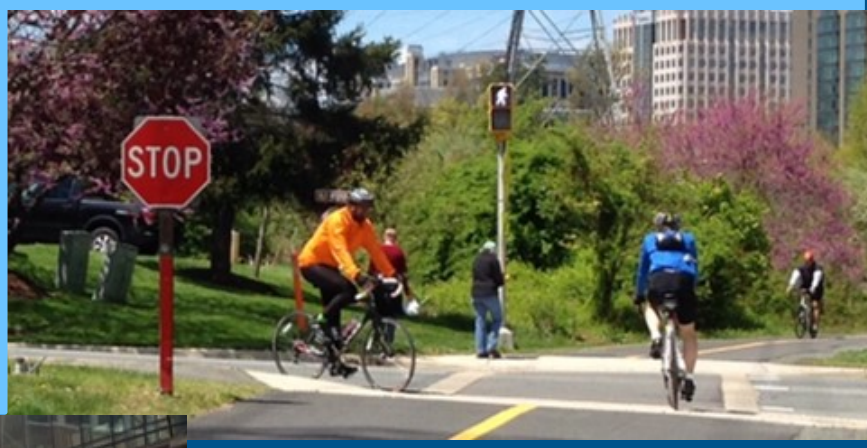
Environmental Justice Analysis in Transportation Planning and Programming:

State of the Practice



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16. Abstract This report documents the state of the practice among State Departments of Transportation (DOTs) and Metropolitan Planning Organizations (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. It is organized around the following focus areas: engaging EJ populations; identifying EJ populations; understanding needs of EJ populations; assessing benefits and burdens of proposed plans; determining whether transportation plans may result in disproportionately high and adverse effects on EJ populations; and deploying strategies to address such effects. 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.		
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Contents

Executive Summary

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 a strategy for identifying and addressing disproportionately high and adverse human health or environmental effects on low-income populations and minority populations. The Federal Highway Administration (FHWA) advances Environmental Justice (EJ) through its numerous policies, programs, and activities. It is FHWA's policy to identify and prevent discriminatory effects by actively administering its programs, policies, and activities to ensure that social impacts to communities and people are recognized early and continually throughout the transportation decision-making process from early planning through implementation and operations.

FHWA supports the U.S. DOT EJ principles, which are as follows:

- To avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority populations and low-income populations.

Implementation of these principles are supported by the U.S. DOT Environmental Justice Order 5610.2(a); U.S. DOT Environmental Justice Strategy; FHWA Order 6640.23A: Actions to Address on Environmental Justice in Minority Populations and Low-Income Populations; and FHWA Guidance on Environmental Justice and NEPA Memorandum.

This report focuses on transportation planning and programming which are important points in the transportation decision-making processes for addressing environmental justice (EJ). This report **does not establish any new requirements or replace any existing guidance.**

The research objectives of this report are as follows:

- **Promote Safety** – Provide tools and resources to help Federal aid recipients identify and address disproportionate safety risk in underserved communities.
- **Promote Infrastructure Improvements** – Provide information to support State departments of transportation, metropolitan planning organizations, and other transportation agencies to plan and prioritize multimodal investments, accelerate the delivery of multimodal infrastructure in an equitable manner that improves connectivity, accessibility, safety, and convenience for all users, including those in rural areas.
- **Support Community Revitalization and Access to Jobs** – Provide information on approaches to promote equity in transportation decision making and accessibility for all users, while safeguarding vulnerable communities, maintaining a healthy environment, and stimulating economic growth. Analyze the accessibility of the transportation system for underserved populations, promote meaningful public involvement, and help facilitate economic development.

During the development of critical documents such as Statewide and metropolitan long-range transportation plans (SLRTPs/ LRTPs) and transportation improvement programs (STIPs/ TIPs), transportation agency staff work with partners, stakeholders, and the public to conduct a systems-level assessment of proposed transportation investments, prior to moving forward with specific projects. By considering EJ principles during planning and programming, agencies can demonstrably weigh the impacts of transportation investments on different segments of the community and make well-informed choices about investments, future projects, policies, and other actions that help to achieve an equitable distribution of benefits and burdens. This report does not establish any new requirements or replace any existing guidance.

Based on a detailed scan of documents published by all 52 State Departments of Transportation (DOTs), including the District of Columbia and Puerto Rico, and a sample of 100 Metropolitan Planning Organizations (MPOs), the report documents commonly applied techniques and emerging new approaches for assessing EJ principles in planning and programming. ***It is organized around six focus areas that reflect common themes from the research:***

- Providing opportunities for meaningful public involvement with EJ populations;
- Identifying EJ populations;
- Understanding EJ needs and concerns;
- Assessing benefits and burdens of proposed plans;
- Assessing whether transportation plans may result in disproportionately high and adverse effects on EJ populations; and
- Deploying strategies to address such effects, including imbalances and needs.

Providing opportunities for meaningful public involvement with EJ populations. Public involvement and EJ is relevant to all stages of transportation planning and project development. Low-income populations and minority populations were, for many years, typically underrepresented in the transportation decision-making process. Given this historic trend and the current barriers to civic participation common among some populations, such as poor internet access or unreliable transportation, transportation agencies often need to make concerted efforts to ensure equitable representation in key processes such as planning, programming, and EJ analyses. The research found that the DOT EJ principles were better addressed when an agency was fully aware of the locations and characteristics of the EJ populations throughout the region. This data, which is essential to successful stakeholder involvement, informs all the other steps in the EJ analysis process. It helps agencies to target outreach efforts, understand existing needs and conditions, assess the potential effects of agency plans, and identify planning steps to remedy any disproportionately high and adverse effects.

Collaboration and partnerships helped agencies to build relationships with trusted local community members who know the preferences and traditions of the people with whom the agency seeks to increase engagement. Strong relationships with trusted advocates can help a transportation agency to allay the mistrust that some minority or low-income individuals may feel towards participating in government agency activities. The research found that partnering with community organizations also provided agencies with an opportunity to develop a deeper understanding of the needs and concerns of EJ populations.

Identifying EJ populations during the transportation planning process. Many agencies are customizing their definitions of EJ populations to include a broader range of groups than the low-income populations and minority populations required under the EJ Executive Order. The research also found that agencies frequently designate certain areas as "EJ areas" or "non-EJ areas" based on whether the area meets an agency-specified threshold concentration level. FHWA does not recommend the use of bright-line thresholds. In some cases, this research found that concentration levels were used as an indicator to consider. In addition, the report identified more detailed examples from agencies that develop dot density maps that identify the regional distribution of different population groups at a finer population concentration.

Understanding the needs and concerns of EJ communities during the transportation planning process, such as the ***benefits*** and ***burdens*** experienced under current conditions. Many agencies accomplished this through stakeholder input and technical analyses (e.g., transportation system performance, transit accessibility gap analyses). To understand the needs appropriately, this research found that agencies deployed a wide range of options to suit their capabilities and their service population's unique needs. They started with the approaches that are easiest for them to accomplish, such as those that build from existing agency activities. Additionally, EJ stakeholders and partners often advised the agency with suggestions on how to prioritize investments and select additional actions to achieve an equitable distribution of benefits and burden.

FHWA Order 6640.23A - FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, states "Under EO 12898, FHWA managers and staff must administer their programs to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of FHWA programs, policies, and activities on minority populations and/or low-income populations." This research found that agency information on current conditions can also inform the selection of indicators used to measure the potential benefits, burdens and effect of agency plans and programs.

Assessing benefits and burdens of plans and programs. Following FHWA Order 6640.23A agencies can ensure their plans and programs "identify and avoid disproportionately high and adverse effects on low-income populations and minority populations." The definition of adverse effects is described as including "increased traffic congestion, isolation, exclusion or separation of minority or low-income individuals within a given community or from the broader community; and the denial of, reduction in, or significant delay in the receipt of, benefits of FHWA programs, policies, or activities."[1] This research identified agencies that identify and develop measures for the benefits and burdens of their programs and that update these analyses when they are undergoing major updates or changes to plans and programs.

[1] https://www.fhwa.dot.gov/legsregs/directives/orders/664023a.pdf

Assessing whether adverse effects on minority and low-income populations are disproportionately high. FHWA Order 6640.23A defines disproportionately high and adverse effect on minority and low-income populations as: "An adverse effect that: is predominately borne by a minority population and/or a low-income population; or will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the nonminority population and/or non-low-income population." The research found that once agencies measured benefits, burdens, and effects for EJ and non-EJ comparison groups, they often discover differences but then face challenges determining whether those differences constitute a disproportionately high and adverse effect. Each situation is unique, however, and some agencies documented an adverse effect as disproportionately high under one scenario but less of an adverse effect under other conditions. Some agencies conducted further analyses to explore the cause of their findings and discussed them with EJ constituents to understand their perspective on disproportionately high and adverse effects.

Deploying strategies to address disproportionately high and adverse effects. FHWA Order 6640.23A describes "proposing measures to avoid, minimize, and/or mitigate disproportionately high and adverse environmental or public health effects and interrelated social and economic effects, and providing offsetting benefits and opportunities to enhance communities, neighborhoods, and individuals." FHWA Order 6640.23A also describes "providing public involvement opportunities and considering the results…" The research highlights various strategies and approaches agencies have employed during the transportation planning process to avoid, minimize, or mitigate potential disproportionately high and adverse effects.

The report concludes with a discussion of overarching best practices that can help all agencies to address EJ effectively, including: applying a consistent EJ analysis process, integrating EJ analyses with plans and programs at the regional and statewide level, and using EJ analyses to inform decision making.

Introduction

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[2] 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.

FHWA Order 6640.23A, FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, establishes policies and procedures for the Federal Highway Administration (FHWA) to use in complying with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

The U.S. DOT has a long-standing commitment to the principles of environmental justice:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and/ low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and/ low-income populations.

Transportation planning and programming are important points at which to assess EJ principles. At these stages of transportation decision making, transportation planners and their partners, with involvement from stakeholder groups and the public, examine transportation investments from the systems level prior to advancing specific projects. The continuing, cooperative, and comprehensive multimodal transportation planning process carried out by State DOTs and MPOs includes development of a statewide long-range transportation plan (SLRTP), metropolitan long-range transportation plan (LRTP), statewide transportation improvement program (STIP), and metropolitan transportation improvement program (TIP). By assessing EJ in planning and programming, transportation agencies, stakeholders, and the public can identify the effects of transportation investments on different segments of the community to mitigate disproportionately high and adverse effects.

