response, other state DOT research programs and California MPOs may have information to share about equity analysis practices. Reaching out to agencies not responding to the survey may yield additional findings. Though some respondents provided a fairly significant level of detail in their survey responses, Caltrans could benefit from targeted follow-up inquiries that seek more details about agency practices.

Next Steps

Moving forward, Caltrans could consider:

- Engaging with respondents reporting on robust equity analysis practices to learn more about how the equity indicators were developed and continue to evolve.

- Contacting Metropolitan Transportation Commission to follow up on the information available in the agency's Plan BayArea 2040.

- Studying in detail the recently published two-volume TCRP Research Report 214. This report is rich with detail and examples of MPOs' development and application of equity indicators.

- Reviewing other publications cited in this Preliminary Investigation to identify best practices and gather additional examples of equity indicators in practice.

- Examining the data sources, products and tools respondents use in their equity analyses to identify how they might be applied by Caltrans.

Background Information

Publication or Project (Year)	Source	Excerpt From Abstract or Description of Resource
Assembly Bill No. 1550 (AB-1550), Greenhouse Gases: Investment Plan: Disadvantaged Communities (2016)	California Legislative Information	Defines low-income households and low-income communities.
Senate Bill No. 535 (SB-535), California Global Warming Solutions Act of 2006: Greenhouse Gas Reduction Fund (2012)	California Legislative Information	Identifies disadvantaged communities for investment opportunities.
Senate Bill No. 1000 (SB-1000), Land Use: General Plans: Safety and Environmental Justice (2016)	California Legislative Information	Defines low-income area and disadvantaged communities.
CalEnviroScreen 3.0 (2020)	California Office of Environmental Health Hazard Assessment	Describes a tool used to identify communities that face multiple burdens of pollution and socioeconomic disadvantage. Also used to identify the census tracts that will be considered disadvantaged communities for purposes of SB-535.
Environmental Justice Analysis in Transportation Planning and Programming: State of the Practice (2019)	Federal Highway Administration	Documents the state of the practice among state DOTs and MPOs regarding how these agencies are considering and addressing EJ concerns in transportation planning and programming.
Evaluating Transportation Equity: An Intermetropolitan Comparison of Regional Accessibility and Urban Form (2013)	Federal Transit Administration	Compares 25 metropolitan regions to identify those regions that best support high accessibility for transit-dependent populations, racial minorities and low-income households.
Evaluating the Distributional Effects of Regional Transportation Plans and Projects (2017)	National Institute for Transportation and Communities	Aims to provide additional guidance to MPOs on how to evaluate distributional equity in regional plans and projects.
TCRP Research Report 214: Equity Analysis in Regional Transportation Planning Processes; Volume 1: Guide (2020)	Transit Cooperative Research Program	Documents a five-step equity analysis framework for regional transportation plans and programs. Includes step-by-step descriptions of methods, examples and resources to help agencies develop and implement equity analyses that reflect varying regional contexts and agency capabilities.
TCRP Research Report 214: Equity Analysis in Regional Transportation Planning Processes; Volume 2: Research Overview (2020)	Transit Cooperative Research Program	Companion to Volume 1 that describes the results of a research effort conducted to identify ways in which equity in public transportation can be analyzed through an integrated participatory and quantitative approach.

Publication or Project (Year)	Source	Excerpt From Abstract or Description of Resource
Mobility Equity Framework: How to Make Transportation Work for People (2018)	The Greenlining Institute	Provides tools to assess and maximize equity in transportation planning and decision-making to address community-identified mobility needs. By referencing the 12 equity indicators and the examples provided, low-income communities and communities of color can identify and prioritize transportation modes or projects that best provide positive health and economic benefits.
Greenlined Economy Guidebook: Transforming Community Development, Transforming Our Economy (2020)	The Greenlining Institute	Presents a set of rules to govern funds and programs intended to address poverty and inequity.
Transportation Equity Scorecard: A Tool for Project Screening and Prioritization (2020)	U.S. Department of Transportation	Provides a user guide and companion equity scorecard tool that offers a framework for MPOs and other agencies to advance equity during project screening and prioritization.

California Metropolitan Planning Organizations

Publication or Project (Year)	Agency	Excerpt From Abstract or Description of Resource
Appendix H: Environmental Justice Analysis (2018)	Fresno Council of Governments	Discusses performance indicator results. Metrics are described in five categories: accessibility and mobility, reliability, financial, land use/housing and air quality.
Plan BayArea 2040 (2017)	Metropolitan Transportation Commission	Provides a general discussion of the plan's seven goals and 13 performance targets covering three broad areas: the environment, equity and the economy.
Equity Analysis Report (2017)	Metropolitan Transportation Commission	Summarizes the equity analysis results for Plan BayArea 2040 and EJ analyses intended to address whether communities of concern are subject to disproportionately high and adverse effects.
Research Papers: Plan Bay Area 2040 Equity Analysis (undated)	Metropolitan Transportation Commission	Describes the travel patterns of low-income and minority populations, with an emphasis on commute to work and neighborhood walkability.
Appendix H: 2020 MTP/SCS Environmental Justice Analysis (2019)	Sacramento Area Council of Governments	Describes the criteria used to develop EJ communities (race/ethnicity, low income and other vulnerabilities).

Publication or Project (Year)	Agency	Excerpt From Abstract or Description of Resource
2021 San Diego Regional Active Transportation Program (ATP) Call for Projects (undated)	San Diego Association of Governments	Defines disadvantaged communities as minority, low-income and senior populations.
Appendix H, Social Equity: Engagement and Analysis (2015)	San Diego Association of Governments	Provides details of the three population groups that represent the disadvantaged communities that are analyzed in the Regional Plan: minorities, low-income populations and seniors.
Active Transportation Program: Regional Definition of Disadvantaged Communities (2018)	Santa Barbara County Association of Governments	Provides a regional definition for communities of concern: minority, low-income, low-mobility and low community engagement.

California State and County Agencies and Related Organizations

Publication or Project (Year)	Agency	Excerpt From Abstract or Description of Resource
California Climate Investments (2020)	California Air Resources Board	Describes a statewide initiative to reduce greenhouse gas (GHG) emissions, strengthen the economy and improve public health and the environment—particularly in disadvantaged communities, low-income communities and low-income households.
CCI Co-Benefit Assessment Methodologies (2020)	California Air Resources Board	Identifies and prioritizes co-benefits of the California Climate Investments program, which include social, economic and environmental benefits. Also provides guidance on quantification methods and reporting.
Sustainable Transportation Equity Project (STEP) (2020)	California Air Resources Board	Describes a transportation equity pilot that aims to address community residents' transportation needs, increase access to key destinations and reduce GHG emissions by funding planning, clean transportation and supporting projects. The program's overarching purpose is to increase transportation equity in disadvantaged and low-income communities.
Low-Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents (2018)	California Air Resources Board	Presents the barriers and opportunities to expand low-income residents' access to energy efficiency, weatherization and renewable energy investments, and for small businesses contracting opportunities in disadvantaged communities.
California Building Climate Zones (2018)	California Energy Commission	Highlights 16 climate zones with unique climatic conditions that dictate which minimum efficiency requirements are needed for a specific climate zone.

Publication or Project (Year)	Agency	Excerpt From Abstract or Description of Resource
Energy Equity Indicators (2020)	California Energy Commission	Provides a summary report of indicators to help identify opportunities to improve access to clean energy technologies for low-income customers and disadvantaged communities, increase clean energy investment in those communities and improve community resilience to grid outages and extreme events.
Energy Equity Indicators Tracking Progress (2018)	California Energy Commission	Describes progress associated with nine indicators relating to clean energy access, investment and resilience in California's low-income and disadvantaged communities.
Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities (2016)	California Energy Commission	Explores the barriers to and opportunities for expanding low-income customers' access to energy efficiency, weatherization and renewable energy investments.
Leading the Way: Policies and Practices for Sustainable Communities Strategies (2016)	ClimatePlan	Highlights some of the leading practices that have emerged to meet state-mandated GHG reduction targets through changes in land use and transportation. Also offers recommendations in areas such as climate adaptation, water and affordable housing.
Equity Indicators Tool (undated)	Los Angeles County Department of Regional Planning	Describes the web-based Equity Indicators Tool that displays "socioeconomic, demographic and other information to identify areas that are experiencing greater degrees of challenges."

State Departments of Transportation

Publication or Project (Year)	State	Excerpt From Abstract or Description of Resource
Mobility, Accessibility and Disadvantaged Neighborhoods (Research in Progress)	California	Seeks to describe the variation in mobility and accessibility among policy-based definitions of disadvantaged neighborhoods through use of bivariate and multivariate statistical methods. Completion date: December 2020.
2021 Capital Investment Plan (undated)	Massachusetts	Discusses the state DOT's social equity analysis.
2020-2024 Capital Investment Plan Update (undated)	Massachusetts	Presents an equity analysis.
Focus40: Positioning the MBTA to Meet the Needs of the Region in 2040 (2019)	Massachusetts	Identifies several equity-related indicators.

Publication or Project (Year)	State	Excerpt From Abstract or Description of Resource
Access to Jobs Dashboard (undated)	Massachusetts	Provides information about the Accessibility Observatory, a dashboard that reflects the number of jobs that are reachable by various modes at different times of day within different travel times from each census block group in Massachusetts.
Statewide Bicycle/Pedestrian Suitability Analysis (2019)	Minnesota	Describes the prioritization process for reviewing projects for bicycle and pedestrian accommodations. The author notes that to "avoid issues with updates to the LRS [linear referencing system] and ensure continuity across geographies, the entire state was divided into 522,263 equal sized hexagons. Each hexagon is approximately 104 acres …."
Outcome Evaluation Metrics Related to Equity That Include Both Quantitative and Qualitative Measures (Research in Progress)	Minnesota	Seeks to facilitate the adoption of identified or developed equity assessment methods and complementary strategic actions through a custom training program that includes appropriate use cases, and data requirements and considerations. Completion date: Not noted.
Advancing Transportation Equity Initiative (undated)	Minnesota	Describes an initiative to better understand how the transportation system, services and decision-making processes help or hinder the lives of people in underserved and underrepresented communities in Minnesota.
Community Conversations Engagement Project (undated)	Minnesota	Documents a series of in-person conversations between Minnesota DOT and individuals who work with and represent underserved communities in Minnesota.
Research Roadmap Project (undated)	Minnesota	Describes a research effort that identified and evaluated existing programs and initiatives addressing transportation equity. (This research report is cited below.)
Advancing Transportation Equity: Research and Practice (February 2019)	Minnesota	Presents a working definition of transportation equity, recommends action steps for Minnesota DOT and its partners to consider in advancing transportation equity, and identifies directions for future research and practice that can advance transportation equity in Minnesota.
Performance Dashboard (2020)	Minnesota	Allows the user to view performance measures by topic, objective and scorecard.
Rethinking Areas of Concentrated Poverty: Council Researchers to Shift Focus, Elevate Community Voices (2020)	Minnesota	Describes Minnesota's largest MPO's plans to change "the way we will characterize areas of concentrated poverty in our ongoing research about income, race and geography in the seven-county Twin Cities area."
Title VI Report 2020 (2020)	Rhode Island	Describes the agency's Transportation Equity Benefit Analysis (TEBA), which provides a transportation equity analysis to assess equitable distribution of transportation resources and access to public transit.

Publication or Project (Year)	State	Excerpt From Abstract or Description of Resource
State of Rhode Island Transportation Improvement Program FFY 2017-2025 (2017)	Rhode Island	Includes a discussion of the agency's TEBA.

Data Sources and Analysis Products and Tools

Product or Tool (Year)	State or Vendor	Excerpt From Abstract or Description of Resource
TransCAD Transportation Planning Software (undated)	Caliper Corporation	Geographic information system (GIS) software designed for transportation professionals to store, display, manage and analyze transportation data.
Impact Analysis: Evaluate Changes to Your Public Transportation System (undated)	Conveyal	Tool that helps evaluate changes to public transport systems using accessibility indicators. These indicators quantify the access to opportunities experienced by transit riders.
ITHIM USA: Integrated Transport and Health Impact Model (2020)	ITHIM	Planning tool that determines how much benefit or harm to human health can be expected by changing the mix of active and motorized travel across the nation.
StreetLight Data Frequently Asked Questions (2019)	Minnesota	Application that allows users to analyze data gathered from multiple sources such as GPS, commercial fleet management systems and various mobile phone data collectors to determine how people and vehicles move.
PopulationSim (undated)	PopulationSim	Open platform for population synthesis and survey weighting.
Remix (2020)	Remix	Planning platform that allows users to visualize data and the transportation network, and to analyze the community and cost impacts of design; used by Delaware Transit Corporation.
Tableau (2020)	Tableau Software, LLC	Visual analytics platform used by Minnesota DOT.
Trapeze (undated)	Trapeze North America	Systems to help transit agencies manage bus, rail and paratransit services.
American Community Survey (ACS) (undated)	U.S. Census Bureau	Provides access to census data billed as "the premier source for detailed population and housing information about our nation."
Longitudinal Employer-Household Dynamics (undated)	U.S. Census Bureau	Provides access to data products that may be used to research and characterize workforce dynamics for specific groups.

Product or Tool (Year)	State or Vendor	Excerpt From Abstract or Description of Resource
Public Use Microdata Sample (PUMS) (undated)	U.S. Census Bureau	Enables data users to create free custom estimates and tables that are not available through ACS pretabulated data products.

Related Resources

Publication or Project (Year)	State	Excerpt From Abstract or Description of Resource
Looking Beyond the Mean for Equity Analysis: Examining Distributional Impacts of Transportation Improvements (2017)	California	Discusses a general framework for performing transportation equity analysis using activity-based travel demand models, distributional comparisons and equity standards. Also demonstrates the advantages of distributional comparisons relative to average measures.
Planning for Transportation Equity in Small Regions: Towards Meaningful Performance Assessment (2016)	California	Investigates key analytical choices that shape equity outcomes and provides recommendations for future analyses aimed at improving the consistency between equity analyses and the real-world impacts of transportation plans.
Opportunity-Based Dynamic Transit Accessibility in Southern California: Measurement, Findings and Comparison With Automobile Accessibility (2012)	California	Presents an opportunity-based transit accessibility measure applied to the Southern California Association of Governments megaregion. Indicators are sensitive to the availability of opportunities for travelers within a day and are a direct function of the transit routes and schedules and the associated spatiotemporal variation of level of service during a day.
Activity-Based Travel Models and Transportation Equity Analysis: Research Directions and Exploration of Model Performance (2012)	California	Presents a research framework for the equity analysis of long-range transportation plans to critique the current state of practice and point to key research needs. Also explores how well an activity-based travel demand model represents heterogeneity of travel behavior among different income classes.
Geovisualization of Opportunity Accessibility in Southern California: An Exploration of Spatial Distribution Patterns Using Geographic Information Systems for Equity Analysis (2011)	California	Uses GIS to derive network-based accessibility indicators to analyze patterns of opportunity distribution. Also discusses possible planning and future data collection needs for a successful implementation of desired regional land use and transportation objectives in Southern California.
Assessing and Quantifying Public Transit Access (2014)	Connecticut	Describes a model that uses a single score to map areas with different levels of transit accessibility and transit needs.
Nonwork Accessibility as a Social Equity Indicator (2015)	Michigan	Explains a method for deriving nonwork accessibility indicators and evaluates how nonwork accessibility varies among social groups in the Detroit metropolitan region.

Publication or Project (Year)	State	Excerpt From Abstract or Description of Resource
Integrating Social Equity Into Urban Transportation Planning: A Critical Evaluation of Equity Objectives and Measures in Transportation Plans in North America (2015)	Multiple states	Analyzes how social equity is incorporated into transportation plans in 18 large North American metropolitan areas. Considers the quality of the related objectives, how meaningfully their achievement is assessed through the choice of performance measures or indicators, and their prioritization relative to other objectives.
Assessing Public Transit Service Equity Using Route-Level Accessibility Measures and Public Data (2018)	Not applicable	Informs the development of more robust transit equity analyses than are currently conducted by integrating measures of accessibility—the ease with which destinations can be reached—into Federal Transit Administration-required analyses.
Civil Rights Guidance and Equity Analysis Methods for Regional Transportation Plans: A Critical Review of Literature and Practice (2013)	Not applicable	Examines the law, regulatory guidance, academic research and agency practice pertinent to equity analysis, finding that recommendations are extensive but generally lack specificity and are rarely enforceable.

Detailed Findings

Background

In many parts of California, low-income and disadvantaged communities have less than equal access to transportation system services and opportunities. Limited access adversely impacts the mobility of people in these communities while also increasing travel costs, congestion and pollution in their neighborhoods. By determining equity indicators and incorporating them in policy analysis and decision-making, transportation agencies and service providers can provide more equitable access and better mobility for these communities.

California Department of Transportation (Caltrans) is seeking information about the practices that other state departments of transportation (DOTs) and California agencies have instituted and implemented (or plan to implement) to measure the impacts of proposed transportation policies, programs and projects, and ensure transportation equity for disadvantaged communities (including low-income communities, communities of color and tribal nations). Also of interest to Caltrans are the tools, methodologies, models, performance measures, decision criteria and other metrics, and the actionable data sources that agencies use to improve mobility and equitable access. Findings from this Preliminary Investigation will be used to inform Caltrans' development and implementation of tools and practices to incorporate equity into its long-range planning, project prioritization and asset management decisions.

Survey of Practice

An online survey was distributed to members of the American Association of State Highway and Transportation Officials (AASHTO) Committee on Planning. This committee's membership is national in scope and includes representatives from state DOTs in all 50 states and the District of Columbia. The survey distribution list also included a select group of California local and regional agency contacts:

- Selected California metropolitan planning organizations (MPOs).
- California Air Resources Board (CARB).
- California Department of Public Health.
- California Energy Commission (CEC).
- Los Angeles County Metropolitan Transportation (LA Metro).
- Oakland DOT.

Survey questions are provided in Appendix A. The full text of survey responses is presented in a supplement to this report.

Summary of Survey Results

Sixteen agencies responded to the survey. Of these, 11 reported on experience with equity indicators:

California State Agencies
CARB
CEC

California MPOs
Association of Monterey Bay Area Governments (AMBAG)
Fresno Council of Governments (Fresno COG)
Santa Barbara County Association of Governments (SBCAG)

State Transportation Agencies
Delaware Transit Corporation (operating division of Delaware DOT)
Maryland Transit Administration (part of Maryland DOT)
Massachusetts DOT
Minnesota DOT
Rhode Island DOT
Wisconsin DOT

Five responding agencies are not currently employing equity indicators in transportation planning and decision-making:

California MPOs
Sacramento Area Council of Governments (SACOG)
Shasta Regional Transportation Agency

State DOTs
Colorado DOT
Delaware DOT
Washington State DOT

Information provided by these agencies begins on page 50.

Survey results for the 11 agencies reporting on experience with equity indictors are summarized below in the following topic areas:

- Defining key population groups.

- Elements of the equity analysis.

- Examples of equity indicators.

- Conducting equity analyses.

- Assessing equity analyses.

Supplementary resources provided by these respondents and sourced through a limited literature search are included as supporting documents.

Defining Key Population Groups

The population groups considered in most, if not all, equity analyses include low-income and disadvantaged or underserved households or communities. Agencies often differ in how they define these population groups.

Several respondents define these population groups in the context of environmental justice (EJ) analyses. A February 2019 Federal Highway Administration (FHWA) report describes the federal action underlying the EJ analyses conducted by state DOTs and MPOs:

Executive Order (EO) 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629; 1994) directs each Federal agency

to develop an EJ strategy for identifying and addressing disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. State departments of transportation (DOTs) and metropolitan planning organizations (MPOs) conduct environmental justice (EJ) analyses to identify and address disproportionately high and adverse effects of transportation investment decisions on EJ populations.

The same FHWA publication includes these definitions:

Low-income – The U.S. DOT and FHWA EJ Orders define a "low-income" individual as a person whose median household income is at or below the Department of Health and Human Services (HHS) poverty guidelines. CEQ [Council on Environmental Quality] guidance on EJ uses of U.S. Census Bureau poverty guidelines. The HHS website outlines key differences between HHS guidelines and census guidelines.

Underserved population – In this document, the term "underserved population" or "traditionally underserved population" refers to a broad category that includes minority populations and low-income populations but may also include many other demographic categories that face challenges engaging with the transportation process and reaping equitable benefits, such as children, older adults and persons with disabilities.

(See Supporting Documents on page 20 for a citation for the February 2019 FHWA publication.)

Table 1 is a compilation of definitions of *low-income* and *disadvantaged* provided by survey respondents. Rather than creating their own definition of a specific population, some California agencies refer to definitions prescribed by state legislation. Citations for the California legislation providing these definitions appear in Supporting Documents beginning on page 21.

Table 1. Definitions of Key Population Groups

Agency	Low Income Households or Communities	Disadvantaged or Underserved Communities
AMBAG	Defined as 200% of the federal poverty level for 2015. This definition reflects the higher cost of living in the AMBAG region. For the this analysis, a tract was considered predominantly low-income if greater than 33% of residing families earned less than 200% of the federal poverty level annually.	Definition includes minority, low-income, low community engagement and low-mobility factors.
CARB	Uses the definition appearing in AB-1550.	Uses the CalEnviroScreen 3.0 definition.[1]
CEC	Uses the definitions appearing in AB-1550, SB-535 and SB-1000. Also includes California Native American Tribes.	Uses the CalEnviroScreen 3.0 definition.[1] Also uses disadvantaged unincorporated communities, rural, Title I communities (schools), ethnic-serving community college institutions (community colleges), highest unemployment and highest pollution burdens.

Agency	Low Income Households or Communities	Disadvantaged or Underserved Communities
Delaware Transit Corporation	Uses data from the American Community Survey (ACS) (ID: C17002, Ratio of Income to Poverty Level in the Past 12 Months). From that data, categorize those at less than or equal to 100% of the poverty line as low-income households.	Instructed under Federal Transit Administration Circular 4702.1B and Delaware State Code Title 2, Chapter 13, Section 1309, to determine populations as disadvantaged for the purpose of its service equity analysis. While the planning team uses various resources and population groups to "calibrate, investigate and understand" the makeup of statewide communities, the equity analysis includes only three determining factors: low-income, racial minorities and limited English proficiency (LEP).
Fresno COG	Definition is application-dependent and one of the following: • 150% above poverty. • Consistent with SB-535.	Definition is application-dependent: • May be transit-dependent populations. • For EJ analysis, defined as populations that are minority and/or low-income.
Maryland Transit Administration	Uses the following definitions of what constitutes a low-income household based on set thresholds[2]: • *Core Bus*: Less than or equal to $44,999 household income. • *Commuter Bus*: Less than or equal to $44,999 household income. • *MARC Commuter Rail*: Less than or equal to $44,999 household income. • *Light RailLink*: Less than or equal to $39,999 household income. • *Metro SubwayLink*: Less than or equal to $44,999 household income. The percentage of low-income households within each service area is defined as the number of low-income households divided by the total number of households.	No definition
Massachusetts DOT	*Low-income households*: Apply 65% of the statewide median household income. *Low-income communities*: Compare the tract/town median household income to the household number identified above.	No definition
Minnesota DOT	Generally uses a definition of a person whose household income (or in the case of a community or group, whose median household income) is at or below the U.S. Department of Health and Human Services poverty guidelines. Uses different definitions for low-income households and communities for different purposes: • *Safe Routes to School.* The equity score includes the percent of students eligible for free and reduced-price lunch.	No consistent definition. Generally uses the populations identified in Title VI and the EJ executive order as well as persons age 65 and older, age 17 and younger, LEP, individuals with a disability, and households with zero vehicles.

Agency	Low Income Households or Communities	Disadvantaged or Underserved Communities
	• *Student Transportation Equity for Priority Populations (STEPP)*. The score includes a variety of variables measuring economic status: the percent of the population below 185% of the federal poverty threshold, the per-capita income, the unemployment rate and the percent of the population living in poverty.	
Rhode Island DOT	Based on Transportation Equity Benefit Analysis (TEBA) requirement and census data.[3]	Based on TEBA requirement and census data.[3]
SBCAG	Uses two low-income screening methods: • Block groups with average household income below 80% of regionwide median income. • Block groups with higher than the regionwide average for impoverished households.	Until the next Regional Transportation Plan (RTP) is adopted in August 2021, the agency relies on San Diego Association of Governments' (SANDAG's) methodology, applied locally. The updated RTP will contain a methodology that assesses concentration of low-income, minority, limited English, no vehicle, elderly and educational attainment. (See Supporting Documents on page 22 for SANDAG's definition of disadvantaged communities.)

1 CalEnviroScreen identifies disadvantaged communities using SB-535 guidance.

2 Thresholds for "low-income" were set separately for each mode service area using the U.S. Housing and Urban Development (HUD) FY2019 median family income limits summary and ACS 2013-2017 Five-Year estimates:

- The average household size within the service area of each mode was determined and rounded to the nearest whole number.
- For each mode, the average rounded household size was referenced against area median family income for the "very low (50 percent)" income limits within the Baltimore-Columbia-Towson, Maryland, Metropolitan Statistical area.
- To match with census and survey income limit divisions, this figure was rounded to the nearest income division (break point) identified in U.S. Census Table B19001, "Household Income in the Past 12 Months."

3 See page 23 for *Title VI Report 2020*, which describes TEBA.

Supporting Documents

Federal Highway Administration

Environmental Justice Analysis in Transportation Planning and Programming: State of the Practice, Hannah Twaddell, Beth Zgoda, David Aimen and Anne Morris, Federal Highway Administration, February 2019.
https://www.fhwa.dot.gov/environment/environmental_justice/publications/tpp/fhwahep19022.pdf
From the abstract: This report documents the state of the practice among [s]tate [d]epartments of [t]ransportation (DOTs) and [m]etropolitan [p]lanning [o]rganizations (MPOs) regarding how these agencies are considering and addressing environmental justice concerns in their transportation planning and programming process. Based on a detailed scan of publicly available planning and programming documents for all 52 DOTs and a sample of 100 MPOs, the report chronicles commonly applied techniques and emerging new approaches for conducting EJ assessments. … The report concludes with a discussion of overarching best practices observed: integrating EJ analyses with plans and programs, and using EJ analyses to support decision making.

State of California

Assembly Bill No. 1550 (AB-1550), Greenhouse Gases: Investment Plan: Disadvantaged Communities, California Legislative Information, September 2016 (Chaptered).
http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB1550
From the bill text:

> "Low-income households" are those with household incomes at or below 80 percent of the statewide median income or with household incomes at or below the threshold designated as low income by the Department of Housing and Community Development's list of state income limits adopted pursuant to Section 50093.

> "Low-income communities" are census tracts with median household incomes at or below 80 percent of the statewide median income or with median household incomes at or below the threshold designated as low income by the Department of Housing and Community Development's list of state income limits adopted pursuant to Section 50093.

Senate Bill No. 1000 (SB-1000), Land Use: General Plans: Safety and Environmental Justice, California Legislative Information, September 2016 (Chaptered).
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1000
From the bill text:

> "Low-income area" means an area with household incomes at or below 80 percent of the statewide median income or with household incomes at or below the threshold designated as low income by the Department of Housing and Community Development's list of state income limits adopted pursuant to Section 50093.

> "Disadvantaged communities" means an area identified by the California Environmental Protection Agency pursuant to Section 39711 of the Health and Safety Code or an area that is a low-income area that is disproportionately affected by environmental pollution and other hazards that can lead to negative health effects, exposure, or environmental degradation.

Senate Bill No. 535 (SB-535), California Global Warming Solutions Act of 2006: Greenhouse Gas Reduction Fund, California Legislative Information, September 2012 (Chaptered).
http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB535
From the bill text:

> The California Environmental Protection Agency shall identify disadvantaged communities for investment opportunities related to this chapter. These communities shall be identified based on geographic, socioeconomic, public health, and environmental hazard criteria, and may include, but are not limited to, either of the following:

> > (a) Areas disproportionately affected by environmental pollution and other hazards that can lead to negative public health effects, exposure, or environmental degradation.

> > (b) Areas with concentrations of people that are of low income, high unemployment, low levels of homeownership, high rent burden, sensitive populations, or low levels of educational attainment.

CalEnviroScreen 3.0 (updated June 2018), California Office of Environmental Health Hazard Assessment, 2020.
https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30
An FAQ page on this web site notes that CalEnviroScreen was developed "as part of CalEPA's [California Environmental Protection Agency's] environmental justice program. CalEnviroScreen is being used to identify communities that face multiple burdens of pollution and socioeconomic disadvantage. This information helps CalEPA to prioritize its work in the state's most burdened communities." Among its uses is identifying the census tracts that will be considered disadvantaged communities for purposes of SB-535.

San Diego Association of Governments

2021 San Diego Regional Active Transportation Program (ATP) Call for Projects, San Diego Association of Governments, undated.
https://www.sandag.org/uploads/projectid/projectid_483_28072.pdf
From page 4: San Diego Forward: The Regional Plan defines Disadvantaged Communities as minority, low-income and senior populations.

- The term "minority" as used by SANDAG is described by the Federal Highway Administration as: Black (having origins in any of the black racial groups of Africa); Hispanic (of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race); Asian American (having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands); or American Indian and Alaskan Native (having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition).

- Low-income populations are those with income levels below 200 percent of the Federal Poverty Rate.

- Senior populations include anyone 75 years old and older.

Appendix H, Social Equity: Engagement and Analysis, San Diego Forward: The Regional Plan, San Diego Association of Governments, October 2015.
https://www.sdforward.com/pdfs/RP_final/AppendixH-SocialEquityEngagementandAnalysis.pdf
From page 11 of the document, page 12 of the PDF: After examining mapped data using both the previous indicators and various populations proposed for a social equity analysis, and with input from the social equity stakeholders, SANDAG then selected three population groups that represent the disadvantaged communities that are analyzed in the Regional Plan: (1) minorities, (2) low-income populations, and (3) seniors. … The threshold for seniors selected was 75 and older. … For low-income, the threshold selected was 200 percent of the 2012 federal poverty level.

Santa Barbara County Association of Governments

Active Transportation Program: Regional Definition of Disadvantaged Communities, Memorandum to California Transportation Commission, Santa Barbara County Association of Governments, May 2018.
See Attachment A.
This letter and supporting documentation, submitted to the California Transportation Commission in connection with the Active Transportation Program, provides a regional definition for communities of concern. These community designations include minority, low-income, low-mobility and low community engagement.

Rhode Island

Title VI Report 2020, Division of Statewide Planning, Rhode Island Department of Transportation, October 2020.
http://www.planning.ri.gov/documents/trans/ppplep/Title-VI-Report-2020_with_appendices-FINAL.pdf
See page 13 of this publication for a description of the agency's Transportation Equity Benefit Analysis (TEBA), which "provides a transportation equity analysis, bridging select population group (SPG) data with STIP [State Transportation Improvement Program] project locations and investments to assess equitable distribution of transportation resources and access to public transit."

State of Rhode Island Transportation Improvement Program FFY 2017-2025, Division of Planning, Rhode Island Department of Administration, Amended July 2017.
http://www.planning.ri.gov/documents/tip/ffy17_25/RI_STIP17-25-Final%20-%20112717.pdf
A discussion of the agency's TEBA begins on page 61.

Elements of the Equity Analysis

Described below are some of the critical elements of the equity analyses respondents conduct:

- Population variables.
- Spatial or geographic-based variables.
- Numerical thresholds.
- Analysis level.
- Geographic unit of analysis.

Population Variables

Tables 2 and 3 identify the stratification of the population groups included in respondents' equity analyses.

Table 2. Stratification of Population Groups: Survey Respondents

Agency	Ethnic Minority	Female	Foreign Born	Households Receiving Public Assistance	Households With No Car	LEP	Low Income	No High School Education
AMBAG	X				X	X	X	X
CEC[1]	X				X		X	
Delaware Transit Corporation						X	X	
Fresno COG	X				X	X	X	X
Maryland Transit Administration						X	X	
Massachusetts DOT	X					X	X	
Minnesota DOT	X	X		X	X	X	X	
Rhode Island DOT[2]	X				X	X	X	
SBCAG	X				X	X	X	X

Agency	Ethnic Minority	Female	Foreign Born	Households Receiving Public Assistance	Households With No Car	LEP	Low Income	No High School Education
Wisconsin DOT	X		X			X		
Total	8	1	1	1	6	9	9	3

Table 3. Stratification of Population Groups: Survey Respondents (continued)

Agency	Older Adults/ Seniors	Over 65	Over 75	People With Disabilities	Racial Minority	School Age Children	Single Parent Families	Transit Dependent Households	Under 18	Youth
AMBAG	X	X		X	X					
CEC[1]					X			X		
Delaware Transit Corporation					X					
Fresno COG			X	X	X		X	X		
Maryland Transit Administration					X					
Massachusetts DOT					X					
Minnesota DOT	X	X	X	X	X	X		X	X	X
Rhode Island DOT[2]	X			X	X	X		X		
SBCAG			X		X					
Wisconsin DOT	X	X	X	X	X				X	
Total	4	3	4	5	10	2	1	4	2	1

1 CEC also uses transportation costs, nonattainment areas and people in certain climate zones. (CEC established 16 climate zones for use in establishing energy budgets. Each zone "has a unique climatic condition that dictates which minimum efficiency requirements are needed for that specific climate zone.")

2 Rhode Island identifies five LEP language groups: Spanish or Spanish Creole, Portuguese or Portuguese Creole, Chinese, French Creole and Mon-Khmer Cambodian.

The CARB respondent noted that the stratification of population groups differs by funding program and the benefit provided by the funding program. In the Sustainable Transportation Equity Project (STEP) grant program, applicants are asked to define their community, identify hard-to-reach residents in their community and describe how they will focus transportation services on those hard-to-reach residents.

Table 4 supplements survey findings with data culled from Table A-12, Agencies Studied, which appears in the recently published TCRP Research Report 214: Equity Analysis in Regional Transportation Planning Processes; Volume 2: Research Overview. (See page 53 for more information about TCRP Research Report 214.) Data associated with the following agencies appears in the table:

- Atlanta Regional Commission (ARC).
- Delaware Valley Regional Planning Commission (DVRPC) (Philadelphia).
- Mid-America Regional Council (MARC) (Kansas City, Missouri).
- Madison Area Transportation Planning Board (MATPB) (Madison, Wisconsin).

- Mid-Ohio Regional Planning Commission (MORPC) (Columbus, Ohio).
- Metropolitan Planning Commission (MTC) (San Francisco Bay Area).
- North Central Texas Council of Government (NCTCOG) (Arlington, Texas).
- Oregon Metro (Portland, Oregon).
- Southern California Association of Governments (SCAG).

Table 4. Stratification of Population Groups: Other Transportation Agencies

Factor	ARC	DVRPC	MARC	MATPB	MORPC	MTC	NCTCOG	Oregon Metro	SCAG	Total
Carless Household		X	X	X	X	X	X		X	7
Cost-Burdened Renter						X				1
Female Head of Household		X					X			2
Foreign-Born									X	1
Household in Poverty		X		X						2
Individual Without a High School Diploma									X	1
LEP		X				X	X	X	X	5
Low-Income	X		X		X	X	X	X	X	7
Minority	X	X	X	X	X	X	X	X	X	9
People With a Disability		X	X		X	X	X		X	6
Senior/Elderly/Older Adults		X	X		X	X		X	X	6
Single-Parent Family						X				1
Veteran			X							1
Young Person/Children								X	X	2
Total	2	7	6	3	5	8	6	5	9	

Supporting Documents

California Building Climate Zones, California Energy Commission, January 2018.
https://cecgis-caenergy.opendata.arcgis.com/datasets/549017ee96e341d2bbb3dd0c291a9112_0
From the web site: Building Climates Zones of California Climate Zone Descriptions for New Buildings—California is divided into 16 climatic boundaries or climate zones, which is incorporated into the Energy Efficiency Standards (Energy Code). Each [c]limate zone has a unique climatic condition that dictates which minimum efficiency requirements are needed for that specific climate zone.