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2 FHWA and USDOT EJ Orders define a "minority" individual as a person who identifies with one or more of these categories: (1) Black: a person having origins in any of the black racial groups of Africa; (2) Hispanic or Latino: a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race; (3) Asian American: a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent; (4) American Indian and Alaskan Native: a person having origins in any of the original people of North, Central, and South America and who maintains cultural identification through tribal affiliation or community recognition; or (5) Native Hawaiian and Other Pacific Islander: a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

U.S. DOT and FHWA directives provide guidance for addressing EJ, but many State DOTs and MPOs have been seeking more specific information. This report provides a summary of approaches currently used in practice today, with a specific focus on notable practices for conducting EJ assessments during transportation planning and programming. Recognizing that agencies vary in size, priorities, technical capacity, and access to data, the practices documented here reflect a range of approaches that agencies can consider within the context of their own resources and community goals.

This report is intended to provide useful information and to generate ideas among practitioners, but it does not constitute guidance nor does it establish any new requirements.

Organization of This Report

Based on the research, the report provides notable practices among transportation agencies conducting an EJ analysis during the statewide, nonmetropolitan, and metropolitan transportation planning process. The report provides an overview of the planning process in transportation decision making and is organized to highlight six focus areas that are informed by the transportation planning process and by input from EJ stakeholders.

- Providing opportunities for meaningful public involvement with EJ populations;
- Identifying EJ populations;
- Understanding EJ needs and concerns;
- Assessing benefits and burdens of proposed plans;
- Assessing whether transportation plans may result in disproportionately high and adverse effects on EJ populations; and
- Deploying strategies to address such effects, including imbalances and needs.

Research Process

This report synthesizes research conducted via an online review of the EJ practices documented by all 52 State DOTs (include Puerto Rico and the District of Columbia) and a sample of 100 MPOs. The review focused on descriptions of EJ practices documented in the agencies' LRTPs, MTPs, STIPs, and TIPs, and other elements of the transportation planning process such as public participation plans, unified planning work programs (UPWPs), and EJ program documents.

Research Basis for Identifying MPO Sample

A random number generator was used to select 100 of the nation's 405 MPOs, using parameters for diversity in geographies and service population sizes. A list of the MPOs in the sample is included as an appendix to this report. The MPO sample has the following characteristics:

- More than 30% of the MPOs in the study sample are housed within regional councils whose jurisdiction includes rural areas, and which may provide staff support to rural transportation planning organizations (TPOs).
- 20% of the MPOs are relatively new, designated since 2003.
- 51% of the MPOs have a service population of less than 250,000, which is like the national distribution.

- Although the sample only contains 25% of the nation's MPOs, the sample accounts for 41% of the nation's population that lives within an MPO service area.

Although the sampling method did not control for organizational structure, the online review revealed that the selected MPOs are almost evenly divided among the following structures:

- Freestanding independent organization;
- Hosted by municipal government;
- Hosted by county government;
- Hosted by regional planning commission (RPC); and
- Hosted by council of governments (COG).

Research Process for Scanning Published Transportation Planning and Programming Documents

Researchers reviewed hundreds of publicly available planning-related reports on the selected MPO and DOT websites using an extensive content review questionnaire. For each agency, the researchers scanned LRTP, TIP, public participation plans, Title VI plans, unified planning work programs, and other available reports relevant to EJ considerations and assessments.

The content review questionnaire or "checklist" contained 115 questions organized around the focus areas supported by a foundation of EJ stakeholder involvement. It included both categorical and open-ended questions. Categorical questions supported a general characterization of the frequency of various practices, processes, or methods. Open-ended questions facilitated a broader understanding of the range and type of practices, processes, and methods used.

The researchers entered their findings in an online database developed for the project, from which the team leaders developed a detailed technical memorandum for discussion with study advisors. The results were synthesized to generate descriptions of common and notable practices associated with each focus area and developed a report for review by study advisors. The final report highlights the key findings that reflect the state of the practice and that provide useful information for practitioners.

Advisors

The researchers were advised throughout the process by a panel of subject matter experts from the Federal Highway Administration (FHWA), State DOTs, and MPOs. The panel discussed the sample selection method, provided input on the "checklist," of items scanned during the review of online documents, and reviewed technical memoranda and draft reports. A list of FHWA staff advisors and technical panel members is included as an appendix to the report.

Definitions

Adverse effect – The U.S. DOT and FHWA EJ Orders state that "adverse effects" means the totality of significant individual or cumulative human health or environmental effects, including interrelated social and economic effects, which may include, but are not limited to: bodily impairment, infirmity, illness, or death; air, noise, and water pollution and soil contamination; destruction or disruption of human-made or natural resources; destruction or diminution of aesthetic values; destruction or disruption of community cohesion or a community's economic vitality; destruction or disruption of the availability of public and private facilities and services; vibration; adverse employment effects; displacement of persons, businesses, farms, or nonprofit organizations; increased traffic congestion, isolation, exclusion, or separation of minority and/or low-income individuals within a given community or from the broader community; and, the denial of, reduction in, or significant delay in the receipt of benefits of FHWA/DOT programs, policies, or activities.

Disproportionately high and adverse – The U.S. DOT and FHWA EJ Orders state that "disproportionately high and adverse" refers to an adverse effect that (1) is predominately borne by a minority population and/or a low-income population; or (2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the nonminority population and/or non-low-income population. When considering whether an effect is "disproportionately high and adverse," practitioners should include the community that may be affected in that discussion.

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 guidance on EJ uses of U.S. Census Bureau poverty guidelines. The HHS website outlines key differences between HHS guidelines and Census guidelines.

Minority – The U.S. DOT and FHWA EJ Orders define a "minority" individual as a person who is: (1) Black: a person having origins in any of the black racial groups of Africa; (2) Hispanic or Latino: a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race; (3) Asian American: a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent; (4) American Indian and Alaskan Native: a person having origins in any of the original people of North America, South America (including Central America), and who maintains cultural identification through Tribal affiliation or community recognition; or (5) Native Hawaiian and Other Pacific Islander: a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

Populations – For the terms "minority" and "low-income," the U.S. DOT and FHWA EJ Orders define a "population" as any readily identifiable group of minority and/or low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed/transient persons of those groups (such as migrant workers, homeless persons, or Native Americans) who will be similarly affected by a proposed FHWA/DOT program, policy, or activity.

Practitioner – In this document, the term "practitioner" refers to the agency staff directly conducting an activity or project, which in most cases will be FHWA funding recipients, such as State departments of transportation and metropolitan planning organizations. FHWA primarily serves in an oversight and advisory role.

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.

Understanding the Planning Process in Transportation Decision making

Understanding the potential effects to the human environmental of transportation plan options is important in making informed decisions, and community impacts and environmental justice is an environmental issue States and MPOs consider. To support informed transportation investment decision-making, states, MPOs, and transit agencies are increasingly incorporating performance measures in their transportation plans and analyzing the anticipated performance implications of alternative strategies or investment packages. Statewide and metropolitan transportation plans are designed to take a long-term view of transportation needs and to identify projects, strategies, and policies to achieve agreed-upon goals.

The public participation includes a process for soliciting information and considering the needs of all affected parties including those traditionally underserved by existing transportation systems, such as low-income and minority households. Integrating the quality and location of transportation facilities to broader opportunities such as access to good jobs, affordable housing, quality schools, and safer streets and roads is integral. This is reflected in measures such as reliability, safety, trip quality, travel time, and trip cost, yet often can be challenging to define in quantitative terms with a limited set of measures. Discussing these tradeoffs – as well as the role that asset condition plays in safety and costs for preserving the transportation system – can be a useful way to engage people in thinking about transportation issues. Therefore, appropriate communication of environmental justice analysis and performance-related information can be targeted to each stakeholder need, and should consider effective ways to engage the environmental justice community in a discussion about transportation needs and desired system performance outcomes and priorities.

Statewide Planning

Transportation effects almost every aspect of our lives. The statewide transportation planning process is a forum through which transportation decisions are made to address these issues. States are required to conduct continuing, comprehensive and collaborative intermodal statewide transportation planning that facilitates the efficient, economic movement of people and goods in all areas of the state, including metropolitan areas. The statewide transportation planning process includes an analysis of strategies to meet projected future demands, and for providing a safe and efficient transportation system for people and freight that includes seeking out and considering the needs of those traditionally underserved by existing transportation systems, such as low-income and minority households, who may face challenges accessing employment and other services. The plan documents the planning process analysis and identification of elements of the integrated multimodal transportation system, including how existing transportation facilities, including major roadways, transit, multimodal and intermodal facilities, pedestrian walkways and bicycle networks, and intermodal connectors serve the community. Each State carries out a continuing, cooperative, and comprehensive statewide transportation planning process that provides for consideration and implementation of projects, strategies, and services that address the ten planning factors based on the scale and complexity of transportation, land use, employment, economic development, human and natural environment at the same time with a performance based approach to transportation decision making that address the National Performance Goals.

Metropolitan Planning

A Metropolitan Planning Organization (MPO) has authority and responsibility for transportation policy-making in metropolitan planning areas with a population greater than 50,000 have an MPO. MPOs ensure that existing and future expenditures for transportation projects and programs are based on a continuing, cooperative and comprehensive (3-C) planning process. MPOs also cooperate with State and public transportation operators to set spending levels for Federal funds that are meant for transportation projects. MPOs that serve regions with a population greater than 200,000 are Transportation Management Areas (TMA) and the board or policy makers include local elected officials; officials of public agencies that administer or operate major modes of transportation in the metropolitan area, including representation by providers of public transportation; and appropriate State officials. Metropolitan transportation planning is the process of examining travel and transportation issues and needs in metropolitan areas. It includes a demographic analysis of the community in question, as well as an examination of travel patterns and trends. The metropolitan planning process also includes an analysis of alternatives to meet projected future demands, and for providing a safe and efficient transportation system for people and freight that includes seeking out and considering the needs of those traditionally underserved by existing transportation systems, such as low-income and minority households, who may face challenges accessing employment and other services. MPOs carry out the metropolitan transportation planning process in coordination with the statewide transportation planning process to meets mobility needs while not creating adverse impacts to the environment. MPOs also address the planning factors together with a performance based approach to transportation decision making that address the National Performance Goals.