<u>Spatial or Geographic-Based Variables</u>

Three respondents described geographic-based variables that supplement the population-based variables used in their equity analyses:

- *CEC*. Degree-days by low-income community/disadvantaged community by state regions.
- *Fresno COG*. A spatial dataset such as CalEnviroScreen is sometimes used, as is proximity to bus stops.
- *Rhode Island DOT*. Geographic information system (GIS) software is used to identify the locations of concentrated select population groups and designated select population group tracts. Maps identifying these locations are included within the mapping component of the agency's transportation equity benefit analysis.

<u>Numerical Thresholds</u>

Some respondents described numerical thresholds that are used to identify concentrations of the population groups considered in an equity analysis. Table 5 summarizes survey responses.

Table 5. Numerical Thresholds Used in Equity Analyses

Agency	Threshold Example or Description
CARB	The California Climate Investments[1] statewide initiative includes investment targets for low-income and disadvantaged communities set by statute; each program has investment goals to help meet those targets. For STEP, 100% of the funds benefit low-income and/or disadvantaged communities.
CEC	CEC uses Percent Energy Savings Assistance program low-income customers who are renters in investor-owned utility territories.
Fresno COG	In the agency's last RTP, traffic analysis zones that had a minority/low-income share of at least 35% were considered EJ zones.
Maryland Transit Administration	If associated with a Title VI Service Equity Analysis or Fare Equity Analysis, a threshold for a Disparate Impact (Minority) or Disproportionate Burden (Income) is applied when there is a 10% difference between the demographics of the impacted riders or community and that of the service area for the mode.
Massachusetts DOT	The agency uses statewide average thresholds that are binary—either above or below the average.
Minnesota DOT	Thresholds vary by purpose. In some analyses, a threshold is not used. When one is, it is often either a statewide or regional average.
SBCAG	The agency compares the top 20% of census block groups to regionwide average.

1 The CARB web site describes California Climate Investments as "a statewide initiative that puts billions of [c]ap-and-[t]rade dollars to work reducing greenhouse gas emissions, strengthening the economy and improving public health and the environment—particularly in disadvantaged communities, low-income communities and low-income households."

The Delaware Transit Corporation respondent stated that no threshold is applied to allow for consistency over a long period of time, noting that "population changes can skew the need for this kind of analysis."

<u>Analysis Level</u>

Agencies can apply equity analyses at varying levels of granularity. Respondents' application of equity indicators ranges from the most granular—at the project level—to a statewide

assessment. Almost all respondents conduct programwide analyses and many conduct multilevel analyses. Table 6 summarizes survey responses.

Table 6. Application of Equity Indicators

Agency	Project	Program	Corridor	Local (City or County)	Regional	Statewide
AMBAG					X	
CARB	X	X				
CEC[1]	X	X			X	X
Delaware Transit Corporation				X		X
Fresno COG		X			X	
Maryland Transit Administration[2]	X	X		X		
Massachusetts DOT[3]	X	X				
Minnesota DOT	X	X			X	X
Rhode Island DOT		X				X
SBCAG	X	X	X	X	X	
Wisconsin DOT		X				
Total	**6**	**9**	**1**	**3**	**5**	**4**

1 The agency also applies equity indicators by census tract, ZIP code and county.

2 The agency also evaluates equity indicators for its service area, which includes Baltimore City and portions of the surrounding counties.

3 The agency compares eastern Massachusetts to western Massachusetts (different densities).

Geographic Unit of Analysis

Table 7 identifies the geographic units of analysis applied in respondents' analysis. Most reported the use of census tracts.

Table 7. Geographic Units Used for Analysis

Agency	Census Block Groups	Census Blocks	Census Tract	Transportation Analysis Zone
AMBAG			X	
CARB			X	
CEC		X	X	
Delaware Transit Corporation	X			
Fresno COG	X		X	X
Maryland Transit Administration	X			
Massachusetts DOT[1]			X	

Agency	Census Block Groups	Census Blocks	Census Tract	Transportation Analysis Zone
Minnesota DOT²	X	X		
Rhode Island DOT			X	
SBCAG	X			
Total	**5**	**2**	**6**	**1**

1 The agency includes municipalities in its equity analysis.

2 Some equity analyses use a uniform hexagonal grid as described in the publication below:

> **Statewide Bicycle/Pedestrian Suitability Analysis**, Eric DeVoe, Office of Traffic Engineering, Minnesota Department of Transportation, June 2019.
> http://www.mndot.org/consult/documents/notices/1035802attachment.pdf
> This document describes the prioritization process for reviewing projects for bicycle and pedestrian accommodations. The author notes that to "avoid issues with updates to the LRS [linear referencing system] and ensure continuity across geographies, the entire state was divided into 522,263 equal sized hexagons. Each hexagon is approximately 104 acres .…"

Examples of Equity Indicators

Respondents described equity indicators in the following categories:

- Accessibility.
- Affordability.
- Connectivity.
- Efficiency.
- Environment.
- Health.
- Housing.
- Jobs.
- Mobility.
- Safety.
- Travel time.
- Vehicle miles traveled (VMT).

Tables 8 through 19 present the equity indicators described by respondents in these 12 categories. Table 20 presents equity indicators that did not fall into one of the categories above.

Note: All CARB responses are related to the STEP grant program and may also reference California Climate Investments programs. See Supporting Documents beginning on page 35 for information about both programs.

The Massachusetts DOT respondent described equity indicators used to score applications submitted to two programs:

- Massachusetts Bay Transportation Authority (MBTA) capital investment plan (CIP) scoring.
- Massachusetts DOT highway CIP scoring.

Table 8. Accessibility Equity Indicators

Agency	Accessibility Indicator or Metric
CARB	Applicants are asked to qualitatively address how the proposed project will provide accessibility benefits.
CEC	• Clean energy jobs • Electric mobility • Electric vehicle chargers • Number served • Rooftop solar • Small business contracting
Delaware Transit Corporation	Judged by facilities team following Americans with Disabilities Act (ADA) standards for stops; considers ridership data and changes in Census Bureau ACS data.
Fresno COG	• Access to transit • Percentage of population that lives within 1/4 mile of a transit stop or an active transportation facility
Maryland Transit Administration	Evaluates whether a disparate impact exists for proposed changes to transit service or fares; also monitors access to jobs, hospitals, grocery stores, medical centers, etc.
Massachusetts DOT	*Impact on accessibility*. Score based on the project's ability to improve system accessibility. Accessibility improvements can include infrastructure such as elevators and high-level platforms as well as technology improvements such as audio announcements (MBTA CIP).
Minnesota DOT	• Percentage of state-owned sidewalk miles substantially compliant with ADA standard • Percentage of state highway curb ramps that are compliant with ADA requirements • Percentage of eligible state highway intersections with accessible pedestrian signals installed • Percentage of the state's communities whose span of transit service meets the minimum guidelines each year
SBCAG	• 75+ years • No vehicle

Table 9. Affordability Equity Indicators

Agency	Affordability Indicator or Metric
CARB	Applicants are asked to qualitatively address how the proposed project will provide affordability benefits. All California Climate Investments programs are required to quantify travel cost savings to the transportation users, if applicable.
CEC	• High energy bills • Rooftop solar • Reduce transportation costs in rural areas
SBCAG	Low-income/impoverished

Table 10. Connectivity Equity Indicators

Agency	Connectivity Indicator or Metric
CARB	Applicants are asked to qualitatively address how the proposed project will provide connectivity benefits.
CEC	• Electric mobility • Electric vehicle chargers
Massachusetts DOT	*Impact on connectivity to employment centers.* Score based on whether the project improves connectivity to major employment centers in the inner core (MBTA CIP). *Connectivity.* Score based on a project's ability to create or complete connections for other modes of travel (highway CIP).
Minnesota DOT	• Freeway congestion • Interstate reliability • Number of jobs within 30-minute bike commute (in development) • Number of jobs within 30-minute car commute • Number of jobs within 30-minute transit commute

Table 11. Efficiency Equity Indicators

Agency	Efficiency Indicator or Metric
CARB	Applicants are asked to qualitatively address how the proposed project will provide reliability benefits. All California Climate Investments programs are required to quantify energy and fuel cost savings to the transportation operators, if applicable.
CEC	• High energy bills • Energy efficiency: savings, amount invested, number served
Massachusetts DOT	Evaluates design, construction, right of way, environmental, utility and other risks (highway CIP).
Minnesota DOT	Incident clearance time

Table 12. Environment Equity Indicators

Agency	Environment Indicator or Metric
CARB	Applicants are asked to qualitatively address how the proposed project will provide environmental benefits. All California Climate Investments programs are required to quantify greenhouse gas (GHG) emission reductions and other pollution reduction benefits (NOx, PM2.5, diesel particulate matter, reactive organic gas), if applicable. STEP was designed to only fund projects that will reduce GHG emissions.
CEC	• Electric mobility • Energy consumption

Agency	Environment Indicator or Metric
Massachusetts DOT	Scoring includes criteria related to air quality and GHG reduction and reducing pollution and/or consumption of natural resources (MBTA CIP). Scoring includes criteria related to air quality and GHG reduction, stormwater mitigation, wetlands impacts and mitigation, wildlife impacts and mitigation, resiliency mitigation, and cultural resources/open space (highway CIP).
Minnesota DOT	• Criteria pollutants • GHG emissions from the transportation sector • Road salt usage • VMT per capita • Winter severity index
SBCAG	Assessed via California Environmental Quality Act (CEQA).

Table 13. Health Equity Indicators

Agency	Health Indicator or Metric
CARB	All California Climate Investments programs are required to provide data to help CARB quantify heart and lung health co-benefits of projects, if applicable.
CEC	Health and safety issues abated
Fresno COG	Air contaminant exposure measured by the percentage of EJ population living within 500 feet of a major roadway
Massachusetts DOT	*Benefits to EJ communities*. Score based on the project's positive environmental impacts targeting an EJ community. *Air quality and GHG reduction* (highway CIP scoring). Score based on a project's ability to meet the state goals of improving air quality and reducing GHG.
Minnesota DOT	• Annual percent of Minnesota DOT omnibus survey respondents perceiving safe environments for bicycling/walking • Criteria pollutants • Noise

Table 14. Housing Equity Indicators

Agency	Housing Indicator or Metric
CARB	Applicants are asked to qualitatively address how the proposed project will support affordable housing, and vice versa.
CEC	Housing tax credits for energy upgrades
Fresno COG	New units, by type, in EJ versus non-EJ areas
SBCAG	Low-income/impoverished

Table 15. Jobs Equity Indicators

Agency	Jobs Indicator or Metric
CARB	Applicants are asked to qualitatively address how the proposed project will provide workforce development benefits. All California Climate Investments programs are required to estimate jobs supported (direct, indirect and induced full-time equivalent) and track jobs benefits.
CEC	• Clean energy jobs • Training
Fresno COG	*Average number of jobs*. This measure estimates the average number of jobs there are within a specified travel time.
Massachusetts DOT	*Impact on connectivity to employment centers*. Score based on whether the project improves connectivity to major employment centers in the inner core (MBTA CIP). *Workforce commuting and accessibility, and improvements to an existing labor market* (highway CIP).
Minnesota DOT	Women and minorities working in highway construction, participating in on-the-job training or working at Minnesota DOT
SBCAG	• 75+ years • Education • LEP • No vehicle

Table 16. Mobility Equity Indicators

Agency	Mobility Indicator or Metric
CARB	Applicants are asked to qualitatively address how the proposed project will provide mobility benefits.
CEC	• Electric mobility (cars, transit, transportation network companies) • Rural clean mobility
Fresno COG	Ease of reaching destinations as measured by the percentage of commuters who can get to work within a given period of time (total time traveled). Indicator is measured by calculating average travel time during the peak commute to desired destination.
Massachusetts DOT	MBTA CIP: • Impact on accessibility • Impact on customer experience • Impact on reliability • Number of riders affected Highway CIP: • Connectivity • Effect on bicycle mobility and accommodations • Effect on motor vehicle mobility and congestion • Effect on pedestrian mobility and accommodations • Effect on transit mobility and accommodations

Agency	Mobility Indicator or Metric
Minnesota DOT	• Annual Greater Minnesota transit ridership • Annual Twin Cities Metro Area transit ridership • Percentage of the state's communities whose span of transit service meets the minimum guidelines each year
SBCAG	• 75+ years • No vehicle

Table 17. Safety Equity Indicators

Agency	Safety Indicator or Metric
CARB	Applicants are asked to qualitatively address how the proposed project will provide safety benefits.
CEC	Health and safety issues abated
Massachusetts DOT	*Impact on safety of customers and employees*. Based on whether a project's primary purpose is to address a documented or identified safety issue (MBTA CIP). Highway CIP: • Existing bicycle safety conditions • Existing motor vehicle safety conditions • Existing pedestrian • Improvement to motor vehicle safety • Proposed improvements • Proposed improvements safety conditions • Road safety audits
Minnesota DOT	• Total number of fatalities on Minnesota roadways resulting from crashes involving a motor vehicle each year • Total number of serious injuries on Minnesota roadways resulting from crashes involving a motor vehicle each year

Table 18. Travel Time Equity Indicators

Agency	Travel Time Indicator or Metric
Fresno COG	Ability to move throughout the region within a reasonable amount of time, measured by calculating average travel time on highways and transit during peak travel time (delay/congestion)
Massachusetts DOT	*Impact on reliability.* Score based on the project's anticipated benefits to reliability, which is defined in the MBTA Service Delivery Policy as consistent headways on frequent services and on-time performance on infrequent services (MBTA CIP). *Effect on motor vehicle mobility and congestion.* Score based on the project's ability to improve travel time for single occupancy motor vehicles (highway CIP).
Minnesota DOT	• Annual per capita delay • Federal reliability measures
SBCAG	Assessed via CEQA

Table 19. Vehicle Miles Traveled Equity Indicators

Agency	Vehicle Miles Traveled Indicator or Metric
CARB	All California Climate Investments programs are required to quantify VMT reductions, if applicable. STEP was designed to only fund projects that will reduce VMT.
Minnesota DOT	VMT per capita
SBCAG	Assessed via CEQA and consistent with SB-375[1] and SB-743[2]

1 The Sustainable Communities and Climate Protection Act of 2008.

2 The bill updates the way transportation impacts are measured in California for new development projects, ensuring they are built in a way that allows Californians more options to drive less.

Table 20. Other Equity Indicators

Agency	Other Indicator or Metric
CARB	*Level of community engagement*. This was particularly important for STEP. The most sure way to equitably develop and implement projects is for those projects to be identified, developed, implemented and evaluated by and with the community residents who will benefit from those projects. STEP required this level of engagement and also qualitatively evaluated this engagement. All California Climate Investments programs are required to assess community engagement levels through a questionnaire, if applicable.
CEC	Consumer protection
Massachusetts DOT	Both MBTA and highway CIP scores for projects include criteria on social equity and health effects, including impact on Title VI and EJ populations.

Three respondents described efforts underway to develop, evaluate or expand on equity indicators or metrics:

- *CARB* is working with University of California, Berkeley and STEP grantees to develop community-specific metrics that the Berkeley research team will use to evaluate the success of the funded projects from the community's perspective.

- *Massachusetts DOT* is currently undergoing a strengths, weaknesses, opportunities and threats (SWOT) analysis related to its CIP scoring.

- *Minnesota DOT* is working with Texas Transportation Institute on an equity metrics research project in process that will consider both qualitative and quantitative measures. See page 39 for a project description.

Other California Agencies' Equity Indicators

A limited literature search identified equity indicators used by California agencies not responding to the survey:

Metropolitan Transportation Commission (San Francisco Bay Area)
- *Healthy and Safe Communities* (Performance Target #3). To measure the health benefits and burdens associated with air quality, road safety and physical inactivity for high- and low-income households.

- *Equitable Access* (Performance Target #5). To measure a lower-income household's share of income consumed by transportation and housing costs compared to a higher-income household.
- *Equitable Access* (Performance Target #6). To measure the share of affordable housing in Priority Development Areas (PDAs), Transit Priority Areas (TPAs) or High-Opportunity Areas (HOAs) within and outside communities of concern (CoCs).
- *Equitable Access* (Performance Target #7). To measure the share of low- and moderate-income households in PDAs, TPAs and HOAs that are at an increased risk of displacement within and outside CoCs.
- *Economic Vitality* (Performance Target #8). To measure the share of jobs that are accessible by auto and transit in congested conditions within and outside CoCs.
- *Economic Vitality* (Performance Target #9). To measure the share of middle-wage jobs in the region within and outside CoCs.

MTC uses the following definitions of population groups critical to the equity analysis:
- Defines persons as low income if they live in a household with incomes less than 200% of the federal poverty level established by the Census Bureau. (MTC established the 200% threshold in 2001 to account for the Bay Area's high cost of living relative to the rest of the country.)
- Defines CoCs as census tracts that have a concentration of both minority and low-income residents, or that have a concentration of low-income residents and any three or more of the following six disadvantage factors: persons with LEP, zero-vehicle households, seniors age 75 years and over, persons with one or more disability, single-parent families and renters paying more than 50% of their household income on housing.

Los Angeles County Department of Regional Planning
The county developed its web-based Equity Indicators Tool to display "socioeconomic, demographic and other information to identify areas that are experiencing greater degrees of challenges." The mapping tool displays the following indicators at the county and neighborhood levels:

- Educational attainment.
- Income.
- Unemployment.
- Homeless counts.
- Housing cost burden.
- Pollution burden.
- Overcrowding.
- School quality.
- High segregation and poverty.
- Park need.

Supporting Documents

California Air Resources Board

California Climate Investments, California Air Resources Board, 2020.
https://ww2.arb.ca.gov/our-work/programs/california-climate-investments
From the web site: California Climate Investments (CCI) is a statewide initiative that puts billions of [c]ap-and-[t]rade dollars to work reducing greenhouse gas emissions, strengthening the economy and improving public health and the environment—particularly in disadvantaged communities, low-income communities and low-income households.

Related Resource:

CCI Co-Benefit Assessment Methodologies, California Air Resources Board, 2020.
https://ww2.arb.ca.gov/resources/documents/cci-methodologies
From the web site: California Climate Investments support the [s]tate's climate change goals and provide many additional benefits to individuals, households, businesses and communities. These "co-benefits" include social, economic and environmental benefits. CARB provides guidance on quantification methods and reporting to administering agencies. CARB contracted with the University of California, Berkeley (UC Berkeley) to help research and develop methods for evaluating project co-benefits. Guidance on using the co-benefit assessment methodologies is contained in CARB's Funding Guidelines.