Non-discrimination in Transportation Planning

Equity is a critical consideration for the transportation planning process, given the importance of ensuring the process is inclusive. Specifically, the environmental justice is one of the considerations in planning processes designed to accommodate all populations, as required in:

- Title VI of the Civil Rights Act of 1964, which prohibits exclusion from participation in, denial of benefits of, and discrimination under Federally-assisted programs on grounds of race, color, or national origin.
- The Americans With Disabilities Act of 1990, which states that no qualified individual with a disability shall, because of such disability, be excluded from participation in or be denied the benefits of services, programs, or activities of a public entity, or be subjected to discrimination by any such entity.
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, which requires Federal agencies to identify any needs for services to those with limited English proficiency (LEP), and develop a system to provide those services so LEP persons can have meaningful access to them.
- Executive Order 12898, Environmental Justice in Minority Populations and Low-Income Populations, which instructs Federal agencies to identify and address instances in which adverse human health or environmental effects of their actions disproportionately affect minority and low-income populations.
- The Age Discrimination Act of 1975, which prohibits discrimination on the basis of age in programs or activities receiving Federal financial assistance.

Providing Opportunities for Meaningful Public Involvement with EJ Populations

Low-income populations and minority populations were, for many years, typically underrepresented in the transportation decision-making process. Due to this historic trend, agencies often face challenges in reaching these populations, especially among communities that may have reservations about attending public meetings or may distrust the process based on decisions made in the past.

FHWA Order 6640.23A policy states "it is FHWA's continuing policy to identify and prevent discriminatory effects by actively administering its programs, policies, and activities to ensure that social impacts to communities and people are recognized early and continually throughout the transportation decision-making process--from early planning through implementation. Should the potential for discrimination be discovered, action to eliminate the potential shall be taken." 23 CFR 450.210 (viii), states that States and MPOs shall "Include a process for seeking out and considering the needs of those traditionally underserved by existing transportation systems, such as low-income and minority households, who may face challenges accessing employment and other services" as part of public involvement.

The research found that many agencies' public involvement plans, and other documents, generally describe minimal efforts to reach EJ populations, often limited to distributing meeting notices to minority news outlets and organizations serving low-income populations and/or minority populations. These efforts are good practices but are unlikely to be very effective if not paired with other proactive approaches, such as the following strategies discussed in this chapter:

- Building relationships in EJ communities and with EJ stakeholders and organizations;
- Tailoring public involvement methods to overcome barriers and improve participation; and
- Measuring effectiveness in engaging minority or low-income individuals and using that data to improve public involvement programs.

This research found that all proactive approaches benefited from an agency's knowledge of geographic areas where there are large numbers of minority or low-income populations. Approaches for assessing EJ areas are described in the next focus area of this report. Agencies can use the data from their public involvement efforts to help them better understand locations for targeted outreach and relevant organizations with which to partner.

Building Relationships with EJ Stakeholders

This research found that local community members can be valuable resources for learning about the traditions, history, and issues of concern within the community. Strong relationships with these trusted advocates can help to allay the mistrust that some minority individuals or low-income individuals may feel towards getting involved with a government agency. Partnering with community organizations also gives an agency an opportunity to develop a deeper sensitivity toward the needs and concerns among EJ populations.

Approaches include mechanisms to initially "break the ice" and build a foundation for continuing dialogue; to establish formal relationships with advocates and leaders; and to employ communication strategies that garner trust and strengthen informal social networks. It is particularly effective to build one or more relationships with trusted community members that are not primarily known for their association with a single advocacy organization or coalition. These individuals can advise the agency on how to approach a variety of community leaders and advocates; with respect to recruiting community leaders as "ambassadors" for a planning process; and where appropriate; help train them in transportation issues and decision-making processes.

Bay County, FL TPO has a "Riders Under Cover" stakeholder engagement program in which five frequent transit riders are chosen to represent the riders at large. These five riders are asked to solicit comments from fellow riders about the transit system and ways to improve it. In exchange, the selected riders receive free transit passes for the year.

Community ambassadors have proven very effective at reaching traditionally underserved populations and at gathering meaningful feedback from them. Generally, ambassadors have proven less successful, however, at sustaining participation from community members at public meetings and convincing people to work directly with practitioners. Getting members of the community to openly communicate with ambassadors about one project is no guarantee of participation in later efforts. Agencies should be prepared to sustain relationships with local advisors for the long term to make lasting improvements to community relations.

Transportation practitioners who are effective in maintaining long term relationships with ambassadors to foster involvement with underserved populations may be able to build trust with the community and position the agency to pursue future initiatives. These programs require staff resources (to recruit, educate, and support ambassadors) and funds for printed materials (flyers, pamphlets, etc.), stipends, and, as needed, storefront project information centers.

Tailoring Public Involvement Methods for EJ Populations

Public involvement is essential to developing a full understanding of the unique transportation needs and concerns of low-income populations and minority populations. This involves "seeking out and considering the needs of those traditionally underserved by existing transportation systems such as low-income and/or minority households, who may face challenges accessing employment and other services. Public involvement can also capture important details, nuances, and empirical stories that are not discernible from quantitative analyses, but it can

Focus Area
Providing Opportunities for Meaningful Public Involvement with EJ Populations

Tools and Techniques
- Innovative public involvement activities
- EJ-focused communication strategies
- Trusted community partners
- Convenient opportunities to provide input

Examples
- Community Planning Association of Southwest Idaho
- Massachusetts DOT
- North Jersey Transportation Planning Authority
- Puget Sound Regional Council, WA
- Southern New Hampshire Planning Commission

only succeed if agencies strategically tailor their efforts to overcome barriers to participation experienced by minority or low-income individuals. Low-income individuals may not have access to computers, magazine or newspaper subscriptions, or the internet; they may also have lower literacy rates and may be working two jobs, leaving little time for meetings. Minority individuals may be reluctant to trust transportation agencies if they have negative associations with government officials or decision-making processes.

What is tailored public involvement?

Most agencies prepare specific plans on reaching populations with limited English proficiency (LEP), which include people with limited literacy and those for whom English is a second language. Fully tailored public involvement, however, involves using a portfolio of approaches to overcome barriers, including a process for seeking out and considering the needs of people traditionally underserved by existing transportation systems (such as low-income and minority individuals) who may face challenges accessing employment and other services. In general, tailored public involvement plans address three fundamental goals:

- Ensuring that information on how to participate in the process reaches minority and/or low-income individuals;
- Ensuring that the options for participating are convenient and accessible to minority and/or low-income individuals; and
- Ensuring that participation is worthwhile by listening to minority and/or low-income individuals, documenting their comments, and communicating the ways in which their input has been considered.

Attending to key activities such as these helps agencies to build trust with EJ communities, which in turn can encourage future participation in decision-making processes. Additionally, transportation decision makers can discover valuable information from tailored public involvement that may not be available via other avenues of research.

Why is tailored public involvement notable for an environmental justice analysis?

Agencies used tailored public involvement strategies to foster an inclusive process in which minority and/or low-income individuals feel comfortable and empowered to express their needs, concerns, and ideas, to build trust that decision makers will consider and address their input. Effective outreach overcomes barriers by providing opportunities for EJ communities to engage in multiple ways, both in person and remotely.

Agencies found that meaningful public involvement of minority and/or low-income individuals can pose a challenge, especially in communities where residents have difficulty getting to meetings, have language barriers, or are unfamiliar with the decision-making process. Sensitively planned, targeted outreach that employs communication strategies tailored to EJ audiences can help practitioners to engage meaningfully with low-income populations and/or minority populations, especially those who are wary of participating in civic dialogue. This is particularly relevant for foreign born populations, for whom English may not be the primary language and who may have limited experience interacting with government. The results of tailored public

involvement can help agency staff and officials to work with all types of populations, including those who have been historically underrepresented and those that want to participate in shaping useful strategies to address their unique transportation challenges.

What are some techniques described by agencies for implementing tailored public involvement?

The research found that tailoring public involvement to EJ communities requires a multi-faceted approach that provides a range of opportunities to participate. EJ groups may face different barriers to participation including feeling marginalized in previous planning processes, language barriers, lack of knowledge about the transportation planning process, and inability to attend meetings because of competing time constraints from jobs, family, or other commitments. As such, agencies may wish to consider including a process for seeking out and considering the needs of those traditionally underserved by existing transportation systems Practitioners may also need to apply a range of approaches to overcome the different obstacles.

Communication strategies tailored for EJ communities should be both informative and educational. It is important to not only inform minority and/or low-income individuals about opportunities for public involvement, but also to assist in understanding the transportation decision-making process and the role of the public's input. Gaining a more comprehensive understanding of how to effectively engage EJ and/or LEP populations in decision making can help those having trouble finding time or ability to participate.

Below are listed some common approaches used by agencies to achieve the basic goals of tailored public involvement:

Make sure minority persons and/or low-income persons are informed of opportunities to participate

- **Notify EJ groups regularly** of opportunities to participate in planning-related meetings, to be involved in outreach activities such as surveys and focus groups, to access important documents such as plans and programs, and to provide their input in a variety of ways.
- **Make it as easy as possible for different "audiences" throughout the community to hear, understand, and act** upon each notification or public message. Audiences could include, for example, people with limited English proficiency, single parent households, older adults, people with disabilities, and people who do not use the Internet or social media.
- **Use a combination of simple techniques to target outreach to a variety of communities,** such as dropping off fliers at individual's homes and through "backpack mail" sent home with public school children; connecting with advocacy organizations; and working with local media outlets.

Make it easy for minority persons and/or low-income persons to participate.

- **Select a variety of days and times** for EJ groups to participate in activities.
- **Identify convenient meeting locations** in places near transit or central to areas with high concentrations of EJ populations.
- **Offer incentives** to encourage participation, such as providing free transit to the meeting and professional child care during the session.
- **Provide ways to participate remotely** for those who cannot attend activities in-person (e.g. online or printed mail-in surveys).
- **When conducting surveys, oversample** areas with high numbers of EJ populations.
- **Go to where minority and/or low-income individuals are already congregating**, such as fairs, festivals, places of worship, and other community events.
- **Ensure that facilities are ADA accessible** to people with physical disabilities.
- **Provide easily accessible accommodations** such as interpreters for people who are hearing impaired or for whom English is a second language (ESL).