Sustainable Transportation Equity Project (STEP), California Air Resources Board, 2020.
https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-investments-and-air-quality-improvement-program-1
From the web site: STEP is a new transportation equity pilot that aims to address community residents' transportation needs, increase access to key destinations, and reduce greenhouse gas emissions by funding planning, clean transportation, and supporting projects.

STEP's overarching purpose is to increase transportation equity in disadvantaged and low-income communities throughout California via two types of grants: Planning and Capacity Building Grants and Implementation Grants.

Low-Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents; Final Guidance Document, California Air Resources Board, February 2018.
https://ww2.arb.ca.gov/sites/default/files/2018-08/sb350_final_guidance_document_022118.pdf
From the abstract: Pursuant to the Clean Energy and Pollution Reduction Act of 2015, Senate Bill (SB) 350 (De León, Chapter 547, Statutes of 2015), the California Air Resources Board (CARB or Board) presents its findings on the barriers low-income residents, including those in disadvantaged communities, face to access zero-emission and near zero-emission transportation and mobility options, and recommendations to increase access. Recommendations establish a pathway to overcome these barriers statewide. This document supplements the California Energy Commission's "Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities" that presents the barriers and opportunities to expand low-income residents' access to energy efficiency, weatherization and renewable energy investments, and for small businesses contracting opportunities in disadvantaged communities. [See page 37 for CEC's Part A study.]

California Energy Commission

Energy Equity Indicators, California Energy Commission, 2020.
https://www.energy.ca.gov/rules-and-regulations/energy-suppliers-reporting/clean-energy-and-pollution-reduction-act-sb-350-3
From the web site: The CEC manages data known as Energy Equity Indicators to help identify opportunities to improve access to clean energy technologies for low-income customers and disadvantaged communities, increase clean energy investment in those communities, and improve community resilience to grid outages and extreme events.

The Energy Equity Indicators Tracking Progress Report provides a summary report of these indicators. It is updated periodically to track how recommendations from the Energy

Commission's Low-Income Barriers Study are being implemented, and to monitor the performance of state-administered clean energy programs in low-income and disadvantaged communities across the state.

The CEC also maintains maps and geospatial information on selected energy equity indicators. The base map highlights areas with median household income of $37,000 or less (60 percent of statewide median income for 2011-2015) and disadvantaged communities eligible for greenhouse gas reduction fund programs.

Related Resource:

Energy Equity Indicators Tracking Progress, California Energy Commission, June 2018. https://www.energy.ca.gov/sites/default/files/2019-12/energy_equity_indicators_ada.pdf
From the document: Adding to the Energy Commission's Tracking Progress reports, this report launches a set of energy equity indicators to identify opportunities and track progress for advancing the recommendations in the SB 350 Low-Income Barriers Study. This report includes nine indicators relating to clean energy access, investment and resilience in California's low-income and disadvantaged communities. Key themes emerging from these indicators are highlighted below, illustrating how the indicators apply in different areas of the state ….

Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities, California Energy Commission, December 2016. https://efiling.energy.ca.gov/getdocument.aspx?tn=214830
From the abstract: This study, mandated by Senate Bill 350, explores the barriers to and opportunities for expanding low-income customers' access to energy efficiency, weatherization and renewable energy investments. It also examines barriers and opportunities related to contracting with small businesses located in disadvantaged communities. This study provides recommendations intended to have a transformative effect on access to clean energy investments for low-income customers and local small businesses in disadvantaged communities.

Fresno Council of Governments

Appendix H, Environmental Justice Report, 2018 Regional Transportation Plan, Fresno Council of Governments, March 2018.
https://www.fresnocog.org/wp-content/uploads/2017/02/2018-RTP_Appendix-H_FINAL.pdf
See page 17 of the appendix (page 18 of the PDF) for a discussion of performance indicator results. Metrics are described in five categories: accessibility and mobility, reliability, financial, land use/housing and air quality.

Los Angeles County Department of Regional Planning

Equity Indicators Tool, Los Angeles County Department of Regional Planning, undated.
https://planning.lacounty.gov/equity
From the web site: On December 8, 2015, the Los Angeles County Board of Supervisors initiated the Equitable Development Work Program. The work program includes land use ordinances and other tools to ensure implementation of the Los Angeles County General Plan in a manner that allows County residents at all income levels to benefit from growth and development, encourages the preservation and production of safe and affordable housing, and reduces neighborhood health disparities.

Massachusetts

2021 Capital Investment Plan, Massachusetts Department of Transportation, undated.
https://www.mass.gov/doc/2021-capital-investment-program-cip-pdf/download
Discussion of the agency's social equity analysis begins on page 32 of the plan (page 36 of the PDF).

2020-2024 Capital Investment Plan Update, Massachusetts Department of Transportation, undated.
http://massdot.maps.arcgis.com/apps/MapJournal/index.html?appid=33a118c32b3f47b3b90a76 9498aa68bd# (StoryMap)
https://massdot.maps.arcgis.com/sharing/rest/content/items/4bf75feb30e148a080f5a890946806 69/data (text-only version)
An equity analysis begins on page 60 of the text-only version of the plan update (page 72 of the PDF).

Focus40: Positioning the MBTA to Meet the Needs of the Region in 2040, Massachusetts Department of Transportation, March 2019.
https://static1.squarespace.com/static/57757a3cff7c50f318d8aae0/t/5c9042690852294993eae6 2b/1552958096600/F40+Final+Book+Layout_V9-2019_03_13-508compliant.pdf
This publication, cited by the Massachusetts DOT respondent, identifies several equity-related indicators.

Metropolitan Transportation Commission

Plan BayArea 2040, Final Supplemental Report, Metropolitan Transportation Commission, Association of Bay Area Governments, July 2017.
https://mtc.ca.gov/sites/default/files/Final_Plan_Bay_Area_2040.pdf
Provides a general discussion of the plan's "seven goals and 13 performance targets covering three broad areas: the environment, equity and the economy. These aggressive and aspirational targets enable the plan to be evaluated by its performance in areas identified as key regional concerns, including equitable access, economic vitality and transportation system effectiveness."

Related Resources:

Equity Analysis Report, Plan BayArea 2040, Final Supplemental Report, Metropolitan Transportation Commission, Association of Bay Area Governments, July 2017.
http://2040.planbayarea.org/files/2020-02/Equity_Report_PBA%202040%20_7-2017.pdf
From Chapter 5, Analysis Results (page 5-1 of the report, page 68 of the PDF): This chapter summarizes the equity analysis results for the Draft Plan, incorporating relevant findings from related Title VI analyses (in the distribution of investment benefits and the spatial distribution of projects included in the plan, intended to satisfy federal nondiscrimination requirements) and environmental justice analyses (intended to address whether communities of concern [CoCs] are subject to disproportionately high and adverse effects).

Research Papers: Plan Bay Area 2040 Equity Analysis, Plan BayArea 2040, Metropolitan Transportation Commission, Association of Bay Area Governments, undated.
https://mtc.ca.gov/sites/default/files/meetings/packets/Reasearch%20Papers%20for%20RE WG%20Review.pdf
From page 2 of the research paper: Low-income and minority populations have somewhat similar travel behaviors compared to the broader population. But there are still some notable

differences. In addition, the needs of transportation-disadvantaged populations, such as youth, seniors and people with disabilities, vary substantially from the rest of the population, irrespective of income and race/ethnicity. This section describes the travel patterns of low-income and minority populations, with an emphasis on commute to work and neighborhood walkability. For additional details on travel behaviors and needs of seniors and people with disabilities, see the San Francisco Bay Area Coordinated Public Transit-Human Services Transportation Plan.

Minnesota

Research in Progress: Outcome Evaluation Metrics Related to Equity That Include Both Quantitative and Qualitative Measures, Minnesota Department of Transportation, start date: July 2020; expected completion date: not noted.
Project description at https://rip.trb.org/view/1678597
From the project description: This research project will synthesize previous research investigating equity assessments by MnDOT, academia and industry, leveraging these findings in concert with directly-collected community experience and staff expertise, to achieve the following objectives: 1) Establish a detailed understanding of current challenges and needs related to equity assessment in Minnesota; 2) Identification or development of assessment methods and equity-focused strategic actions that will improve the likelihood that transportation equity in Minnesota is assessed in a manner that achieves context-sensitive outcomes representative of the communities served; 3) Facilitate the adoption of identified or developed equity assessment methods and complementary strategic actions through a bespoke training program including information detailing the appropriate use cases, data requirements, and considerations.

Conducting Equity Analyses

Described below are the practices, data sources and tracking tools used by respondents to conduct equity analyses.

Analysis Method

Respondents identified the analysis methods used by their agencies to conduct the equity analysis from among the following:

- Activity-based.
- Geography-based.
- Population-based or population-weighted.
- Project mapping.
- Ridership-based.
- Travel demand model.
- Use-based.

All respondents use more than one method when conducting the analysis, most commonly geography, population and project mapping. Table 21 summarizes survey responses.

Table 21. Analysis Methods

Agency	Activity	Geography	Population	Project Mapping	Ridership	Travel Demand Model	Use
AMBAG		X				X	
CARB	X	X					
CEC	X	X	X				
Delaware Transit Corporation		X			X		
Fresno COG	X	X	X	X	X	X	
Maryland Transit Administration							
Massachusetts DOT		X	X	X		X	
Minnesota DOT		X	X	X	X		
Rhode Island DOT		X	X	X	X		X
SBCAG		X	X	X			
Wisconsin DOT	X			X			
Total	**4**	**9**	**6**	**6**	**4**	**3**	**1**

Data Sources

Respondents use a variety of data sources to inform and support their use of equity indicators. The most common sources derive from U.S. census data. Some respondents cited specific census data while others reported on internal data sources that include customer satisfaction surveys. Table 22 summarizes survey responses.

Table 22. Data Sources

Data Source	Agency	Description and/or Comments
American Community Survey (ACS)	AMBAG, Delaware Transit Corporation, Fresno COG, Maryland Transit Administration, Minnesota DOT	The Census Bureau's ACS is "a nationwide survey that collects and produces information on social, economic, housing and demographic characteristics about our nation's population every year." *Delaware Transit Corporation*. The agency uses Remix mapping software to identify other variables in the ACS data such as senior population, car-free households, people with disabilities and youth populations.
Customer Satisfaction Survey	Delaware Transit Corporation, Maryland Transit Administration, Minnesota DOT	*Maryland Transit Administration*. Annual customer satisfaction survey for Title VI equity analyses. *Minnesota DOT*. Omnibus survey, an annual survey that solicits the public's preferences, priorities and concerns.
GIS Tools	Rhode Island DOT	None provided
Public Use Microdata Sample (PUMS)	Fresno COG	PUMS, available through the ACS, allows data users to create custom estimates and tables that are not available through ACS pretabulated data products.

Data Source	Agency	Description and/or Comments
Transit Data	Delaware Transit Corporation, Maryland Transit Administration	*Delaware Transit Corporation*. Transit management data for miles and trips. *Maryland Transit Administration*. Origin and destination surveys for each mode.
U.S. Census	AMBAG, CEC, Delaware Transit Corporation, Maryland Transit Administration, Massachusetts DOT, Minnesota DOT, Rhode Island DOT, SCAG	None provided
Multiple Sources	CEC, Massachusetts DOT, Minnesota DOT	*CEC*: • Climate degree-day maps • Disadvantaged communities • Low-/middle-income communities • Qualitative project information • Zero-emission vehicle sales *Massachusetts DOT*: • Accessibility Observatory data (see *Supporting Documents* below) • Central Transportation Planning Staff regional travel demand model • Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics *(*LODES*)* data *Minnesota DOT*: • Agency internal data • Minnesota Department of Education school statistics • Partner agency data • State Pollution Control Agency monitoring data • StreetLight Data transportation analytics (see *Supporting Documents* below)

Supporting Documents

Access to Jobs Dashboard, Office of Transportation Planning, Massachusetts Department of Transportation, undated.
https://massdot.maps.arcgis.com/apps/webappviewer/index.html?id=134d560d26464ee6baf7b15c0446e5fd
From the web site:

General Information About The Accessibility Observatory (AO):
The data in this dashboard, from 2017, reflects the number of jobs that are reachable by various modes, at different times of day, within different travel times from each [c]ensus block group in Massachusetts. This data can be used to understand the impacts of congestion on travel time, and where there are gaps in job accessibility, among other applications. Special layers are included for Capital Investment Plan project scoring use by Mass[achusetts]DOT and MBTA staff.

American Community Survey (ACS), U.S. Census Bureau, undated.
https://www.census.gov/programs-surveys/acs
From the web site: The American Community Survey (ACS) helps local officials, community leaders and businesses understand the changes taking place in their communities. It is the premier source for detailed population and housing information about our nation.

Longitudinal Employer-Household Dynamics, U.S. Census Bureau, undated.
https://lehd.ces.census.gov/data/
From the web site:

> LEHD makes available several data products that may be used to research and characterize workforce dynamics for specific groups. These data products include online applications, public-use data, and restricted-use microdata. The Quarterly Workforce Indicators (QWI), LEHD Origin-Destination Employment Statistics (LODES), Job-to-Job Flows (J2J), and Post-Secondary Employment Outcomes (PSEO) are available online for public use. Confidential microdata are available to qualified researchers with approved projects through restricted access use in Federal Statistical Research Data Centers (FSRDCs).
>
> ….
>
> LEHD Origin-Destination Employment Statistics (LODES) used by OnTheMap [an online mapping analysis tool] are available for download below. Version 7 of LODES was enumerated by 2010 census blocks. Previous versions of LODES were enumerated with 2000 census blocks.

Public Use Microdata Sample (PUMS), U.S. Census Bureau, undated.
https://www.census.gov/programs-surveys/acs/microdata.html
From the web site: The Census Bureau's American Community Survey (ACS) Public Use Microdata Sample (PUMS) files enable data users to create custom estimates and tables, free of charge, that are not available through ACS pretabulated data products. The ACS PUMS files are a set of records from individual people or housing units, with disclosure protection enabled so that individuals or housing units cannot be identified.

StreetLight Data Frequently Asked Questions, Minnesota Department of Transportation, April 2019.
http://www.dot.state.mn.us/tda/streetlight-faq-041119.docx
The document describes the StreetLight Data application, which "allows users to analyze data gathered from multiple sources like GPS, INRIX [commercial provider of location-based data and analytics], commercial fleet management systems, and various collectors of mobile phone data, to determine how people and vehicles move."

Tracking Tools

Respondents were asked about the in-house or commercial tracking tools used in their equity analyses. Table 23 presents their responses. See *Supporting Documents* following the table for further details of selected tools referenced by respondents.

Table 23. Tracking Tools or Practices

Agency	Tool or Practice
CEC	Confer with CEC Energy Assessments Division
Delaware Transit Corporation	• *Esri ArcGIS*. Used to compile General Transit Feed Specification data. • *Remix*. Mapping software used to review routes in connection with demographic data. • *Trapeze*. Trip data derived from transit scheduling and operational software used to calculate daily miles and trip volumes.

Fresno COG	• Fresno COG activity-based model
	• *PopulationSim*. Used for population synthesis and survey weighting.
	• *Integrated Transport and Health Impact Model (ITHIM)*. Used by public agencies to assess the health impacts of:
	  o Updates to regional transportation plans
	  o Goals of state and local health and transportation agencies
	  o City and regional transportation projects and programs such as high speed rail and bike-sharing

Massachusetts DOT	• ArcGIS • Conveyal • TransCAD (Caliper Corporation)
Minnesota DOT	• *ArcGIS*. Used for spatial analysis related to equity. • *StreetLight Data*. Used to perform different types of analysis, from speed averages along segments of highway to more complex analyses. • *Tableau*. Used to visualize performance measures that guide decision-making.
Rhode Island DOT	Unspecified in-house tool

Supporting Documents

Impact Analysis: Evaluate Changes to Your Public Transportation System, Conveyal, undated.
https://www.conveyal.com/analysis
From the web site: Conveyal Analysis helps you evaluate changes to public transport systems using accessibility indicators. These indicators quantify the access to opportunities experienced by transit riders, such as the proportion of the regional job market reachable within 45 minutes of total walking and transit time.

ITHIM USA: Integrated Transport and Health Impact Model, November 2020.
http://cal-ithim.org/ithim/
From the web site's introduction page: ITHIM stands for Integrated Transport and Health Impact Model (ITHIM). The U.S. version of ITHIM is a planning tool that answers the question of "How much benefit or harm to human health can we expect by changing the mix of active and motorized travel across the nation?"

ITHIM contrasts one travel pattern that serves as a reference with an alternative that has a different profile of fine particulate air pollution from vehicle exhaust, physical activity from walking and cycling, and injuries from traffic collisions. ITHIM calculates the change in deaths, years of life shortening and disability, and costs due to these changes in air pollution, physical activity and traffic injuries.

PopulationSim, undated.
https://activitysim.github.io/populationsim
From the web site: PopulationSim is an open platform for population synthesis and survey weighting. It emerged from Oregon DOT's desire to build a shared, open, platform that could be easily adapted for statewide, regional, and urban transportation planning needs.

Remix, Remix, 2020.
https://www.remix.com/
Delaware Transit Corporation uses this planning platform that allows users to visualize data and the transportation network, and analyze the community and cost impacts of design.

Tableau, Tableau Software, LLC, 2020.
https://www.tableau.com/
Minnesota DOT uses this visual analytics platform.

TransCAD Transportation Planning Software, Caliper Corporation, undated.
https://www.caliper.com/tcovu.htm
From the web site: TransCAD is the first and only Geographic Information System (GIS) designed specifically for use by transportation professionals to store, display, manage and analyze transportation data.

Trapeze, Trapeze North America, undated.
https://www.trapezegroup.com/
This vendor markets systems to transit agencies to manage bus, rail and paratransit services.

Assessing Equity Analyses

Respondents assessed their equity analysis practices in the following areas:
- Evaluating effectiveness.
- Equity indicator successes.
- Equity indicator challenges.
- Recommendations.