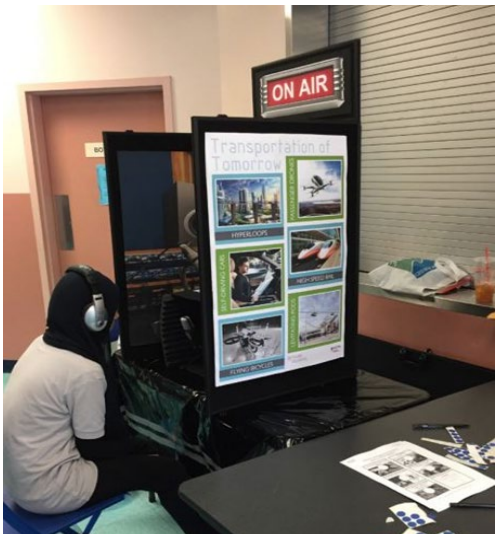

Figure 1. Student using the NJPTA On-Air activity. North Jersey Transportation Planning Authority. 2017. Plan 2045 Connection North Jersey, Public Outreach Appendix.
Source: North Jersey Transportation Planning Authority.

Make participation meaningful and worthwhile.

- **Focus on gathering information** rather than just presenting prepared talking points.
- **Ask people about their own experiences**, needs, and attitudes on transportation-related issues, and ideas for improvements.
- **Hold small group meetings**, using facilitators and exercises to encourage interaction.
- **Collect participants' input visibly** on maps, flip charts, in comment boxes, and through documented interviews.
- **Document and share with participants how their input has been and will be considered and acted upon** by decision makers. This helps build trust and encourage sustained participation over the long term.
- **Follow up with participants** on how their input has impacted programs or plans.

The **North Jersey Transportation Planning Authority (NJTPA)** used insights from focus group participants and data from its *Public Engagement Toolkit "Tools and Approaches" database*,[3] to craft the following initiatives for engaging EJ communities:

- **"Trusted Advocate" Model**. In response to preferences to engage with individuals from their community or who had a deep-rooted understanding of the community, NJTPA sought out "Trusted Advocates" to help EJ outreach.
- **"Set the Table!**" promoted civic dinner parties to combine friends, food, and social media to facilitate community discussions. NJTPA recruited "hosts" and provided them a "meeting-in-a-box" containing facilitation materials and templates to help organize and orient their discussions.
- **"NJTPA On Air"** engaged children and teenagers using a pop-up activity booth and multi-media approach, but this approach could be used for all age groups. The "NJTPA On Air" booth was designed to look like a radio station, and participants recorded their ideas on the future of transportation.
- **Comfortable Settings**. To engage LEP individuals, NJTPA identified locations where these individuals may feel particularly comfortable engaging in conversation and expressing their views (e.g., English-as-a-second-language classroom).

Puget Sound Regional Council (PSRC) mobilized community-based organizations to help foster in-person community public involvement events with minority and/or low-income individuals for the update of the RTP and the Coordinated Human Services Transportation Plan. PSRC researched organizations in the region and assessed their ability to reach EJ populations, resulting in an initial list of 32 potential organizations to contact to gauge their interest in participating. PSRC then contacted each organization at least three times, at minimum once via email and once via phone.

Fourteen community-based organizations agreed to participate, helping to reach EJ populations and other traditionally underserved groups. PSRC sought input from the organizations on how best to conduct outreach, including how, when, and where it would be most convenient for the target audiences. PSRC developed three general outreach approaches to engage these audiences and matched these outreach activities with specific organizations and their stakeholders.

As part of the outreach, PSRC developed a questionnaire to gather public input, available on PSRC's website and in print. The community-based organizations helped distribute the questionnaire by posting links on their websites, sending notifications to their email lists, and distributing the print version where appropriate. In response to public feedback, PSRC refined and simplified the initial questionnaire, then translated it into multiple languages. PSRC shared the final questionnaire with additional organizations that had not yet participated.

[3] http://engage.njtpa.org/

PSRC also leveraged these partnerships by participating in the organizations' existing meetings and events. PSRC's role varied but included presentations, distribution of print questionnaires, and "dot exercises" where participants used dot stickers to prioritize topics on large posters. The "dot-exercise" was specifically used with special needs groups to understand their needs, gaps, and prioritized strategies for the Coordinated Transit-Human Services Transportation Plan.

What are the limitations of tailored public involvement?

Given the inevitable staff and resource constraints, agencies consider carefully the limitations and benefits of the various outreach strategies, so they can choose approaches that are both efficient and effective for their specific circumstances. For example, focus groups and stakeholder meetings reach fewer people than a broad public survey, but their open-ended discussions can generate details and insights that a survey cannot produce. The agency may wish to consider using a survey to get a broad sense of *what* people are concerned about within a given population or community, then conduct a focus group or individual interviews to discern *why* people are sensitive about those issues.

What resources are needed to conduct tailored public involvement?

Conducting targeted EJ outreach and developing tailored materials require staff time and financial resources. Staff may need to facilitate the meetings, which are typically held outside of normal office hours. Depending on the approach taken, agency staff or consulting organization may also spend considerable time recruiting participants to attend meetings. Hosting multiple in-person meetings requires a considerable time commitment from organizers. Each meeting typically runs for 90 to 120 minutes, is preceded by several hours of planning and set up time and is followed by several hours spent analyzing and addressing the input gathered. Depending on the location and arrangements, costs may include venue rental, refreshments, printed materials (perhaps in multiple languages), transit passes, or child care.

There are, however, many ways to reduce outreach costs by utilizing strategies that increase efficiencies (such as the meeting-in-a-box tool). Developing community partnerships can help agencies to effectively stretch their resources in several ways: partners can, for example, help organize outreach activities, recruit attendees, facilitate meetings, and provide free or discounted venues, refreshments, child care, or transit passes.

Who has used tailored outreach to engage EJ populations?

Community Planning Association of Southwest Idaho (COMPASS) held focus groups with low-income communities, older adults, and Hispanic populations. A map of Census tracts with high concentrations of the desired audience populations helped identify specific locations to hold public meetings and areas to distribute advertisements for the meetings. COMPASS offered language translation at meeting and reimbursement for child-care and transportation.

Massachusetts DOT provided translated documents, websites, surveys, and email addresses; and toll-free telephone comment lines in languages such as Spanish, Portuguese, Haitian Creole, and Vietnamese.

North Jersey Transportation Planning Authority engagement activities included focus groups, workshops, and several innovative activities. For more information, see the example in the "What are some techniques for implementing this practice?" section above.

Puget Sound Regional Council mobilized more than a dozen community-based organizations to help foster community engagement activities to directly connect with low-income, minority and other traditionally disadvantaged populations. For more information, see the example in the "What are some techniques for implementing this practice?" section above.

Southern New Hampshire Planning Commission partnered with a civic engagement initiative at the University of New Hampshire to host a series of focus groups with traditionally underserved populations, including low-income populations. The Commission also worked with NH Catholic Charities and Ascentia Care Network, two agencies serving immigrant populations, enlisting their assistance in conducting outreach for the long rage transportation plan.

Wichita Area MPO held roundtable discussion groups specializing in different areas of expertise. The roundtable of traditionally underserved populations identified "improved serviced and coordination among providers" as a priority need. They also identified a list of eight other priorities (e.g., hours of operation and service reliability), five current issues (e.g., barriers to riding), and three emerging issues (e.g., disenfranchisement).

Resources

Community Planning Association of Southwest Idaho (COMPASS). 2014. Communities in Motion 2040, Chapter 2: Public Participation and Involvement. http://www.compassidaho.org/documents/prodserv/CIM2040/final/Final_CIM2040_Interactive.pdf

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Federal Highway Administration. Public Involvement Techniques for Transportation Decision-making. 2015. https://www.fhwa.dot.gov/planning/public_involvement/publications/pi_techniques/index.cfm

Federal Highway Administration. Developing and Advancing Effective Public Involvement and Environmental Justice Strategies for Rural and Small Communities. 2017. https://www.fhwa.dot.gov/planning/public_involvement/publications/effective_strategies/index.cfm

Measuring Effectiveness in EJ Public Involvement Outreach

To ensure that efforts to reach minority and/or low-income individuals have been successful, agencies can track the demographics of participants and compare them to those of the study area or service population. If the demographics are not similar, then the agency can set goals for improving its approach. Many agencies collect these demographics. Some are clearly using the information to confirm whether their participants are representative of their service area's population. Others are less clear about documenting the ways in which the information helps them to tailor their approach.

Focus Area

- Meaningful Public Involvement with EJ Populations

Tools and Techniques

- Setting goals, targets, and measures
- Collecting qualitative and quantitative data on level and quality of participation
- Assessing performance

Practice Examples

- Community Planning Association of Southwest Idaho, ID
- Fayetteville Area MPO, NC
- Minnesota DOT
- Puget Sound Regional Council, WA
- St. Lucie TPO, FL

What is measuring effectiveness in EJ participation?

23 CFR 450.210(a)(1)(ix) describes that States and MPOs shall "Provide for the periodic review of the effectiveness of the public involvement process to ensure that the process provides full and open access to all interested parties and revise the process, as appropriate and 23 CFR 450.316 (a)(1)(x) describes that MPOs shall "Periodically reviewing the effectiveness of the procedures and strategies contained in the participation plan to ensure a full and open participation process." Measuring public outreach effectiveness is a process of setting goals, choosing performance metrics, collecting relevant data, and evaluating progress. Goals establish a tangible commitment by the agency to ensure equitable access to participation in the transportation planning and programming process. Collecting data and evaluating progress throughout the process helps agencies to determine which outreach methods work well with different groups, and how to improve or develop methods to engage populations that are difficult to reach.

What are some notable practices for measuring EJ participation?

The research found that one of the barriers to successfully engaging EJ populations in public participation is not knowing which outreach strategies are effective for which groups. Agencies apply performance-based planning approaches to their public involvement programs to gather appropriate data for evaluating and improving performance.