Evaluating Effectiveness

Respondents reported on practices to evaluate the effectiveness of the equity indicators they use, with several noting ongoing efforts to strengthen and expand their use. Among the more notable efforts is Minnesota DOT's Advancing Transportation Equity Initiative. Table 24 presents survey responses.

Table 24. Evaluating Equity Indicator Effectiveness

Agency	Description
CEC	Evaluation of the agency's baseline measures is provided in Tracking Progress Reports.
CARB	• Research to conduct baseline and post-implementation evaluations of STEP-funded communities will help evaluate the success of STEP and the projects selected. • California Climate Investments staff members are beginning an internal equity assessment of funding programs to better understand how CARB can support equity in all California Climate Investments programs. • Evaluation is something CARB is continually thinking about and will probably evolve in the coming months and years.

Agency	Description
Fresno COG	Potential indicators are provided to an EJ subcommittee that considers which indicators are most effective at gauging impacts.
Massachusetts DOT	Equity measures associated with the agency's CIP are most frequently employed. Consistent with federal regulations, the agency executes an annual CIP equity analysis. Following each analysis, staff members review results and consider how to strengthen the equity indicators.
Minnesota DOT	• The agency's ongoing Advancing Transportation Equity Initiative includes the Community Conversations project, which aims to better understand transportation-related issues negatively impacting traditionally underserved and underrepresented communities in Minnesota (see *Supporting Documents* below). ○ The initiative includes individualized transportation equity labs, which help Minnesota DOT offices identify and pilot equity strategies and evaluate their effectiveness. • Agency performance measures are under review using an equity lens as part of a research project in progress (see page 39 for the project description). • Also under consideration is the inclusion of equity indicators in updates to several key state transportation plans in the next two years.
Rhode Island DOT	Application of equity indicators just started within the agency.
SBCAG	The agency holds an iterative process with its advisory committees to work through indicators and thresholds.

Supporting Documents

Advancing Transportation Equity Initiative, Planning and Programming, Minnesota Department of Transportation, undated.
https://www.dot.state.mn.us/planning/program/advancing-transportation-equity/
From the web site: MnDOT is undertaking the Advancing Transportation Equity initiative to better understand how the transportation system, services and decisions [*sic*]-making processes help or hinder the lives of people in underserved and underrepresented communities in Minnesota. Specifically, MnDOT wants to identify key actions that transportation agencies can take to make meaningful change. The underserved and underrepresented communities this initiative will [serve] include the following:

- Communities underrepresented in transportation processes
- Communities experiencing known inequities in access or outcomes
- Communities with unique transportation needs not well served by a business-as-usual approach

Direction for the initiative comes from Minnesota's Statewide Multimodal Transportation Plan (2017) and reaffirmed in MnDOT's current internal Strategic Operating Plan. The overall initiative includes two components—a Community Conversations pilot project and a Research Roadmap project. Additional phases are anticipated.

Related Resources:

Community Conversations Engagement Project, Planning and Programming, Minnesota Department of Transportation, undated.
https://www.dot.state.mn.us/planning/program/advancing-transportation-equity/community-conversations.html
From the web site: The Community Conversations project is a series of in-person conversations between MnDOT and individuals who work with and represent underserved

communities in Minnesota. Through these conversations MnDOT will learn directly from underserved communities regarding their unique experiences and struggles with transportation.

Research Roadmap, Research, Planning and Programming, Minnesota Department of Transportation, undated.
http://www.dot.state.mn.us/planning/program/advancing-transportation-equity/research.html
(Scroll down to "Research Roadmap (2019)")
From the web site: Through the Research Roadmap project, MnDOT identified and evaluated existing programs and initiatives addressing transportation equity. The objective of the Research Roadmap project was to understand the current state of practice and form recommendations for future transportation strategies that will meaningfully reduce disparities and identify areas where additional research is needed. This work was completed … in spring 2019. [See the February 2019 report cited below.]

Advancing Transportation Equity: Research and Practice, Yingling Fan, Andrew Guthrie, Leoma Van Dort and Gina Baas, Minnesota Department of Transportation, February 2019.
https://www.dot.state.mn.us/planning/program/advancing-transportation-equity/pdf/CTS%2019-08.pdf
From the abstract: This study seeks to create a better understanding of current research and practice and recommend future research and practice that can advance transportation equity in Minnesota. To that end, the research team conducted a literature review that summarizes recent developments in the field of transportation equity, reviewed existing equity-focused programs within and beyond the transportation sector, and engaged multiple stakeholder groups, including a project advisory group with experts in addressing disparities and inequities, a group of transportation users and equity stakeholders, and community members. The study presents a working definition of transportation equity, recommends action steps for MnDOT and its partners to consider in advancing transportation equity, and identifies directions for future research and practice that can advance transportation equity in the state of Minnesota.

Equity Indicator Successes

Informing decision-making and encouraging interest were among the successes respondents reported in connection with the use of equity indicators. Table 25 summarizes survey responses.

Table 25. Equity Indicator Successes

Impact	Agency	Description
Encouraging Interest	CARB, Fresno COG, Minnesota DOT	*CARB*. Lots of interest in STEP and many strong, community-focused STEP proposals will hopefully result in successful and equitable projects. *Fresno COG*. Public input on equity processes has been overwhelmingly positive; the agency seeks to add new capabilities that improve the equity analysis with each planning cycle. *Minnesota DOT*. Building a community of practice within the organization has led to multiple offices, districts and divisions using and evolving equity analyses.

Impact	Agency	Description
Informing Decision-Making	CEC, Massachusetts DOT	*CEC:* • Ability to adjust policies and investments as stakeholders provide feedback on elements of the indicators. • Formation of Disadvantaged Communities Advisory Group (DACAG)[1]. *Massachusetts DOT.* As the agency strengthens its analysis protocols, it is constantly exploring and incorporating new approaches to evaluating and addressing equity concerns.
Meeting Requirements	SBCAG	Satisfied requirements placed on the agency.

1 *From the CEC web site*: Formation of the DACAG was called for in Senate Bill 350, the Clean Energy and Pollution Reduction Act of 2015. The 11-member group meets several times a year to review CEC and CPUC [California Public Utilities Commission] clean energy programs and policies to ensure that disadvantaged communities, including tribal and rural communities, benefit from proposed clean energy and pollution reduction programs. Group members are either from or represent disadvantaged communities.

Equity Indicator Challenges

Respondents identified challenges or roadblocks encountered when developing and applying the equity indicators, and in some cases identified how they were mitigated. Table 26 summarizes survey responses.

Table 26. Equity Indicator Challenges

Challenge	Agency	Description
Competing Interests	CARB, Minnesota DOT	*CARB.* It has been challenging to develop equity metrics that work for so many varied and diverse communities, which is why STEP has focused on qualitative equity metrics and plans to identify unique metrics for each community. The quantitative metrics the agency uses (e.g., CalEnviroScreen) have their own challenges and don't capture all of the groups the agency would like to prioritize (e.g., tribal communities). *Minnesota DOT.* The respondent commented "establishing winners and losers when performing equity analysis."
COVID-19	CEC	The agency was on an "intentional path in applying indicators" when COVID-19 "provided some disruption."
Data	Fresno COG, Massachusetts DOT, Minnesota DOT	*Fresno COG.* Options were limited with the agency's previous four-step model, and finding feasible indicators that were easy to explain to the public was a challenge. Also, the granularity of the data (e.g., traffic zones) was so large that it was difficult to determine EJ populations without the use of arbitrary concentration metrics, which led to edge issues. With the development of the agency's activity-based model and population synthesizer, the agency has been able to do much more intuitive, robust and quantifiable analyses. *Massachusetts DOT.* Data is always a challenge. *Minnesota DOT.* Issues with data availability limit the effectiveness or use of the analysis. The agency is working to mitigate this through pilot projects and ongoing training

Challenge	Agency	Description
		initiatives. The respondent also noted that inconsistencies in data are problematic.
Methodology	SBCAG	The agency has only recently developed its own methodology; the respondent noted "there has been concern using the SANDAG methodology."
Working With Partners	CEC, Massachusetts DOT	*CEC*. Some equity measures are cross-agency. *Massachusetts DOT*. When doing federal equity reporting, the desire to extend the agency's analysis without violating historical precedent "can sometimes be alarming to our federal partners."

Recommendations

Respondents offered recommendations for other agencies planning to implement equity indicators, measures or metrics in transportation policy analysis and decision-making.

CARB:
- Vet the indicators, measures and metrics with equity advocates and public stakeholders. California is just starting to operate in this field; outside organizations have a lot more experience with this issue.
- Identify pitfalls in any metrics you plan to use and be prepared to answer for them. Be flexible in the use of metrics based on community and stakeholder input.
- Identify opportunities to use qualitative and/or community-specific metrics when possible. A lot of quantitative data doesn't tell the full equity story.

CEC:
- Conduct state cross-agency equity indicator meetings. Leverage breakouts for cross-agency chats and questions.
- Identify affected equity stakeholders first by geography; leverage synergy.
- Identify collective communications strategy across sectors (water, energy, transportation, air).

The respondent also noted that "[m]omentum is building across the agencies for equity indicators. From a community perspective, the state 'voices' can be confusing. Particularly true in tribal communities. Must address as local equity community capacity [is] difficult at this time."

Fresno COG:
- Public outreach is critical. The agency's EJ subcommittee has been an excellent resource for helping to accurately and meaningfully gauge equity indicators.
- If possible, remove as much arbitrariness from the analysis as possible, such as determining concentration thresholds. While sometimes arbitrariness is unavoidable, limiting it will lead to a more defensible methodology.

Massachusetts DOT:

- Take the time to invest and think through what you're doing from the beginning. It is important to get it fairly right the first time. It is harder to change things already set in motion than to get things on the right track to begin with.
- Make sure that there is widespread buy-in for the definitions, evaluation measures and applications, especially from senior leadership. Buy-in is also important when it comes to the overall justification or impetus for the integration of equity indicators.
- Talk to people about what you're doing. Equity isn't about what decision-makers think is best—it's what the people being served think is best and what they want and need from transportation networks.
- Don't undervalue qualitative research.

Minnesota DOT:

- Equity analysis, like transportation policy generally, should be accessible and transparent to the public. Publicize assumptions, methods, etc.
- Be careful about framing communities from a deficit vantage point. The respondent recommended review of an October 2020 news post from Metropolitan Council, the state's largest MPO, on rethinking areas of concentrated poverty (see *Supporting Documents* below).
- If possible, build the equity analysis using a reasonable number of meaningful measures from reliable sources that are updated frequently.

Rhode Island DOT:

- Use equity indicators for project prioritization.
- Use equity indicators for the best investment decisions.
- Help the public understand the importance of this data.

Supporting Documents

Performance Dashboard, Minnesota Department of Transportation, 2020.
https://performance.minnesotago.org/
This online dashboard allows the user to view performance measures by topic, objective and scorecard. The measures are based on the 2017 20-year Statewide Multimodal Transportation Plan, which focuses on five objectives: open decision-making, transportation safety, critical connections, system stewardship and healthy communities.

"Rethinking Areas of Concentrated Poverty: Council Researchers to Shift Focus, Elevate Community Voices," Council News and Events, Metropolitan Council, October 2020.
https://metrocouncil.org/News-Events/Council-News/Newsletters/Rethinking-areas-of-concentrated-poverty-2020.aspx
From the news post: A chorus of community voices and a growing internal unease about how we frame data on poverty has led our research team to change the way we will characterize areas of concentrated poverty in our ongoing research about income, race and geography in the seven-county Twin Cities area.
….

Council researchers plan to make a number of changes moving forward:

- Areas of concentrated poverty with more than 50% residents of color (ACP50s) will no longer be identified separately from other areas of concentrated poverty. While the region has significant racial disparities when it comes to income, the Council wants to stop reinforcing the stereotypical association between poverty and people of color. The majority of the region's people in poverty are white.

- Similarly, the Council will enrich its data reporting and maps with more nuanced, disaggregated data about different groups within the designation "people of color." This will provide a richer picture of the variation among different groups and undercut the white/people of color binary.

- Annual reporting will also include data about areas of concentrated affluence, where two-thirds of residents have incomes at least five times the federal poverty threshold.

- Data will provide context about how areas have become high or low income, adding historical data about redlining, restrictive covenants, and other discriminatory practices.

Agencies Not Supporting Equity Indicators

Five responding agencies are not currently employing equity indicators in transportation planning and decision-making:

California MPOs
Sacramento Area Council of Governments (SACOG).
Shasta Regional Transportation Agency.

State DOTs
Colorado DOT.
Delaware DOT.
Washington State DOT.

The SACOG respondent provided the most significant level of detail about ongoing and future efforts related to equity analysis. The agency is required to conduct a Title VI analysis as part of its Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) update. As part of this analysis, SACOG identifies disadvantaged community geographies based on concentrations of low income, communities of color and other factors. (See Supporting Documents on page 51 for Appendix H to SACOG's MTP/SCS plan for further details.)

Other SACOG efforts are described below:

- Efforts underway to incorporate additional equity metrics into a Regional Progress Report, expected to be completed in January 2021, will provide insights into changes in various transportation, housing and employment outcomes over time.

- The agency recently set aside $3 million in regional funding for a Disadvantaged Community Grant Program. The framework for this program will be developed and executed in calendar year 2021.

- SACOG convened a Race, Equity and Inclusion Working Group made up of members of its board of directors. The working group serves as a forum to discuss and make recommendations to the SACOG board relating to race, equity and inclusion. The group will examine issues associated with SACOG programs and projects, and historical planning practices and/or programs that either intentionally or inadvertently feed into the

continued lack of equal opportunity and government benefits for Black, Indigenous and people of color (BIPOC).

- The agency is looking at how best to advance equity analysis earlier in its regional transportation plan/sustainable communities strategy process to allow for a greater connection between policy and investment decisions and equity outcomes.

Other respondents commented on future plans to implement equity in transportation policy analysis and decision-making:

- *Delaware DOT*. The agency uses the U.S. Environmental Protection Agency's GIS Screening Tool as an input in the agency's capital project prioritization process.

- *Shasta Regional Transportation Agency*. The agency has considered adding an equity analysis to its policy documents and is attempting to focus on a specific disadvantaged area to address issues within that area. The respondent noted that "[i]t is an element of our unmet transit needs process as required."

- *Washington State DOT.* Inclusion is one of the agency's three goals in the strategic plan. The agency is "working to enhance equity throughout the agency" and is "evaluating this now."

The Colorado DOT respondent indicated that the agency does not currently and explicitly incorporate equity into transportation policy analysis and decision-making but provided no further details.

Supporting Documents

Multiple California Agencies

Leading the Way: Policies and Practices for Sustainable Communities Strategies, ClimatePlan, October 2016.
https://cal.streetsblog.org/wp-content/uploads/sites/13/2016/10/ClimatePlan-Full-Report-WEB.pdf
From the overview: California's Sustainable Communities and Climate Protection Act of 2008 (SB 375) connects land use and transportation planning with California's ambitious greenhouse gas (GHG) reduction goals. This innovative law requires the state's 18 Metropolitan Planning Organizations (MPOs) to create Sustainable Communities Strategies (SCSs) showing how their regions will meet state-mandated GHG reduction targets through changes in land use and transportation. In many regions, the SCS process has led to innovative policymaking to support healthy, equitable and sustainable patterns of development. Drawing on reviews of adopted SCSs, as well as extensive input from ClimatePlan partners, transportation planners, and others, this report highlights some of the leading practices that have emerged so far. It also offers recommendations that go beyond existing SCSs in areas such as climate adaptation, water and affordable housing.

Sacramento Area Council of Governments

Appendix H: 2020 MTP/SCS Environmental Justice Analysis, 2020 Metropolitan Transportation Plan/Sustainable Communities Strategy, Sacramento Area Council of Governments, November 2019.
https://www.sacog.org/sites/main/files/file-attachments/appendix_h_-_environmental_justice_analysis_0.pdf?1573685797
This document describes the criteria used to develop EJ communities. *From page 6 of the PDF*:

CRITERIA: Block Groups are selected as EJ Communities if they are non-white race groups and/or low income and/or qualify as an "other vulnerability" area and/or are within the CalEnviroScreen 3.0 identified Census Tracts.

CRITERIA DETAILS:

1. Race/Ethnicity: Block groups where the Non-White and/or Hispanic resident population is 70 percent or higher; 259 block groups qualify.

2. Low Income: Block groups where 45 percent or more of households earn less than 200% of the federal poverty level; 429 block groups qualify.

3. Other Vulnerabilities: Block groups that fall within the top quintile of all regional block groups in at least four of the following six measures; 85 block groups qualify.

Other Vulnerability Measures:
- Concentration of Older Adults aged 75 or more
- Concentration of Linguistically Isolated Households
- Concentration of Single Parent Households with Children under the age of 18
- Concentration of Low Educational Attainment with Less than a High School Diploma or GED for the population aged 25 or more
- Concentration of Severely Housing Cost Burdened Households where households spend 50% or more of their income on housing costs (both renter and owner households)

Included in the data analysis are:
- Transportation and accessibility.
- Access to jobs.
- Access to medical services.
- Access to higher education.
- Access to parks.
- Air quality.
- Physical activity.

Related Research and Resources

A literature search of recent publicly available resources identified publications that are organized into the following topic areas:

- National research.
- State research and resources.
- Related research.

National Research

TCRP Research Report 214: Equity Analysis in Regional Transportation Planning Processes, Volume 1: Guide, Hannah Twaddell and Beth Zgoda, 2020.
Publication available at https://www.nap.edu/catalog/25860/equity-analysis-in-regional-transportation-planning-processes-volume-1-guide
This publication "documents a five-step equity analysis framework for regional transportation plans and programs." The authors provide "step-by-step descriptions of methods, examples and resources to help agencies develop and implement equity analyses that reflect varying regional contexts and agency capabilities. Volume 1 concludes with descriptions of brief pilot projects conducted with four metropolitan planning organizations (MPOs) to test different aspects of the equity analysis framework."

A few elements of the report that may be of particular interest or offer an example of the type of information the report provides:

- Table 3, Equity Analysis Elements, Resources, Methods and Strategies (page 9 of the report, page 20 of the PDF).
- How to select indicators (page 42 of the report, page 53 of the PDF).
- Table 5, Sample Indicators of Benefits and Burdens (page 43 of the report, page 54 of the PDF).

Note: The report excerpts below describe practices of two MPOs: Mid-Ohio Regional Planning Commission (MORPC) and Metropolitan Transportation Commission (MTC).

- **Example in Practice: Develop a List of Potential Measures** (page 43 of the report, page 54 of the PDF)
  The MORPC developed a table of potential measures, each of which described the relevant mode, the type of portrayal (population, geographic or visual), the tool needed to measure it and the availability of data for immediate use. The list helped the agency to narrow down an initial list of indicators that could be developed fairly quickly and potential indicators to develop in the future (MORPC 2017).

- **Example in Practice: Use-Based Approach** (page 47 of the report, page 58 of the PDF)
  The San Francisco MTC used the use-based approach to allocate spending by project use or mode, looking at indicators such as number of trips on a transit route or VMT on a roadway. The MTC broke the usage down by different populations to determine if investments were proportional to the travel decisions made by residents (MTC 2015).

- **Example in Practice: Population-Weighted Approach** (page 49 of the report, page 60 of the PDF)
  The MORPC uses this population-weighted approach and has documented the approach well in the equity analysis appendices to its plans and programs. The MARC [Mid-America Regional Council] piloted the approach as part of the development of this guide (MARC 2015). Following its initial research, the project team also identified the Northwestern Indiana Regional Planning Commission (NIRPC 2011) and the Licking County (Ohio) Area Transportation Study (LCATS 2016) as additional examples of the population-weighted approach.

Related Resource:

TCRP Research Report 214: Equity Analysis in Regional Transportation Planning Processes, Volume 2: Research Overview, Hannah Twaddell and Beth Zgoda, 2020. Publication available at https://www.nap.edu/catalog/25886/equity-analysis-in-regional-transportation-planning-processes-volume-2-research-overview
This companion to Volume 1 cited above "describes the results of a research effort conducted to identify ways in which equity in public transportation can be analyzed through an integrated participatory and quantitative approach that is adaptable to plans and programs developed by MPOs in partnership with transit agencies and that relates to environmental justice analysis and Title VI procedures, implementation, and reporting compliance."

Interview case studies are included as Appendix B beginning on page 85 of the report (page 96 of the PDF). The interviews conducted with MPO representatives included discussions of "each step in the equity analysis process, beginning with the fundamental element of public involvement planning and implementation, and carrying through the steps of (1) identifying populations for analysis, (2) assessing needs, (3) analyzing relative benefits and burdens, and (4) mitigating inequities."

Transportation Equity Scorecard: A Tool for Project Screening and Prioritization, Kristine M. Williams, Jeff Kramer, Yaye Keita and Tia Boyd, U.S. Department of Transportation, June 2020.
https://rc.library.uta.edu/uta-ir/bitstream/handle/10106/29563/Williams_EquityScorecard_Report.pdf?sequence=1&isAllowed=y
From the abstract: This user guide and companion equity scorecard tool provide a framework for use by MPOs and other agencies to advance equity during project screening and prioritization. Unlike traditional methods, which may only consider proximity to the population or avoiding or mitigating adverse project impacts, the criteria and methods incorporated in the tool aim to advance transportation projects for funding based on the extent to which they directly advance the needs of underserved populations. The tool is useful any time an agency is selecting among a variety of projects or screening an individual project for equity implications and identifying potential enhancements. It could be used within an agency's existing broader project evaluation scoring system or as a separate or additional assessment specific to equity. The guide and tool could also aid MPOs and local governments in formulating projects with important equity impacts and user benefits. Although developed for use by MPOs and local planning agencies to promote equity, concepts advanced by the tool and processes could be useful to any agency or organization seeking to understand and advance transportation equity.

Evaluating the Distributional Effects of Regional Transportation Plans and Projects,
Kristine M. Williams and Aaron Golub, National Institute for Transportation and Communities,
May 2017.
https://rosap.ntl.bts.gov/view/dot/32537/dot_32537_DS1.pdf?

From the abstract: … this research aims to provide additional guidance to MPOs on how to evaluate distributional equity in regional plans and projects. The report begins with an overview of federal requirements related to equity in transportation planning. We then synthesize contemporary methods for measuring transportation equity and the distributional effects of plans and projects from a review of the literature and MPO plans and studies. The report concludes with exploratory case studies of equity analysis in two regions representing distinctly different planning contexts and stages of addressing equity, and a summary of key methods to serve as a resource for use by MPOs in integrating equity into the regional transportation planning process.

Evaluating Transportation Equity: An Intermetropolitan Comparison of Regional Accessibility and Urban Form, Joe Grengs, Jonathan Levine and Qingyun Shen, Federal Transit Administration, June 2013.
https://www.transit.dot.gov/sites/fta.dot.gov/files/FTA_Report_No._0066.pdf

From the abstract: The concept of accessibility is used as the measurement tool to assess the link between social equity and the built environment because it simultaneously accounts for both land-use patterns and a transportation system. This study compares 25 metropolitan regions to identify those regions that best support high accessibility for transit-dependent populations, racial minorities and low-income households. Comparing across metropolitan regions enables a better understanding of which regions offer greater geographic equity in accessibility, and what factors underpin these differences. The analysis demonstrates that accessibility can be evaluated across multiple dimensions.

State Research and Resources

California

Research in Progress: Mobility, Accessibility and Disadvantaged Neighborhoods,
California Department of Transportation, start date: March 2020; expected completion date:
December 2020.
Project description at https://trid.trb.org/view/1714106

From the project description: The proposed project will focus on an urban county and a rural county, Los Angeles (LA) and San Joaquin (SJ). The project will use bivariate and multivariate statistical methods to describe the variation in mobility and accessibility among policy-based definitions of disadvantaged neighborhoods. The project is organized around five tasks to be completed within one year. Task 1 includes assembling transportation and accessibility indicators from existing sources, including those that were developed or currently being developed by CNK [UCLA Center for Neighborhood Knowledge] in partnership with CAR[B] and Caltrans. Task 2 will develop additional indicators where needed and modify existing ones to reflect the specific characteristics of each of the two counties. Task 3 will statistically examine and measure the degree of heterogeneity in the transportation-accessibility indicators among all neighborhoods. Task 4 covers the posting of the dataset on a web site. The last task will produce a final report, a policy brief, and a set of papers to submit to academic and professional journals for publication.

Mobility Equity Framework: How to Make Transportation Work for People, Hana Creger, Joel Espino and Alvaro S. Sanchez, The Greenling Institute, March 2018.
http://greenlining.org/wp-content/uploads/2018/03/Mobility-Equity-Framework-Final.pdf
From the conclusion on page 20: This framework provides tools to assess and maximize equity in transportation planning and decision-making to address community-identified mobility needs. By referencing the 12 equity indicators and the examples provided, low-income communities and communities of color can identify and prioritize transportation modes or projects that best provide positive health and economic benefits. We have designed this framework to be flexible and adaptable across varying geographic contexts, and the entire three-step process can be best utilized at a local community scale. While the implementation of the entire three-step [process] is preferred, even utilizing parts of the process could enhance equity in transportation planning and decision-making. This framework could also be adopted by government or referenced in agency guidelines; for instance, the California Department of Transportation has incorporated participatory budgeting into its Sustainable Communities Planning Grants. Maximizing beneficial outcomes from this framework will require regulations to ensure prioritization of equity and true community engagement in transportation planning and investments. Advocates have long called for identifying community mobility needs to be the first step in any transportation planning process. Prioritizing transportation modes based on their performance across equity indicators can unravel the disparities in transportation burdens and benefits. While more research is still needed, The Greenling Institute will pursue opportunities to codify the elements of this framework into California transportation decision-making.

Related Resource:

> **Greenlined Economy Guidebook: Transforming Community Development, Transforming Our Economy**, The Greenling Institute, September 2020.
> https://greenlining.org/wp-content/uploads/2020/09/Greenlined-Economy-Guidebook-2020.pdf
> *From page 6*: To greenline community investment, we have developed a set of rules to govern funds and programs intended to address poverty and inequity. Without standards, we end up reinforcing the structures that caused these problems in the first place. These standards are meant to address failures of equity in our current community investment model. We imagine that these standards could be applied to community investments by diverse actors, including public agencies, philanthropic organizations, private investors or community-based organizations advising or developing their own investment strategies.

"Looking Beyond the Mean for Equity Analysis: Examining Distributional Impacts of Transportation Improvements," Tierra S. Bills and Joan L. Walker, *Transport Policy*, Vol. 54, pages 61-69, February 2017.
Citation at https://www.sciencedirect.com/science/article/abs/pii/S0967070X16305066
From the abstract: Activity-based travel demand models can be useful tools for understanding the individual level equity impacts of transportation plans, because of their ability to generate transportation measures at disaggregate (individual and household) levels. However, these capabilities have yet to be fully explored in public practice. In this paper we first discuss a general framework for performing transportation equity analysis using activity-based travel demand models, distributional comparisons and incorporating equity standards. In addition, we demonstrate the advantages of distributional comparisons, relative to average measures. This demonstration uses the 2000 Bay Area Travel Survey and (activity-based) mode choice model. The findings show that distributional comparisons are capable of clearly revealing the winners and losers that result from transportation improvements, in comparison with average measures. The use of these results will likely result in different conclusions on transportation investments.

"Planning for Transportation Equity in Small Regions: Towards Meaningful Performance Assessment," Alex Karner, *Transport Policy*, Vol. 52, November 2016.
https://www.researchgate.net/publication/305631842_Planning_for_transportation_equity_in_small_regions_Towards_meaningful_performance_assessment
From the abstract: Some performance areas lend themselves well to operationalization while others do not. One area that has received comparatively little study is the assessment of a plan's impacts on environmental justice and social equity. Although research on regional planning usually emphasizes larger metropolitan areas and agencies, these issues are especially relevant in smaller regions where planners lack the capacity for innovation and careful analysis. Further, the transit services on which disadvantaged populations depend are often lacking or non-existent in less-populated regions. Understanding how planners in these locations undertake social equity-related analyses and providing suggestions for improvement is thus an important endeavor. While prior work has assessed whether, and to what extent, equity objectives are included in plans, there are few detailed investigations of the key analytical choices that shape equity outcomes. This paper fills this important research gap, providing such an analysis of existing practice in a largely rural region in California, the San Joaquin Valley, as well as recommendations for future analyses aimed at improving the consistency between equity analyses and the real-world impacts of transportation plans.

"Opportunity-Based Dynamic Transit Accessibility in Southern California: Measurement, Findings and Comparison With Automobile Accessibility," Ting L. Lei, Yali Chen and Konstadinos G. Goulias, *Transportation Research Record 2276*, pages 26-37, 2012.
Citation at https://journals.sagepub.com/doi/10.3141/2276-04
From the abstract: The relative attractiveness of public transportation depends critically on its performance in terms of the accessibility provided to link people with employment and activity opportunities. In practice, an effective method to derive such indicators and related performance measures is lacking. An opportunity-based transit accessibility measure applied to the Southern California Association of Governments megaregion is presented. The indicators computed are sensitive to the availability of opportunities for travelers within a day (e.g., related to the opening and closing hours of businesses) and are a direct function of the transit routes and schedules and the associated spatiotemporal variation of level of service during a day. The method is described, examples on transit accessibility are provided, and the results are compared with automobile accessibility.

"Activity-Based Travel Models and Transportation Equity Analysis: Research Directions and Exploration of Model Performance," Tierra S. Bills, Elizabeth A. Sall and Joan L. Walker, *Transportation Research Record 2320*, pages 18-27, 2012.
Citation at https://journals.sagepub.com/doi/10.3141/2320-03
From the abstract: The current state of practice for transportation equity analysis is moving toward the use of activity-based travel models for scenario analysis. However, little has been done to validate the use of these models for equity analysis. The first objective of this paper is to present a research framework for the equity analysis of long-range transportation plans, for the purpose of critiquing the current state of practice and pointing to key research needs. This research framework is used to identify four research areas for furthering transportation equity analysis: (a) identifying transportation priorities for different groups of interest, (b) identifying appropriate modeling tools for measuring equity outcomes, (c) identifying and analyzing equity indicators, and (d) linking the equity indicators and the transportation priorities. The second objective is to explore how well an activity-based travel demand model represents heterogeneity of travel behavior among different income classes, for the purpose of transportation equity analysis. Graphical and statistical tools are used to access how well a sample of the model data compares with a sample of travel survey data for the San Francisco Bay Area in California. The

results show that although the tests of distribution equality fail, the general shape of the distributions, the central tendencies, and the relative difference of the low- versus high-income samples perform well.

"Geovisualization of Opportunity Accessibility in Southern California: An Exploration of Spatial Distribution Patterns Using Geographic Information Systems for Equity Analysis," Pamela Dalal and Konstadinos G. Goulias, *Transportation Research Board 90th Annual Meeting*, Paper #11-0784, 2011.
Citation at https://trid.trb.org/view/1091588
From the abstract: Spatial equity research is based on the assumption that inequity has an observable spatial distribution and that the analysis of these spatial patterns can inform understanding of equity. The addition of spatial analysis has greatly contributed to the understanding on how location is relevant to the accessibility of resources and opportunities. Assessments of spatial inequality in the distribution of opportunities can be developed using geographic information systems (GIS) to utilize high-resolution attributes of the built environment that create variation in spatial accessibility and the identification of inequity over space and between individuals. GIS software also allows for a visual representation of resource density and distribution and the assessment of spatial variation in density of locations at multiple spatial scales with spatial distribution, pattern, and cluster analysis tools. This study uses GIS to derive network-based accessibility indicators, to analyze patterns of opportunity distribution, [and] discusses possible planning, and future data collection needs for a successful implementation of desired regional land use and transportation objectives in Southern California.

Connecticut

Assessing and Quantifying Public Transit Access, Nicolas E. Lownes and Sha Al Mamun, Connecticut Department of Transportation, March 2014.
https://rosap.ntl.bts.gov/view/dot/30901
From the abstract: Integrating transit needs into transit accessibility indexing is considered in this research for the evaluation of existing transportation systems and service gaps and for the identification of priority areas for future investments in transportation infrastructure. An accessibility-based transit need indexing model is detailed that focuses on the necessity of evaluating transit needs and transit accessibility simultaneously. A need index is developed to identify areas in high need of public transit services using economic and socio-demographic information. The need for transit service is then modeled as the lack of transit accessibility and correlates different access indicators with their ability to predict transit service need. This model maps areas with different levels of transit accessibility and transit needs using a single score, which may be easily interpreted by planners examining transit equity. The model has been applied to the city of Meriden and New Haven, CT[,] and results have been compared with a general approach for consistency and effectiveness. The research also highlights the model's usefulness through a representative example of its application.

Michigan

"Nonwork Accessibility as a Social Equity Indicator," Joe Grengs, *International Journal of Sustainable Transportation*, Vol. 9, Issue 1, pages 1-14, 2015.
Citation at
https://www.tandfonline.com/doi/abs/10.1080/15568318.2012.719582?journalCode=ujst20
From the abstract: This study explains a method for deriving nonwork accessibility indicators and evaluates how nonwork accessibility varies among social groups in the Detroit metropolitan

region. It finds that vulnerable social groups—including African Americans, Hispanics, low-income households, and households in poverty—experience an advantage in physical accessibility over more privileged groups for several trip purposes, including convenience stores, childcare facilities, religious organizations, and hospitals. However, vulnerable groups experience a distinct disadvantage in accessibility to shopping and supermarkets. These vulnerable social groups experience a substantially larger share of households with extremely low levels of accessibility, as a result of disproportionately low access to private vehicles.

Related Research

"Assessing Public Transit Service Equity Using Route-Level Accessibility Measures and Public Data," Alex Karner, *Journal of Transport Geography*, January 2018.
https://www.researchgate.net/publication/322801962_Assessing_public_transit_service_equity_using_route-level_accessibility_measures_and_public_data
From the abstract: The purpose of the work presented here is to inform the development of more robust transit equity analyses than are currently conducted by integrating measures of accessibility—the ease with [which] destinations can be reached—into FTA [Federal Transit Administration]-required analyses. The measures are calculated using publicly available data, including the US Census Bureau's Longitudinal Employer-Household Dynamics dataset and transit route and schedule information in the General Transit Feed Specification (GTFS) format. The results demonstrate that relying on a single measure (e.g., population shares or accessibility) to associate a route with a particular demographic group is likely to be deficient. Previous academic work on accessibility has not translated well to practice in part because the calculation of accessibility relied upon regional travel demand model outputs that were difficult to obtain. This work thus fills an important gap in the literature and practice by tying advances in the academic literature to FTA-mandated analysis with publicly available data.

"Integrating Social Equity Into Urban Transportation Planning: A Critical Evaluation of Equity Objectives and Measures in Transportation Plans in North America," Kevin Manaugh, Madhav G. Badami and Ahmed M. El-Geneidy, *Transport Policy*, Vol. 37, pages 167-176, 2015.
https://tram.mcgill.ca/Research/Publications/Equity_planning.pdf
From the abstract: In this paper the authors address two inter-related questions: How is social equity conceptualized, operationalized, and prioritized relative to environmental and other objectives; and how might social equity be more effectively integrated in urban transportation plans in North America? The authors critically analyze how social equity is incorporated into transportation plans in 18 large North American metropolitan areas, in terms of the quality of the related objectives, how meaningfully their achievement is assessed through the choice of performance measures or indicators, and their prioritization relative to other objectives. They observe that social equity goals and objectives are in many cases not translated into clearly specified objectives, and appropriate measures for assessing their achievement in a meaningful, disaggregated manner are often lacking. At the same time, there are good examples of social equity objectives and measures in several plans. In general, there is a stronger focus on the local environment (and congestion reduction) than on social equity in the plans. The authors end the paper with a discussion related to considerations for generating objectives and measures for better integrating social equity into urban transportation plans.