The practice is scalable to different conditions, planning purposes, and regional contexts. Approaches to measures the effectiveness of public involvement that are developed by mid-size MPOs, such as the examples provided below for the St. Lucie TPO (Florida) and the Community Planning Association of Southwest Idaho (COMPASS), may be simpler than those employed by major urban areas such as San Francisco's Metropolitan Transportation Commission and Seattle's Puget Sound Regional Council. Each approach provides valuable information that can improve the public participation process in the future.

What are some techniques used by agencies for measuring effectiveness in EJ participation?

The research found that one of most comprehensive technique for evaluating public outreach participation is to set goals from the beginning, choose performance metrics and targets, collect the data, and evaluate progress throughout the process and at the conclusion. Establishing clear and measurable performance metrics helps measure effectiveness in EJ participation.

St. Lucie, Florida TPO evaluated its public outreach effectiveness as part of its public involvement program. The TPO set four overall goals for its public participation process, outlined below. Each goal was associated with specific performance metrics and evaluation activities. The agency divided the region into several communities, prepared a detailed community profile for each area, and tailored the outreach accordingly. The TPO compared the results of the tailored outreach to data from a previous year, calculated changes in terms of absolute numbers and rates, and determined they had achieved the increases desired.

St. Lucie TPO's four key goals were as follows:

- Hold regularly scheduled and advertised meetings open to the general public.
- Seek out traditionally underserved communities.
- Engage the public clearly, continually, and comprehensively through a variety of outreach activities to maximize public input.
- Integrate the principles and special projects adopted in the 2035 Long Range Transportation Plan.

Supporting strategies included activities such as the following:

- Identify communities with high concentrations of underserved populations, develop relationships with community and religious leaders in these communities, and hold workshops and meetings in these communities.
- Provide presentations to community groups throughout the County.
- Tailor outreach methods according to the community profiles.
- Use public transportation equipment and infrastructure for advertising community-based TPO workshops and planning activities.

Performance objectives included indicators such as the following:

- Overall increase in the participation of Spanish and Creole speakers.
- Percentage increase of traditionally underserved and minority community participants who indicate they saw/received TPO communications.
- Overall increase in participation by religious and community leaders in minority communities and underserved communities.
- Overall increase in participants who use public transportation.

Agencies can either set a specific target (i.e., X number of low-income participants at public meetings), or, if the agency has data from a previous year, they can aim for a numeric or percentage increase target (i.e., increase the number of Spanish speakers who participate by 50% or engage 30 additional EJ community leaders). Data collection methods could include head counts, comment cards, website hits, social media comments, and responses to surveys and polls. The number of metrics involved depends in part upon the agency's staff resources and ability to collect and measure the data.

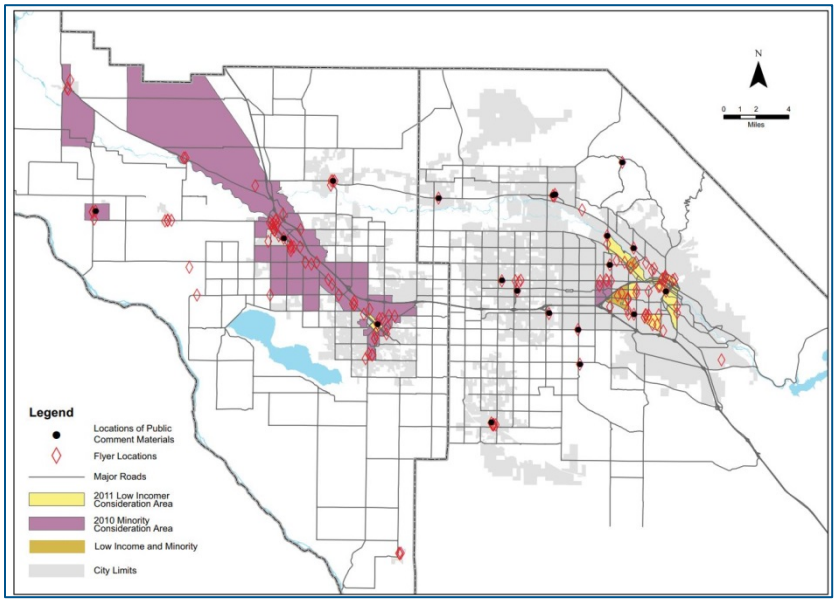

Figure 2. Location of flyers in relation to low-income communities and/or minority communities. Community Planning Association of Southwest Idaho. 2014. Communities in Motion 2040, Chapter 2: Public Participation and Involvement.
Source: Community Planning Association of Southwest Idaho

The Boise-based **Community Planning Association of Southwest Idaho (COMPASS)** uses three categories of measures to evaluate the effectiveness of its public participation and outreach efforts related to its LRTP: output, outcomes, and general feedback.

- *Outputs* are quantifiable indicators of the agency's outreach activities, such as the number and lengths of public comment periods, number of emails sent and number of recipients, number of news releases, and locations of public comment materials and flyer distribution points in relationship to the locations of targeted low-income communities and minority communities (**Figure 2**).
- *Outcomes* capture the results of COMPASS outreach efforts by providing evidence of having an effect. Outcomes include the number of public comments received during a comment period, the number of news stories and opinion pieces generated from COMPASS materials, and the number of attendees at events.
- *General feedback* received through public comment forms helps COMPASS to help measure the equity of the participation process and improve for future efforts. By collecting data from participants such as home zip codes and household demographics, the agency can determine whether the group of respondents is representative of the general population. Zip codes of participants are reported with each comment (when provided), while all other demographics are tracked and reported in aggregate.

What are potential limitations agencies may encouter when measuring effectiveness of public involvement strategies targeted toward EJ populations?

The limitations of measuring effectiveness of EJ participation will depend on the goals and resources of the agency, the data collected by the agency, and how it is collected. Collecting general numbers of attendees helps to describe the agency's reach but does not reveal important information such as which different racial and ethnic segments of the population were engaged, low-income population ability to engage, why certain people chose to participate, how informed or satisfied participants were with the event, or whether participants felt that their involvement was meaningful.

A participant survey can serve multiple purposes. It can provide a venue for eliciting feedback to accompany other opportunities for input such as marking up maps or speaking to a staff member. It also enables the agency to gain more insights on the demographics of participants and, most importantly, to discern personal opinions about why individuals attended, what they gained from the experience, and what they thought was missing from it. One limitation of using surveys to collect demographic information is that respondents may be sensitive about answering questions on race, gender, income, disability status, age, and other personal information. An agency can address this limitation by stating clearly on the survey why it is collecting sensitive data and that it will only report results in aggregate, keeping individual responses confidential.

Understanding the racial/ethnic, income, and neighborhood composition of event participants is an important starting point for measuring outreach effectiveness. Several agencies studied for this report collected demographic information of participants through feedback forms or comments during outreach events, but it is not clear that the agencies set goals or evaluated this data with respect to EJ involvement. Additionally, it is often unclear whether these outreach methods focused on minority and/or low-income individuals or were just used in the overall public participation process. The evaluation can be made more useful and meaningful by comparing participant demographics to the region (as by Minnesota DOT) or measuring progress over time (as by St. Lucie TPO).

A significant limitation to collecting data of any sort from people who participate in meetings and forums is that it does not provide any information about the types of people who chose *not* to participate, and what barriers may be preventing them from engaging. It is challenging to try to discern this kind of important information indirectly, but agencies can make efforts toward this end by collecting opinions on the subject from people who do participate, as well as discussing the issues with EJ stakeholder representatives in focus groups and interviews.

What resources are needed to measure the effectiveness of EJ targeted public involvement strategies?

Measuring public outreach effectiveness requires staff time, but the amount of time will depend on the data collected and how it is analyzed. When integrated into a comprehensive public participation process, the tasks of setting goals, choosing metrics, and evaluating progress requires a relatively small overall share of the staff time and resources required for thorough engagement.

Setting specific goals and developing thoughtful outreach plans can have the effect of making the outreach process more efficient as well as improving its effectiveness.

Who has measured effectiveness of an EJ public involvement strategy?

Community Planning Association of Southwest Idaho measured its public outreach effectiveness by creating a map of home zip codes reported by people that submitted public comments, which enabled comparisons to its maps of EJ areas.

Fayetteville Area MPO tracked demographics through surveys for its Regional Transportation Plan. It found that over half of RTP survey respondents had incomes of less than $19,999 per year and over 80% were from minority populations.

Minnesota DOT compared the demographic makeup of participants in the *Minnesota GO* statewide planning process to that of the statewide population. The participants' racial, ethnic, age, and gender characteristics closely mirrored demographics of the State.

Puget Sound Regional Council assessed the numbers and percentages of responses to the questionnaires by various population groups including Limited English Proficiency (LEP), people of color, people with disabilities, people with low income, older adults, veterans, and youth. The LEP group was broken out into Chinese, Korean, Vietnamese, and Spanish speakers.

St. Lucie TPO measured its public outreach effectiveness by tracking the numbers of meeting participants; the percentage of low-income individuals and/or minority individuals who said they saw TPO communications; and participation by Spanish and Creole speakers, public transit riders, individuals with disabilities, and community leaders in EJ communities. The agency compared the number and diversity of attendees over time and generally demonstrated increased participation among most groups.

Resources

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Puget Sound Regional Council. 2018. *Public Participation Plan*.
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http://www.stlucietpo.org/documents/StLucieTPO_PIP_FINALOctober2012_updated03312017.pdf

Identifying EJ Populations

Thorough identification and assessment of EJ populations can be accomplished when an agency is fully aware of the locations and characteristics of the EJ populations in the region. This informs all the elements of considering and addressing EJ issues in the planning, programming, and decision-making process, helping agencies target outreach efforts, understand existing needs, assess the potential effects of agency plans and programs, and identify locations in which to apply mitigation.

This chapter presents approaches agencies use to identify the locations and characteristics of low income and minority populations. FHWA Order 6640.23A defines "low-income population as any readily identifiable group of low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed FHWA program, policy, or activity and minority population as any readily identifiable groups of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed FHWA program, policy, or activity."