"Civil Rights Guidance and Equity Analysis Methods for Regional Transportation Plans: A Critical Review of Literature and Practice," Alex Karner and Deb Niemeier, *Journal of Transport Geography,* Vol. 33, pages 126-134, December 2013.
Citation at https://www.sciencedirect.com/science/article/abs/pii/S0966692313001865

From the abstract: Metropolitan planning organizations typically undertake an analysis of regional transportation plan equity to comply with federal anti-discrimination law, most prominently Title VI of the 1964 Civil Rights Act. In this critical review, we examine the law, regulatory guidance, academic research and agency practice pertinent to equity analysis. We find that recommendations are extensive but generally lack specificity and are rarely enforceable. In the absence of detailed guidance, practice has become dominated by a single method that has foundations in the spatial analysis of environmental exposures and the neighborhood effects literature. We argue that this method is not appropriate for the analysis of transportation investment benefits, in part because target populations must be defined *a priori* based on demographic thresholds for areal units rather than on the basis of exposure. Further, it does not represent the travel behavior of Title VI-protected populations adequately, most notably people of color. Newer travel demand modeling paradigms are capable of sidestepping methodological problems, and legacy models can be adapted and improved. However, agencies generally have not shifted from traditional methods and planners do not view race as a variable relevant to travel behavior. By relying on an analytical technique that is not likely to reflect the travel behavior of people of color, planning agencies reduce the likelihood that racially disparate outcomes will be identified and mitigated. Meaningful transportation equity analyses must include an assessment of both current and near-term conditions and provide racially specific outcomes, while seeking to mitigate inequities through programming decisions.

Contacts

CTC contacted the individuals below to gather information for this investigation.

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Appendix A: Survey Questions

The following survey was distributed to members of the American Association of State Highway and Transportation Officials (AASHTO) Committee on Planning and a select group of California local and regional agency contacts.

Survey on Equity Indicators to Improve Mobility and Transportation System Access for Low-Income and Disadvantaged Communities

Note: The response to the question below determined how a respondent was directed through the survey.

Caltrans is interested in how other transportation agencies use equity indicators—and the tools, models, methodologies and data sources used in connection with them—to assess the mobility and transportation system access of low-income and disadvantaged or underserved communities.

(Required) Has your agency identified equity indicators that are used in transportation policy analysis and decision-making to ensure equitable access to transportation services?

Response Options:

- No, our agency does not currently and explicitly incorporate equity into transportation policy analysis and decision-making. (Directed the respondent to the **Agencies Not Incorporating Equity in Decision-Making** section of the survey.)
- No, but we're considering implementing equity in transportation policy analysis and decision-making. (Directed the respondent to the **Agencies Considering Incorporating Equity in Decision-Making** section of the survey.)
- Yes. (Directed the respondent to the **Agencies Incorporating Equity in Decision-Making** section of the survey.)

Agencies Not Incorporating Equity in Decision-Making

Please briefly describe why your agency has not considered equity in transportation policy analysis and decision-making.

Note: After responding to the question above, the respondent was directed to the **Wrap-Up** section of the survey.

Agencies Considering Incorporating Equity in Decision-Making

Please briefly describe your agency's interest or any plans your agency has made or is developing to incorporate equity factors into transportation policy analysis and decision-making.

Agencies Incorporating Equity in Decision-Making

1. How does your agency define *low-income households* and/or *low-income communities*? Please indicate any criteria used.

2. How does your agency define *disadvantaged* and/or *underserved communities*?

3. Please identify the stratification of population groups used in your agency's equity analysis. Select all that apply.

- Ethnic minority
- Female
- Female head of household
- Foreign-born
- Homeless persons
- Households receiving some form of public assistance
- Households with no car
- Limited English proficiency
- Limited literacy
- Low-income
- No high school education
- Older adults/seniors
- Other (Please describe.)
- Over 65
- Over 75
- People with disabilities
- Racial minority
- School-age children
- Single-parent families
- Transit-dependent households
- Under 18
- Veterans
- Youth

4. Has your agency set numerical thresholds to identify concentrations of each population group considered in the equity analysis?
   - No
   - Yes (Please provide one or more examples of a numerical threshold for a population group.)

5. Does your agency's equity analysis include spatial/geographic-based variables in addition to the population-based variables identified in Question 3?
   - No
   - Yes (Please identify one or more of these spatial/geographic-based variables.)

6. Please describe the application of your agency's equity indicators and practices. Select all that apply.
   - Project
   - Program level
   - Corridor level
   - Local level (city/county)
   - Regional level
   - Statewide level
   - Other (Please describe.)

7. What geographic unit of analysis is applied in your agency's equity analysis? Select all that apply.
   - Census block groups
   - Census blocks

- Census tract
- Transportation Analysis Zone (TAZ)
- Other (Please describe.)

8. Please list each of your agency's equity indicators, measures or metrics under the most appropriate corresponding general category below. You may list an indicator under more than one category if it is relevant to multiple categories.

- Accessibility
- Affordability
- Connectivity
- Efficiency
- Environment
- Health
- Housing
- Jobs
- Mobility
- Safety
- Travel Time
- Vehicle Miles Traveled
- Other (Please describe.)

8A. Please provide any additional comments about the equity indicators, measures or metrics you listed in Question 8.

9. Please describe the analysis method(s) used in the equity analysis. Select all that apply.

- Activity-based
- Geographic-based
- Population-based or population-weighted
- Project mapping
- Ridership-based
- Travel demand model
- Use-based
- Other (Please describe.)

10. Please describe the data sources your agency uses to inform and support use of the equity indicators, measures or metrics.

11. Does your agency use in-house or commercial tool(s) in connection with the equity indicators, measures or metrics? *These tools might be used to track the equity indicators, measures or metrics, evaluate past-present performance, or assess the expected performance of a proposed transportation project or program as it relates to equity-related measures.*

- No
- Yes (Please briefly describe the tool(s), including the name and vendor if a commercial product.)

12. Has your agency developed documentation related to the equity indicators, measures or metrics, and the tools, models, methodologies and data sources used to support them?

- No
- Yes (Please provide a link or an electronic copy of this documentation, or send any files not available online to chris.kline@ctcandassociates.com.)

Assessment and Recommendations

1. How does your agency evaluate the effectiveness of the equity indicators, measures or metrics?

2. What successes has your agency experienced in connection with application of the equity indicators, measures or metrics?

3. What challenges or roadblocks were encountered when developing and applying the equity indicators, measures or metrics? Please describe how they have been addressed and/or mitigated.

4. What are your top three recommendations for other agencies planning to implement equity indicators, measures or metrics in transportation policy analysis and decision-making?

Wrap-Up

Please use the space below to provide any comments, suggestions, recommendations or additional information about this subject that might further inform Caltrans and/or explain your previous responses.

![SBCAG logo] SBCAG
santa barbara county association of governments

260 North San Antonio Road., Suite B ▪ Santa Barbara, CA ▪ 93110
▪ Phone: 805/961-8900 ▪ Fax: 805/961-8901 ▪ www.sbcag.org

May 30, 2018

Ms. Laurie Waters
Associate Deputy Director
California Transportation Commission
1120 N Street MS 52
Sacramento, CA 95814

RE: ACTIVE TRANSPORTATION PROGRAM – REGIONAL DEFINITION OF
DISADVANTAGED COMMUNITIES

Ms. Waters:

The Santa Barbara County Association of Governments (SBCAG) submits this letter and
supporting documentation for your consideration of a regional definition of disadvantaged
communities as related to the Active Transportation Program. SBCAG developed a regional
definition, Communities of Concern, as part of the development of the 2013 Regional
Transportation Plan and Sustainable Communities Strategy (RTP-SCS). The Communities of
Concern were updated and included in the development of the current RTP-SCS, adopted in
August 2017. The criteria used in your analysis, as presented in the *2019 ATP Guidelines* –
(Adopted in May 2018), including: justification, a documented public outreach process, RTP-
SCS adopting actions, and severity stratification are all satisfied.

Following is a discussion of SBCAG's Communities of Concern.

Justification

Over the last several decades, federal regulations and guidance have been promulgated to
ensure that regional transportation planning meets the spirit and intent of Title VI of the Civil
Rights Act. The Federal Highway Administration requires that all federally funded transportation
planning actions involve an assessment of environmental justice issue that considers effects on
minority and low-income populations.   These federal environmental justice directives are
intended to ensure opportunities for full participation by all potentially affected communities in
the transportation decision-making process and to avoid, minimize, or mitigate disproportionally
high, adverse human health and environmental effects, including social and economic effects,
on minority and low-income populations. In keeping with these requirements, SBCAG strives to
assure that all socio-economic groups are adequately served and receive their fair share of
transportation benefits and that no group or community bears a disproportionate amount of the
costs or impacts of transportation investments.

SBCAG's intent with Communities of Concern was to develop a regionally-applicable
environmental justice screening methodology for analyzing the potential impacts of
transportation investments for the Santa Barbara region. Communities of Concern is also useful
in identifying communities where proactive outreach efforts are needed to ensure the fair
participation of all individuals.   To develop Communities of Concern, SBCAG, under the
direction of the region's Joint Technical Advisory Committee, surveyed other California regions'
methodologies and ultimately chose the San Diego Association of Governments' (SANDAG)

Communities of Concern as the desired model. The SANDAG model employed by SBCAG includes four subsets of the population to assess disadvantage: minority, low income, low mobility, and low community engagement. The number of indicators met for a particular geographic area stratifies the degree of disadvantage. The following table provides an overview of SBCAG's methodology, including current thresholds.

Environmental Justice Indicators

Community of Concern	Indicator	Definition	Thresholds
Minority	Minority Population	Population of non-White Hispanic, Black, Asian/Pacific Islander, and American Indian.	65 percent
Low-Income	Low-Income	Household income <80% of median or $50,000	63 percent
	Poverty	Families living at or below the poverty level-(Census)	25 percent
Low-Mobility	Zero-Car Households	Households that do not have access to a vehicle.	25 percent
	Aged Population	Population 75 years or older.	20 percent
Low Community Engagement	Linguistic Isolation	Households where English is not the primary language and English is not spoken "very well."	20 percent
	Educational Attainment	Population over age 25 who have not earned a high school diploma.	20 percent

Source: Compiled from multiple sources, including the 2010 U.S. Census, and the 2010-2014 American Community Survey 5-Year Estimates.

Communities of Concern has proven to be an effective means of identifying disadvantaged communities in the Santa Barbara County region.

Public Outreach

Communities of Concern is the environmental justice aspect of the RTP-SCS, and was first employed in the SBCAG region during the development of the 2013 RTP-SCS. The underlying demographic data was updated and the methodology was once again applied in the development the current RTP-SCS (August, 2017). With Communities of Concern being part of the RTP-SCS, the public outreach process was used for both purposes.

For the development of the current and previous RTP-SCS, SBCAG employed the three-phase public outreach process as was defined in the RTP-SCS Public Participation Plans. The RTP-SCS Public Participation Plans for the current and previous RTP-SCSs are linked below.

2017 RTP-SCS: http://www.sbcag.org/uploads/2/4/5/4/24540302/adopted_2015_rtp-scs_public_participation_plan.pdf

2013 RTP-SCS: http://www.sbcag.org/uploads/2/4/5/4/24540302/2040_rtp-scs_public_participation_plan.pdf

The three phases are described below.

Phase 1: Stakeholder Engagement

Phase 1 occurs early in the RTP-SCS development process. For this, SBCAG assembles a list of all potentially relevant organizations, interest groups, citizen's groups, etc., and proactively seeks to meet with each. In the past two RTP-SCS cycles SBCAG reached out to roughly 60 groups in each cycle, and was invited to make a presentation and receive feedback from 20 – 25 in each cycle. This number of stakeholder engagements, considering the size and

population of the SBCAG region, proved effective in receiving input from a broad range of stakeholder interests. SBCAG provides all notices in English and Spanish and offers to make presentations in Spanish. In the most recent RTP-SCS cycle, one Phase 1 meeting was conducted entirely in Spanish.

Phase 2: Public Workshops

Phase 2 occurs midway through the development of the RTP-SCS and includes public workshops. For the 2013 RTP-SCS three public workshops were conducted. Two public workshops were conducted for the current RTP-SCS. The public workshops are scheduled to occur in accessible locations, in the evening, and geographically dispersed. A Spanish-language translator is available at all public workshops. During each workshop SBCAG staff makes a presentation, conducts a question and answer session, accepts public comment, and conducts a poster session to discuss issues of importance to individual attendees.

Phase 3: Public Hearings

Phase 3 is a requirement of adopting RTP-SCSs. SBCAG conducts two public hearings, one each in Santa Barbara and Santa Maria. A Spanish-language translator is available at all public hearings. During the public hearings the SBCAG Board of Directors accepts public comment on the RTP-SCS.

Additional Outreach

In addition to the three phases of public outreach, SBCAG provides additional opportunity for public involvement

- SBCAG assembles a list of individuals that have expressed interest in the process and provides notice to upcoming meetings, project status, and opportunities for engagement.

- At the onset of the RTP-SCS development process SBCAG staff meets with representatives of each of SBCAG's nine member jurisdictions.

- A Joint Technical Advisory Committee composed of member jurisdiction planning and public works staffs guides the RTP-SCS development. The Committee meets monthly, as needed, throughout the development process and all meetings are publically accessible and conducted consistent with the Ralph M. Brown Act. Periodic updates are also given to the SBCAG Board of Directors during its regularly scheduled and publically accessible meetings.

During the most recent RTP-SCS cycle, 27 meetings, hearings, or workshops were conducted, nine were located in areas proximate to historically underserved Disadvantaged Communities, and five offered translation services.

<u>RTP-SCS Adopting Actions</u>

For your consideration, adopting resolutions for the current and previous RTP-SCSs, which both included Communities of Concern, are attached. Staff reports presented to the SBCAG Board of Directors for both RTP-SCSs are linked below.

Current RTP-SCS Staff Report:
http://meetings.sbcag.org/Meetings/SBCAG/2017/08%20August/Item%206%20FF%202040/Item%206%20%20-%20FF2040%20and%20DSEIR.pdf

Previous RTP-SCS Staff Report:
http://meetings.sbcag.org/Meetings/SBCAG/2013/08%20August/Web%20item%208/Item%208%20RTP-SCS%20Staff%20Report%20v3.pdf

<u>Severity Stratification</u>

As was previously discussed, SBCAG's Communities of Concern includes four subsets of the population to assess disadvantage: minority, low income, low mobility, and low community engagement. Within the subsets, save minority status, each contains two indicators. The low income indicator includes a severity stratification within itself; the indicator assesses for communities where 63 percent or more of households have incomes of 80 percent of the regional median income, or less, and also by the federally defined poverty levels. For impoverished communities, the threshold is 25 percent or more of all households. The number of indicators met for a particular geographic area stratifies the degree of disadvantage.

Please see the attached maps of the Communities of Concern in the SBCAG region.

Please do not hesitate to contact Michael Becker, SBCAG Planning Division Manager, with any questions or comments. Michael can be contacted at 805-961-8912 or mbecker@sbcag.org.

Sincerely,

Marjie Kirn
Executive Director

Attachments:
1. Resolution 17-26 to adopt Fast Forward 2040
2. Resolution 13-21 to adopt the 2040 RTP-SCS
3. Community of Concern Maps

Cc: Sarkes Khachek, SBCAG Programming Division Manager

A RESOLUTION OF THE SANTA BARBARA
COUNTY ASSOCIATION OF GOVERNMENTS

ADOPTION OF FAST FORWARD 2040   )   RESOLUTION NO. 17-26
REGIONAL TRANSPORTATION PLAN AND   )
SUSTAINABLE COMMUNITIES STRATEGY   )
FOR SANTA BARBARA COUNTY   )

WHEREAS Title 23 Code of Federal Regulations (CFR), Part 450, and Title 49 Code of Federal Regulations, Part 613, require the development of a metropolitan transportation plan by metropolitan planning organizations; and

WHEREAS the Santa Barbara County Association of Governments (SBCAG) has been designated by the Governor as the Metropolitan Planning Organization (MPO) for Santa Barbara County in accordance with Title 23 of the United States Code (USC) section 134 and Title 23 CFR section 450.104; and

WHEREAS Section 65080 of the California Government Code requires the preparation and adoption of a regional transportation plan by regional transportation planning agencies; and

WHEREAS SBCAG is the designated regional transportation planning agency for Santa Barbara County recognized under California Government Code section 29532; and

WHEREAS Section 65080 of the California Government Code requires that the regional transportation plan include a sustainable communities strategy prepared by each MPO; and

WHEREAS pursuant to 23 USC 134 and 49 USC 5303, SBCAG as an MPO prepares and adopts a long range regional transportation plan for the region;

WHEREAS SBCAG, through the conduct of a continuing, cooperative, and comprehensive multi-modal transportation planning process, has prepared Fast Forward 2040, a regional transportation plan (RTP) & sustainable communities strategy (SCS) for Santa Barbara County (Fast Forward 2040) to update the 2040 RTP & SCS adopted by SBCAG in August 2013; and

WHEREAS Fast Forward 2040 has been prepared in conformance with all applicable federal and State requirements; and

WHEREAS Fast Forward 2040 has been prepared in cooperation with federal, State and local government agencies, including local governments in Santa Barbara County, transit operators, Caltrans, the Air Pollution Control District; and the Santa Ynez Band of Chumash Indians; and

WHEREAS Fast Forward 2040 is financially constrained and funds are needed to implement the RTP; and

WHEREAS Fast Forward 2040 is not required to demonstrate transportation conformity with the State Implementation Plan (SIP) because Santa Barbara County is an attainment area for the federal 1-hour ozone standard and an attainment/unclassifiable area for the federal 8-hour ozone standard; and

WHEREAS SBCAG previously certified a final Environmental Impact Report (FEIR) on August 15, 2013 for the 2040 RTP & SCS; and

WHEREAS Fast Forward 2040 is subject to the California Environmental Quality Act (CEQA) and a Supplement to an Environmental Impact Report (SEIR) was prepared for Fast Forward 2040; and

WHEREAS copies of Draft Fast Forward 2040 and Draft SEIR were made available and members of the public were given a reasonable opportunity to review the draft documents and provide input and comment on the documents; and

WHEREAS pursuant to CEQA Guidelines section 15163, SBCAG considered the FEIR as revised by the SEIR for Fast Forward 2040; and

WHEREAS the Mitigation Monitoring and Reporting Program was also made available for public review and comment.