Agencies frequently distinguish "EJ areas" from "non-EJ areas" based on whether given geographic units (e.g. Census tracts, Traffic Analysis Zones) surpass an MPO-designated threshold concentration (i.e., percentage of the population). However, using bright line threshold concentrations to designate EJ and non-EJ areas is not recommend by FHWA. Maps of concentration levels among different populations may provide useful indicators to support a more comprehensive process of identifying EJ populations.

Many agencies customize their assessment of EJ areas to include a broader range of traditionally underserved populations beyond the low-income populations and minority populations required in the EJ orders and related guidance. This approach can enrich the analysis but can also run the risk of obscuring issues specific to the required low-income and minority populations.

A few agencies are striving to understand how demographics and residential location choices might change over the long-term, to improve their assessments of proposed long-term investments later in the process. This is an emerging, technically challenging task that is not yet applied widely.

Identifying Areas With High Concentrations of EJ Residents

The research found that some agencies identify "EJ areas" based on the concentrations of low-income populations and minority populations in those locations. The agency typically establishes a threshold concentration (often the regional average) based on the residential population, which is used to categorize each geographic unit as either "EJ" or "non-EJ." The geographic units vary by agency but usually encompass predefined boundaries such as Census block groups, Census tracts, and Traffic Analysis Zones (TAZs). Some agencies create dot-density maps showing the

distributions of all numbers of minority and low-income individuals. Agencies also create gradient ("heat") maps showing a variety of concentrations or numbers of demographic groups

Although this geographic-based approach of defining and applying threshold concentrations to identify and map EJ populations is common, the research revealed that it has many limitations that agencies should be aware of when presenting and using the data. For example, limiting the identification of EJ populations to those persons that reside in highly concentrated areas may overlook individuals living in low concentrated areas. At U.S. DOT, low-income means a person whose median household income is at or below the Department of Health and Human Services poverty guidelines, and minority individuals are defined by U.S. DOT Order 5610.2(a)[4]. Other challenges associated with this approach include the following:

> FHWA does not recommend using threshold concentrations to designate EJ and non-EJ areas. Concentration levels may be used as an indicator but should not be used to create a bright-line rule. Rather, agencies should use a combination of the quantitative approaches discussed in this report and qualitative approaches, such as public involvement.

- By setting the threshold concentrations as percentages of low-income and minority residents, an agency may risk overlooking densely populated, diverse communities that have high *numbers* of low-income populations and minority populations.
- Setting the threshold concentrations very high can produce a list of "EJ areas" that encompasses a large proportion of the region. It may be important to gather additional information about the broad cluster of identified areas to understand differences or nuances that may be important to EJ stakeholders. Conversely, setting threshold concentrations very low can produce a map of EJ areas that leaves out neighborhoods or locations that are important to EJ stakeholders.
- The research found that predefined geographic units frequently used to determine EJ area boundaries (e.g., Census tracts, block groups, TAZs) rarely coincide with actual neighborhood boundaries. The analysis could result in a map where only half of a low-income neighborhood is represented, because the neighborhood is divided between tracts that fall above and below the threshold. Or, if the tracts are large and diverse, it could potentially generate a map in which large numbers of non-minority persons or higher-income households appear to be part of the total EJ population because they live in the same tracts as low-income or minority persons.
- The research found that the use of threshold concentrations can result in somewhat artificial divisions between areas that are very similar. Many agencies included EJ populations within a Census tract or TAZ that had one percent more than the regional average concentration of minority populations, but not those that live in a tract or TAZ with one percent less than the regional average. Separating these very similar zones into

[4] Final DOT Environmental Justice Order
https://www.fhwa.dot.gov/environment/environmental_justice/ej_at_dot/orders/order_56102a/

two different categories during the analysis could pose a risk of masking potential disproportionately high and adverse effects.

- The research found that threshold concentrations can appear arbitrary or obscure, especially if an agency has not fully documented its rationale for selecting a given threshold concentration, as was the case for most of the plans and programs reviewed for this research.

Of all the approaches applied to improve upon threshold concentrations, the use of standard deviation seems the best at addressing one of the challenges. Standard deviations can be used to identify a breakpoint at which adjacent tracts are more likely to be significantly different. Agencies may be able to improve their ability to judge whether to assign "EJ" status to neighboring tracts by including those whose concentrations fall within a given standard deviation of the threshold.

The research did not yield a universally applicable, precise rationale for identifying ow-income and minority populations solely through "desktop" mapping exercises. Regardless of the techniques used to consider indicators of specific types and locations of populations, it is good practice to validate and enrich the information with qualitative input (and, where possible, quantitative data) from EJ stakeholders.

Dot-Density Mapping the Regional Distribution of EJ Populations

The research found better clarity in the detail in some agencies who created dot-density maps. These maps show the distribution of all *numbers* of minority and/or low-income individuals and/or gradient ("heat") maps showing a variety of concentrations and/or numbers of demographic groups. Some agencies create multiple layers, such as overlaying a dot-density map of all minority and/or low-income individuals onto a map of TAZs shaded in four gradations to represent different concentrations of minority and/or low-income individuals.

Focus Area
- Identifying EJ Populations

Tools and Techniques
- GIS Mapping Tools
- Demographic data

Examples
- Licking County Area Transportation Study, OH
- Mid-Ohio RPC, OH

What is dot-density mapping?

A dot-density map displays dots representing the numbers of a certain population living in a certain geographic unit of analysis. As shown in **Figure 3**, dot-density maps provide a visual representation of the absolute number of persons in an area, complementing gradient maps (e.g., quartiles or quintiles) that display the relative percentages of individuals of a certain population group.

Why is dot-density mapping notable for an environmental justice analysis?

A dot-density map shows any readily identifiable groups of low-income persons and minority persons. Dot-density maps overlaid on gradient maps are particularly effective in conveying both absolute numbers and relative concentrations of populations. For agencies with access to GIS capabilities, dot-density maps are easy to generate.

What are some techniques for implementing dot-density mapping?

To create a dot-density map, an agency will need Census or other data for the relevant population groups. After bringing the Census data into a GIS mapping package, the analyst adjusts the symbology properties of the appropriate layer to use dot-density, then specifies the number of individuals that each dot represents and the size of the dot. One may need to experiment with these settings to generate a map that conveys density without becoming illegible. For example, a symbology in which one dot indicates 200 low-income households per Census block could produce a less precise map than one in which a dot indicates 10 low-income households per block, but the finer-grained map may produce an unreadable image with thousands of dots blurred together. Additionally, adjusting for similarly sized geographic zones can be important in fringe areas, small cities, or mixed type areas. The **Mid-Ohio RPC** in Columbus assembled a series of dot-density maps to show the concentrations of a variety of population groups (i.e., minority, Hispanic, individuals in poverty, older adults (65+), persons with disabilities, and households with no vehicle). As shown in **Figure 3,** each dot represents 200 people identified as minority, and the dots are overlaid on traffic analysis zones shaded by the percentage of minority populations. This approach allows the agency to see where there are concentrations of at least 200 minority individuals, even within areas that do not have high percentages of minority

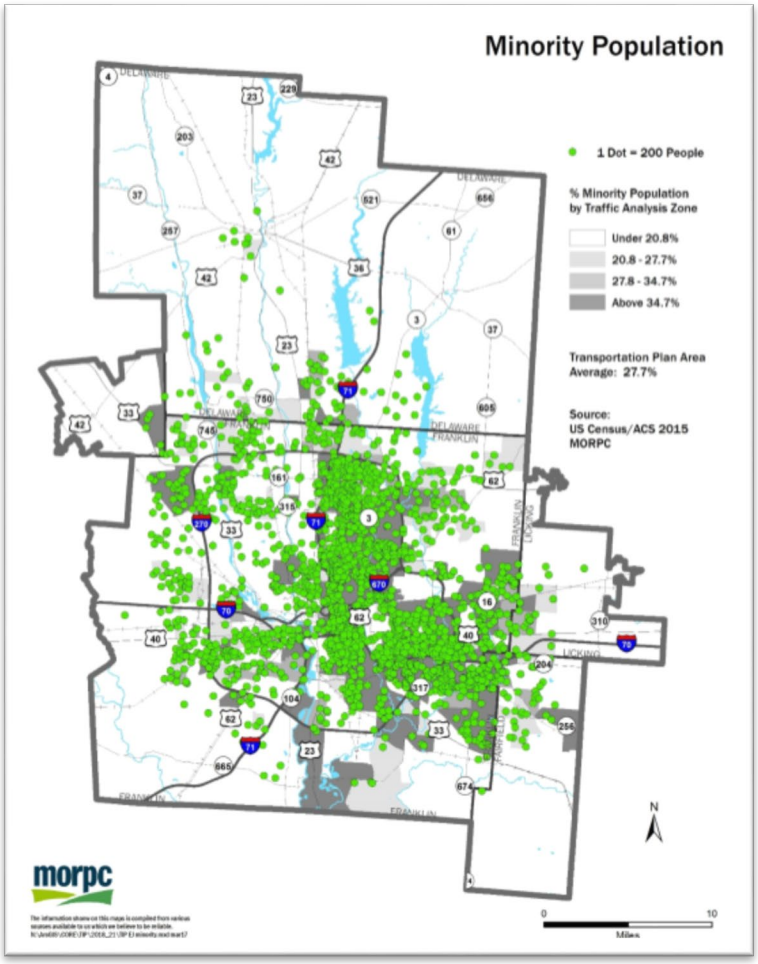

Figure 3. Dot-Density Map and Gradient Map of the Minority Population in the MORPC Area. Source: Mid-Ohio RPC. 2017. Environmental Justice Analysis: Appendix 3 to SFY 2018-2021 MORPC TIP.

population. The method can reveal predominantly non-minority zones and/ or sparsely-populated areas that have "pockets" of minority populations.

Ohio's Licking County Area Transportation Study (LCATS) also mapped a variety of populations, such as zero-vehicle households, using dot-density maps in its LRTP.

What are the limitations of dot-density mapping?

The dots are randomly placed throughout the geographic unit; they do not represent the exact location of the populations mapped, nor do they represent specific households or individuals. Agencies may need to acquire additional local data, such as real estate plots and housing values, to determine the locations of EJ populations more precisely for a project such as a corridor study or NEPA analysis.