NOW, THEREFORE, BE IT RESOLVED that the SBCAG Board of Directors finds that Fast Forward 2040 was developed in accordance with public involvement procedures specified by federal law as expressed locally in the SBCAG Public Participation Plan adopted by SBCAG on August 20, 2015; and

BE IT FURTHER RESOLVED that the SBCAG Board of Directors finds that Fast Forward 2040 was developed in accordance with public involvement procedures specified by State law as expressed locally in the 2040 RTP-SCS Public Participation Plan adopted by SBCAG on September 17, 2015; and

BE IT FURTHER RESOLVED that the Board has reviewed the responses to comments received from the public and interested agencies on both Fast Forward 2040 and the SEIR and adopts those responses to comments as findings of this Board; and

BE IT FURTHER RESOLVED that the CEQA Findings and Statement of Overriding Considerations and the Mitigation Monitoring and Reporting Program are hereby adopted by the Board in Resolution 17-25; and

BE IT FURTHER RESOLVED that Fast Forward 2040 addresses requirements prescribed in State and federal law; and

BE IT FURTHER RESOLVED that Fast Forward 2040 complies with the 2010 Regional Transportation Plan Guidelines adopted by the California Transportation Commission; and

BE IT FURTHER RESOLVED that Fast Forward 2040 is the applicable transportation plan for SBCAG under State and federal law and supersedes all preceding RTP-SCSs and RTP-SCS amendments; and

BE IT FURTHER RESOLVED that the SBCAG Board of Directors does hereby adopt the Fast Forward 2040 RTP-SCS.

PASSED AND ADOPTED this 17th day of August 2017 by the following vote:

AYES: DirectorsWolf, Hartman, Lavagnino, Richardson, Lizalde, Mosby, Clark, Schneider, Patino, Sierra and Chair Bennett

NOES:

ABSENT:

ABSTAIN: Director Adam

ATTEST:

Terry Contreras
Clerk of the Board
Santa Barbara County
Association of Governments

Michael T. Bennett
Chair
Santa Barbara County
Association of Governments

APPROVED AS TO FORM:

Rachel Van Mullem
Chief Assistant County Counsel

A RESOLUTION OF THE SANTA BARBARA
COUNTY ASSOCIATION OF GOVERNMENTS

ADOPTION OF THE 2040 REGIONAL   )   RESOLUTION NO. 13-21
TRANSPORTATION PLAN AND   )
SUSTAINABLE COMMUNITIES STRATEGY   )
FOR SANTA BARBARA COUNTY   )

WHEREAS Title 23 Code of Federal Regulations, Part 450, and Title 49 Code of Federal Regulations, Part 613, require the development of a metropolitan transportation plan by metropolitan planning organizations; and

WHEREAS the Santa Barbara County Association of Governments (SBCAG) is the designated metropolitan planning organization for Santa Barbara County under federal law; and

WHEREAS Section 65080 of the California Government Code requires the preparation and adoption of a regional transportation plan by regional transportation planning agencies; and

WHEREAS the Santa Barbara County Association of Governments (SBCAG) is the designated regional transportation planning agency for Santa Barbara County under State law; and

WHEREAS Section 65080 of the California Government Code requires that the regional transportation plan include a sustainable communities strategy prepared by each metropolitan planning organization; and

WHEREAS SBCAG, through the conduct of a continuing, cooperative, and comprehensive multi-modal transportation planning process, has prepared a 2040 Regional Transportation Plan (RTP) & Sustainable Communities Strategy (SCS) for Santa Barbara County; and

WHEREAS the 2040 RTP-SCS has been prepared in conformance with all applicable federal and State requirements; and

WHEREAS the 2040 RTP-SCS has been prepared in cooperation with federal, State and local government agencies including local governments in Santa Barbara County, transit operators, Caltrans, the Air Pollution Control District; and the Santa Ynez Band of Chumash Indians; and

WHEREAS the 2040 RTP-SCS is financially constrained and funds are needed to implement the RTP; and

WHEREAS the 2040 RTP-SCS is not required to demonstrate transportation conformity with the State Implementation Plan (SIP) because Santa Barbara County is an attainment area for the federal 1-hour ozone standard and an attainment/unclassifiable area for the federal 8-hour ozone standard; and

WHEREAS the 2040 RTP-SCS is subject to the California Environmental Quality Act (CEQA) and an Environmental Impact Report (EIR) was prepared for the 2040 RTP-SCS; and

WHEREAS copies of the Draft 2040 RTP-SCS and Draft Environmental Impact Report (DEIR) were made available and members of the public were given a reasonable opportunity to review the draft documents and provide input on the documents; and

WHEREAS the Mitigation Monitoring and Reporting Program was also made available for public review.

NOW, THEREFORE, BE IT RESOLVED that the SBCAG Board of Directors finds that the 2040 RTP-SCS was developed in accordance with public involvement procedures specified by federal law as expressed locally in the SBCAG Public Participation Plan adopted by SBCAG on December 20, 2007; and

BE IT FURTHER RESOLVED that the SBCAG Board of Directors finds that the 2040 RTP-SCS was developed in accordance with public involvement procedures specified by State law as expressed locally in the 2040 Regional Transportation Plan & Sustainable Communities Strategy Public Participation Plan adopted by SBCAG on August 18, 2011; and

BE IT FURTHER RESOLVED that the Board has reviewed the responses to comments received from the public and interested agencies on both the 2040 RTP-SCS and the EIR and adopts those responses to comments as findings of this Board; and

BE IT FURTHER RESOLVED that the CEQA Findings and Statement of Overriding Considerations and the Mitigation Monitoring and Reporting Program are hereby certified by the Board; and

BE IT FURTHER RESOLVED that the 2040 RTP-SCS addresses requirements prescribed in State and federal law; and

BE IT FURTHER RESOLVED that the 2040 RTP-SCS complies with the 2010 Regional Transportation Plan Guidelines adopted by the California Transportation Commission; and

BE IT FURTHER RESOLVED that the 2040 RTP-SCS is the applicable transportation plan for SBCAG under State and federal law and supersedes all preceding RTPs and their amendments; and

BE IT FURTHER RESOLVED that the SBCAG Board of Directors does hereby adopt the 2040 RTP-SCS.

PASSED AND ADOPTED this 15th day of August 2013 by the following vote:
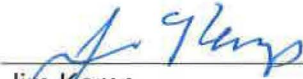
AYES: Chair Aceves, Directors Wolf, Farr, Lavagnino, Linn, Clark, Richardson, Schneider, Patino, Sierra
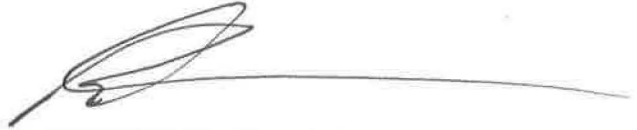
NOES: Directors Adam and Romero

ABSENT: Director Carbajal

ABSTAIN:

ATTEST:

Jim Kemp
Executive Director
Santa Barbara County
Association of Governments

Roger S. Aceves
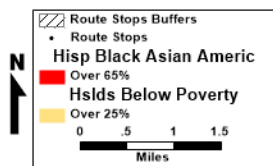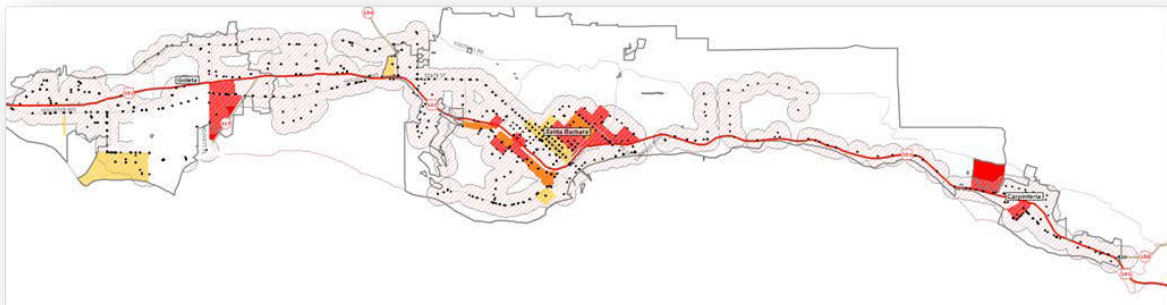Chair
Santa Barbara County
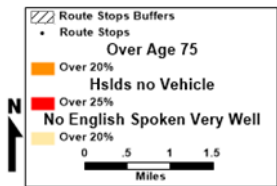Association of Governments

APPROVED AS TO FORM:

William M. Dillon
Senior Deputy County Counsel

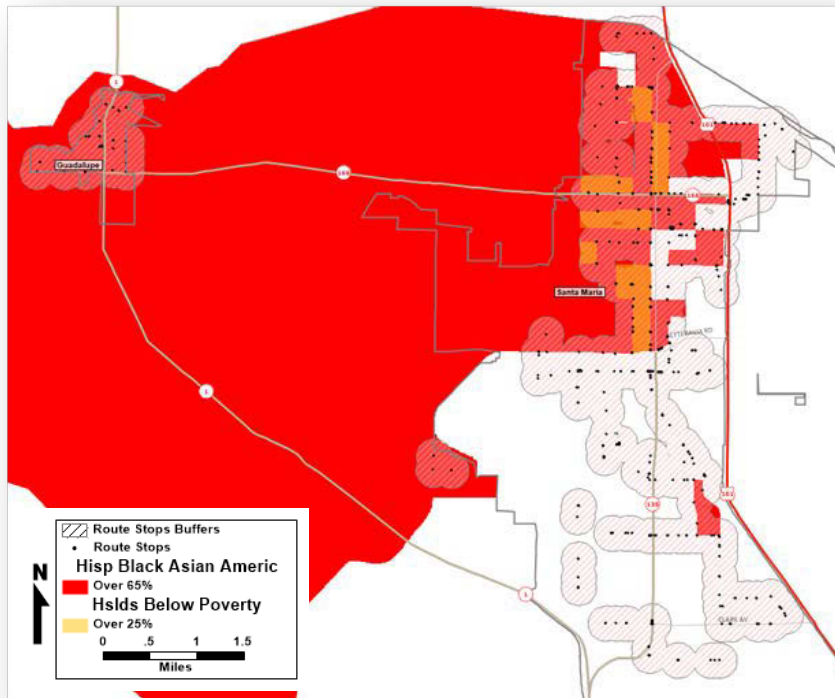# Attachment 3, Community of Concern Maps

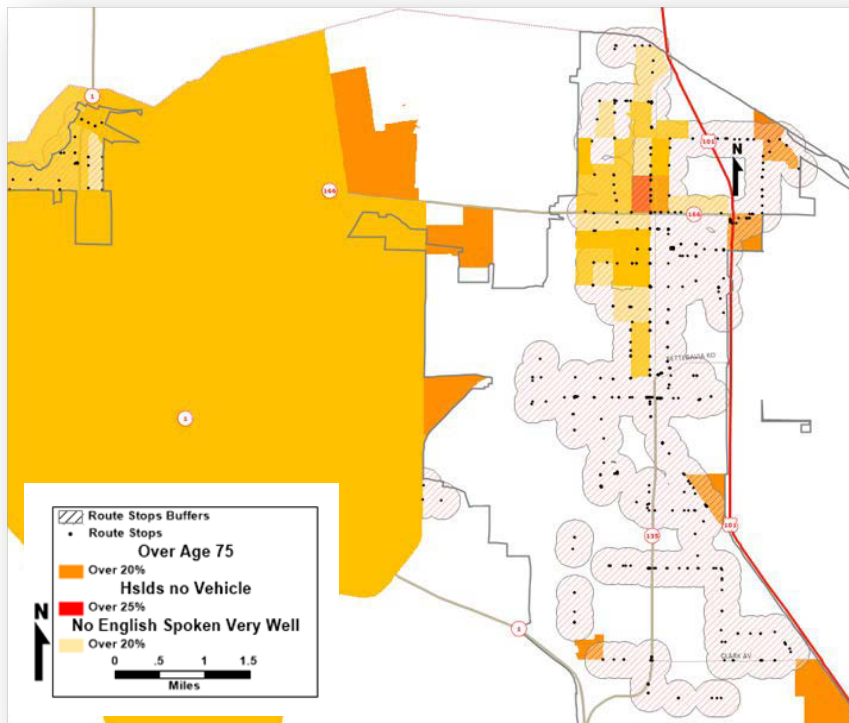*South Coast Communities of Concern, Minority and Poverty*

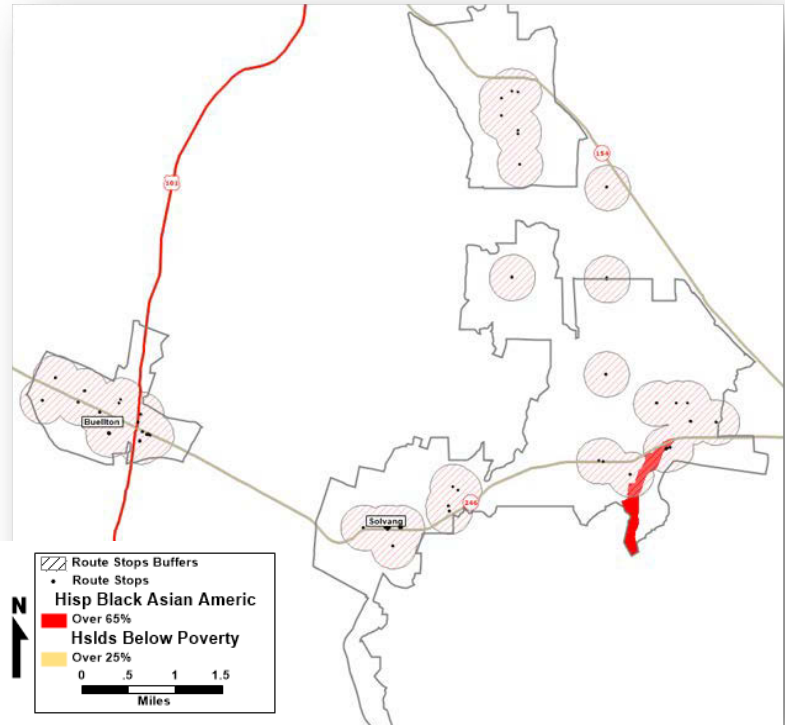*South Coast Communities of Concern, No English/Vehicle and Age 75+*

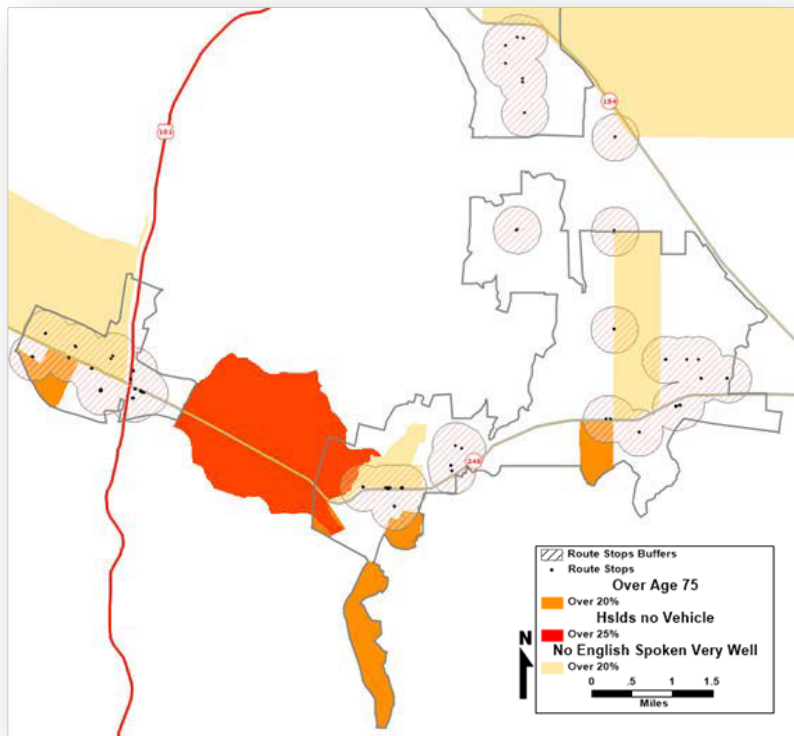*Santa Maria Region Communities of Concern, Minority and Poverty*

Santa Maria Region Communities of Concern, No English//Vehicle and Age 75+
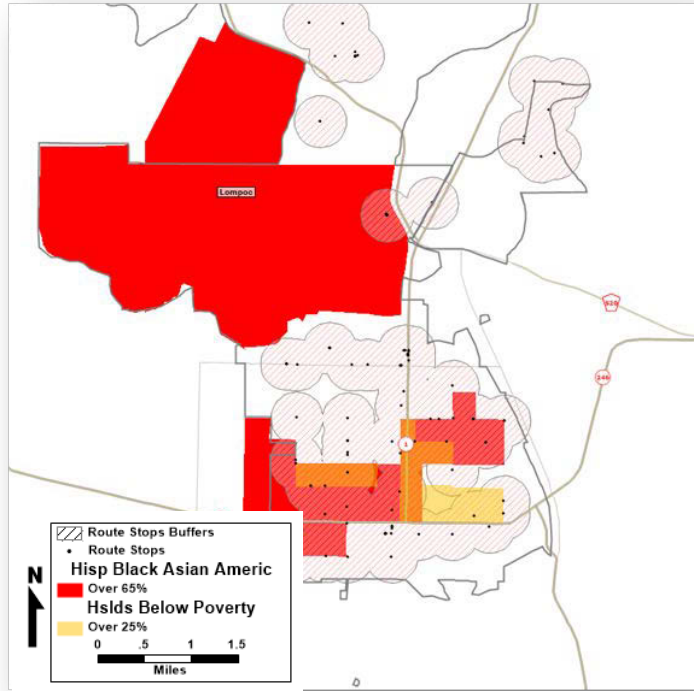
Santa Ynez Valley Communities of Concern, Minority and Poverty

S.Y. Valley Communities of Concern, No English/Vehicle and Age 75+

Lompoc Region Communities of Concern, Minority and Poverty

Lompoc Region Communities of Concern, No English/Vehicle and Age 75+