Some of the limitations of dot-density maps are like those of threshold concentration maps—if the numbers of persons in a specific population group are very small and/ or dispersed over a wide area, the scale of a regional map may cause them to be missed. Conversely, a dot-density map could appear cluttered or almost unreadable in a densely populated area with overlapping population groups. By focusing on total numbers or gradients of population, however, the dot-density maps are not subject to some of the problems associated with setting thresholds and using tract or zone-based boundaries.

What resources are needed for dot-density mapping?

Creating a dot-density map is no more difficult than creating a gradient map. Any agency with GIS professionals (GISP) or similarly qualified staff capable of navigating the data and mapping techniques easily create these maps.

Resources

MORPC. 2017. Environmental Justice Analysis: Appendix 3 to SFY 2018-2021 MORPC TIP. http://www.morpc.org/wp-content/uploads/2017/12/MORPCTIP2018-2021Appendix3EJ.pdf

LCATS. 2016. Transportation for Progress 2040: LCATS Long-Range Multi-Modal Transportation Plan. http://www.lcats.org/documents/documents/2040Plan/Transportation_Plan_2040_Final_Draft_05102016.pdf

Understanding Demographic Change

Many urban areas are grappling with gentrification and displacement issues caused by neighborhood redevelopment and increases in housing prices. In many cases, concentrated public and private community investments can result in displacement of low-income residents who may be unable to secure affordable replacement housing in his/her community, resulting in that individual or family relocating away from the community where they may have social, economic, and/or familial ties.

Meanwhile, numerous regions throughout the nation have undergone rapid rises or falls in numbers of different demographic groups and/ or economic conditions. It is difficult to accurately forecast future population composition and distribution based on jagged historic trend lines. For example, a downtown neighborhood with a high concentration of low-income populations today could easily transform into an upscale community of expensive homes during the 25-year span of a typical long-range transportation plan, while a homogenous suburb may become an ethnically diverse community over the same 10- or 20-year period. In rapidly evolving communities, it is important to consider the potential adverse effects of long-range plan investments and outcomes using maps and statistics of EJ communities in the present day and for forecast years.

Some MPOs (including Metropolitan Transportation Commission, Portland Metro, Puget Sound Regional Council, and Southern California Association of Governments) have begun to quantitatively analyze gentrification and displacement risk in their equity analyses. In response to stakeholder group concerns about the ability to accurately forecast the location and magnitude of EJ populations over the long-range planning horizon in the Portland region, Metro has begun conducting a 10-year interim analysis (as opposed to only looking at the longer-term forecast) of long range planning investment scenarios and transportation system performance outcomes.

For more information on noteworthy practices of addressing changing demographics in EJ Analysis, agencies may wish to reference FHWA's publication, *Addressing Changing Demographics in Environmental Justice Analysis, State of Practice.*

Customized Approaches of Identifying EJ Populations

Many agencies rely on data from the U.S. Census to count and map EJ populations, which is updated once every ten years. As such, many agencies use the annual American Communities Survey (ACS) products (e.g., American FactFinder) to refresh data more frequently. Some agencies update in-house demographic projections each year (or do so with the help of consultants). The research revealed many agencies who sought to examine unique characteristics of the disadvantaged populations in their service areas.

Focus Area

- Identifying EJ Populations

Tools and Techniques

- GIS Mapping Tools
- Demographic data

Examples

- District of Columbia DOT
- Lancaster MPO, PA
- Metropolitan Transportation Commission, CA
- Morgantown Monongalia MPO, WV
- Puget Sound Regional Council

These agencies are using a wide variety of tools and data sources to add detail to their understanding.

Table 1 and **Table 2** summarize tools and datasets used by a variety of the agencies studied for this report in addition to Census products.

Table 1. National EJ Analysis Tools and Datasets beyond Census Products

Tool Name	Description / Possible Application	Agency Examples (from project research)
CDC Agency for Toxic Substances and Disease Registry (ATSDR) Social Vulnerability Index	Identifies communities that might need support in preparing for hazards or recovering from disaster.	Massachusetts DOT
EJSCREEN: Environmental Justice Screening and Mapping Tool[5]	Mapping and screening tool that provides demographic and environmental information that can help identify vulnerable communities and potential environmental concerns.	DOTs: ID, MA, NJ, RI, SD MPOs: Centre County, Community Association of SW Idaho, Lubbock, Morgantown Monongalia, NE Indiana RPC, NW Arkansas RPC, NW Indiana RPC, Oahu, Ocala/Marion TPO, Polk County TPO, Portland Area Comprehensive Transportation System, Puget Sound Regional Council, Winchester-Frederick Co
HUD Location Affordability Portal	Cost calculation tool that estimates housing and transportation costs.	Massachusetts DOT
Longitudinal Employer–Household Dynamics (LEHD)	Assess commute travel times, distances, and potential transit access to jobs.	Southern California Association of Governments
Medicaid	Participation in Medicaid and the Children's Health Insurance Program.	Vermont DOT
National Center for Education Statistics	Data on school quality, student attendance, and participation in free school lunch program.	Birmingham MPO, West Virginia DOT
National Equity Atlas	Assessment of equity among 150 largest metropolitan areas, determined by demographic, economic, and equity indicators.	Massachusetts DOT

[5] FHWA has also identified these agencies as users of EJSCREEN: Augusta Planning & Development Department (GA), Hillsborough MPO (FL), Kalamazoo Area Transportation Study (MI), Missouri DOT, North Florida TPO, Nevada DOT, Ohio DOT, and Washington State DOT.

Tool Name	Description / Possible Application	Agency Examples (from project research)
National Household Travel Survey	Detailed daily travel data across several modes, demographics, and vehicular data.	Memphis Urban Area MPO
NEPAssist	Web-based application that pulls environmental data from U.S. EPA databases and web services, enabling immediate screening for environmental indicators.	Lubbock MPO
Public Use Microdata Sample	Enables matching of Census demographic data to traffic analysis zones.	Mid-Ohio RPC, Puget Sound Regional Council
UrbanSim Model Data	Simulation and visualization model for comparing scenarios.	Puget Sound Regional Council
U.S. Department of Health and Human Services (HHS)	A repository of datasets including data on communities, health, and Medicare.	Michigan DOT

Table 2. Local, Regional, and State EJ Analysis Tools and Datasets

Dataset Name	Possible Application	Agency Examples (from project research)
Grocery stores and other essential services	Locate essential goods and services to assess accessibility.	Rogue Valley MPO, Mid-America Regional Council, Delaware Valley RPC
Local bicycle and pedestrian crash data	Identify high-crash areas, especially in EJ communities	Rogue Valley MPO, Mid-American Regional Council
Local job and economic data	Assess travel times or access to employment centers or areas with projected job growth.	Charlotte County-Punta Gorda MPO, Chicago Metropolitan Agency for Planning, Hattiesburg-Petal-Forrest-Lamar MPO, Iowa DOT, Mid-Ohio RPC, North Central Texas COG, Rogue Valley MPO
MassDOT Engage	Identify language needs, community organizations, and meeting places.	Massachusetts DOT
Primary data from community leaders	info on community assets, such as local social services	Birmingham MPO, West Virginia DOT, Rogue Valley MPO
Transit and passenger surveys	Determine service quality or gaps.	Metropolitan Transportation Commission
Transit ridership	Assess passenger trips and transit service.	Birmingham MPO, Chicago Metropolitan Agency for Planning, Metropolitan Area Planning Agency, Metropolitan

Dataset Name	Possible Application	Agency Examples (from project research)
and service data		Council, Metropolitan Transportation Commission, Rogue Valley MPO
Travel Surveys and Travel Model Outputs	Assess individual travel behavior.	Chicago Metropolitan Agency for Planning, Fayetteville Area MPO, Madison Area TPB, Memphis Urban Area MPO, Mid-America Regional Council, Mid-Ohio RPC, North Central Texas COG, OH DOT, Puget Sound Regional Council, Roanoke Valley TPO, Wichita Area MPO, Winston-Salem MPO

Another national data source is the Opportunity Zone Explorer. As described on the tool's Web site: "Created in the 2017 Tax Cuts and Jobs Act, Opportunity Zones use tax incentives to encourage private investment into designated census tracts. The Opportunity Zone Explorer identifies tracts that have been designated and how they relate to other federal programs and designations. In addition, users can filter tracts using the Opportunity360 Outcome Indices to see how people living in these tracts are faring across five outcome dimensions, and explore tracts that were eligible but not designated by the states as Opportunity Zones."

Other local data sources include information from discount tolling programs for low-income populations (i.e. LA Metro Express Lanes); and similar data for subsidized bike share programs, rideshare programs, and microtransit (e.g., demand-response minibuses and vans) incentives targeted towards low-income populations.

What is a customized approach to identifying EJ populations?

Some of the agencies researched for this study customized their analysis methods to address regional concerns or unique characteristics. These customizations tend to fall into three categories:

- Modifying or broadening the definition of "low-income" to be more reflective of regional characteristics rather than applying the U.S. Department of Health and Human Services poverty guidelines.
- Identifying additional population groups – beyond the required low-income populations and/or minority populations – for consideration in the analysis.
- Developing an index approach that identifies areas with high concentrations of multiple types of underserved populations.

These approaches can help agencies to enrich their understanding of issues and to tailor approaches to the needs of their region. These approaches where observed in the research, however, it is important to note that they supplement—and do not replace—analyses focusing on

the population groups covered by the U.S. DOT EJ Order[6]: low-income populations and/or minority populations.

Why are customized approaches to identifying EJ populations notable?

Underserved populations can vary widely in their needs and may require different approaches.

Defining low-income at the regional level – U.S. DOT EJ guidance defines "low-income" as "a person whose household income is at or below the Department of Health and Human Services poverty guidelines." However, regional differences in cost of living can make the national poverty guidelines insufficient for identifying persons with financial burdens. Defining low-income at the regional scale may capture individuals or families who may not otherwise be identified as low-income using national guidelines.

Adding other populations – Some regions and States map locations of populations whose mobility needs may require unique consideration in the transportation plan, such as Amish residents or older adults. EJ guidance does not require these populations in an EJ analysis but including them in the analyses can help agencies improve decision making and regional equity.

Creating an index that identifies areas having multiple types of underserved populations – Agencies should identify and consider the needs of low-income populations and minority populations independently during an EJ analysis, but other people also experience transportation disadvantages, such as people with disabilities, older adults, children and youth, or transit-dependent populations. By creating a map of areas that have multiple demographic groups with disadvantages, the agency can find areas that might warrant additional efforts.

What are some techniques for implementing customized approaches?

Defining low-income at the regional scale – Most DOTs and several MPOs use the U.S. Department of Health and Human Services (HHS) poverty guidelines, as recommended by U.S. DOT EJ guidance and *FHWA Order 6640.23A FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. Other agencies define "low-income" more inclusively to capture those who may be financially burdened in their region but who do not meet the national guidelines. Whichever method is selected, it should be clearly defined for the public. Income definitions may be more useful at a regional level to account for regionals costs of living. Agencies may adopt a higher standard for declaring low-income status if the definition is not selectively implemented and is inclusive of all persons at or below the HHS poverty guidelines.

[6]Final DOT Environmental Justice Order
https://www.fhwa.dot.gov/environment/environmental_justice/ej_at_dot/orders/order_56102a/

Both the Puget Sound Regional Council (PSRC) in the Seattle metropolitan area and the Metropolitan Planning Commission (MTC) in the San Francisco Bay Area define low-income at 200% of the federal poverty guidelines. Other agencies set it as a selected percentage (e.g., less than or equal to 80%, 65%, or 50%) of their regional or Statewide median household income. While these alternative definitions of low-income can provide useful supplementary information, a complete EJ analysis ensures an adequate examination of potentially disproportionate high and adverse effects that may be experienced by those with the lowest incomes.

Adding other populations – Agencies may wish to consider minority populations and populations in their EJ analyses, but agencies are often also interested in other disadvantaged populations. Many agencies identify locations of households with characteristics that indicate transit dependency, Limited English Proficiency (LEP), or persons with disabilities. Agencies also sometimes identify locations at risk for high exposures to mobile source emissions or economically distressed areas.

The **Lancaster County Planning Commission** in Pennsylvania identifies Amish populations. The religious tradition for some Amish groups forbid the use of motor vehicles and electricity, and Amish people routinely operate horse-drawn buggies on public roadways in the County **(**Error! Reference source not found.**)**. The Amish may not frequently participate in transportation decision-making processes, so discerning their needs and identifying solutions may require targeted outreach.

Creating an index that identifies areas having multiple types of underserved populations – A trend in identifying populations is the use of indices to identify areas (e.g., traffic analysis zones, or Census tracts or blocks) that have high concentrations of multiple types of potentially disadvantaged populations. The needs of all low-income populations and minority populations should be considered, but those communities that also have high numbers of older adults and persons with disabilities may be areas where the agency would want to consider targeted outreach relating to paratransit services, for example.

Maps that use these index approaches can inform a more robust demographic profile of a region by bringing together several data indicators to identify the locations and needs of traditionally underserved populations. Agencies can use these maps to identify not just the minority populations and low-income populations but also populations to analyze in relation to the agency's efforts at Title VI compliance with nondiscrimination statutes, regulations and authorities such as ensuring access to services that cover foreign born persons with limited English proficiency (LEP), persons with disabilities, and older adults, among other populations.

San Francisco's **Metropolitan Transportation Commission** identifies locations that include minority populations and low-income populations for its planning process, as well as areas with other "disadvantage factors," as displayed in **Table 3**.

Seattle's **Puget Sound Regional Council** conducts an Aggregate Population of Interest Analysis, in which every Census tract is assigned a numeric value between zero and four, based on the tracts concentration of persons meeting four regionally defined indicators shown in **Table 4**. For example, if a tract exceeds the threshold concentration for persons in poverty but not for minority persons, older adults, or persons with disabilities, it is classified as with a value of one.

Table 3. MTC Concentrations for 8 Indicators of Disadvantage

Disadvantage Factor	% of Regional Population	Threshold concentration
Minority	54%	70%
Low Income (<200% of Poverty)	23%	30%
Limited English Proficiency	9%	20%
Zero-Vehicle Households	9%	10%
Seniors Aged 75 and Over	6%	10%
Population with a Disability	18%	25%
Single-Parent Families	14%	20%
Rent Burdened Households	10%	15%

Table 4. Puget Sound Regional Population Percentage Concentrations

	Persons in Poverty	Minority Persons	Older Adults	Persons with Disabilities
Threshold Concentration	11.3%	33.6%	11.2%	11.4%
Percent of Tracts Meeting Threshold Concentration	38.9%	40.1%	55.4%	43.7%

What are the limitations of customized approaches to identifying EJ populations during the transportation planning process?

Modifying the national low-income definition – Agencies may wish to consider customizing definitions to reflect regional characteristics, so that they do not neglect or minimize the identification of population groups with the most pressing needs. While it may be appropriate to add households with slightly higher incomes, the agency can run a risk of failing to distinguish the needs of the most financially-burdened households.

Adding other populations – Data for some groups may be challenging to find. Amish communities, for example, are considered religious groups and are not captured as unique populations in Census block-level maps. State and regional agencies can collect data on populations such as Amish communities, which are not classified in other datasets but can be useful in analyses, as they may have specific transportation needs or concerns.

Creating an index that identifies areas having multiple types of underserved populations – Index approaches risk losing sight of the two population groups that are covered under the EJ Executive Order: low-income populations and minority populations. These two groups can be considered in various combinations for planning purposes, but the FHWA Environmental Justice Order 6640.23 requires an independent identification and assessment for each of these populations. Indices are valuable tools for prioritizing outreach and investments, but they should only be used to supplement—and not replace—analyses focusing on the population groups covered by the EJ directives.

For example, the results of an index-based analysis may lead an MPO to prioritize only those areas that have a composite high score across several demographic characteristics. An area with a high concentration of minority persons might not then "qualify" in that EJ assessment unless it also has a high concentration of one or more indicators within the index. This MPO, despite putting a lot of effort and good intentions into its equity analysis, could fall short of its essential obligation to consider minority populations and/or low-income populations.

Regardless of the agency approach, documentation is key. A clear description of its process for conducting the EJ analysis helps decision makers, EJ stakeholders, and the public to understand and participate in an inclusive planning and programming process.

What resources are needed to customize an approach to defining EJ populations?

Modifying the national low-income definition –The most significant effort lies in developing and documenting a meaningful justification for the alternative approach. Since there is no standardized approach, the process could involve a fair amount of research and consultation with peers, as well as local EJ stakeholders. Once a new definition is identified, the approach need not require extensive effort beyond the traditional process of identifying low-income households using national data.

Creating an index that identifies areas with multiple types of underserved populations – National indices, such as the EPA EJSCREEN are cost-effective ways to begin to identify disadvantaged communities using multiple indicators. The most challenging component of these activities is interpreting the information, communicating it effectively with stakeholders and decision makers, and building upon the national snapshot with additional local analyses. Agencies can work with local EJ stakeholders and technical experts to interpret the national datasets and to develop definitions and methods for localized tools.

Who has used customized approaches to define EJ populations?

Lancaster County Planning Commission (PA) maps Amish communities, which are not identified in the U.S. Census tract-level data, but which have specific transportation needs.

Morgantown Monongalia MPO used EPA EJSCREEN to map disadvantaged populations as they relate to areas with environmental concerns**.**

Metropolitan Transportation Commission defines "low-income" as 200% of the federal poverty guidelines to account for a higher cost of living in the San Francisco Bay Area. They also developed an index for "communities of concern" which define disadvantaged communities as meeting 4 of 8 characteristics.

Puget Sound Regional Council aggregates data on potentially vulnerable populations, looking at Census tracts where multiple vulnerable populations might be living.

District (of Columbia) DOT created an Analyzed Affected Population index that compares the percentages of four target populations (minority, foreign persons, low-income, and persons with limited English proficiency) in each Census tract to the city's percentage of these populations.

Resources

Metropolitan Transportation Commission. 2009. *Transportation 2035.* https://mtc.ca.gov/our-work/plans-projects/plan-bay-area-2040/transportation-2035

Metropolitan Transportation Commission. 2017. *Equity Analysis.* https://www.planbayarea.org/2040-plan/plan-details/equity-analysis

Morgantown Monongalia MPO. 2017. *2017-2045 Metropolitan Transportation Plan. Environmental Justice Documentation.* https://drive.google.com/file/d/0BxGrXumdvqOnUm10alc2d05kOU0/view

Lancaster County MPO. 2016. *Connections 2020: 2016 Update.* https://lancastercountyplanning.org/DocumentCenter/View/822/Connections2040-2016-Update

Understanding EJ Needs and Concerns

The research revealed various approaches agencies use to identify the needs and concerns of EJ communities. As stated in 23 CFR 450 316(a)(1) (vii) "Seeking out and considering the needs of those traditionally underserved by existing transportation systems, such as low-income and minority households, who may face challenges accessing employment and other services" This is accomplished by assessing public input and technical analyses (e.g., transit gap analysis, multimodal transportation system analysis, including accessible pedestrian walkways, bicycle transportation facilities, and intermodal facilities that support intercity transportation, including intercity buses and intercity bus facilities and commuter vanpool providers[7]).

Once an agency knows the current needs and concerns of the region's EJ communities, including any existing adverse effects caused by historical patterns of investment, then the agency can identify transportation planning mitigation strategies. The research identified strategies that are documented in a later section of this report, after the assessment of benefits and burdens. Both a needs assessment and a benefits/burdens assessment should inform the strategies selected to ensure that agency investments do not create disproportionately high and adverse effects.

To identify the needs appropriately, agencies have a wide range of options from which to select based on their capabilities and the population's unique needs. When deciding what additional efforts to take, EJ populations and partners can advise the agency on how to prioritize and select additional plans that will be meaningful and achievable. Agencies can start with the approaches that are easiest for them to accomplish, such as those that build from existing agency activities.

In general, it may be easier for the agency to begin with identifying regional needs, such as regional exposure to mobile source emissions or gaps in the regional transit system. These regional analyses often reveal neighborhoods in which agencies then want to identify neighborhood-level needs.

Information Needs Asessements with Input from EJ Stakeholders

The research found that public involvement with EJ communities helps agencies manage the risk of missing important questions and considerations. Desk-based technical analyses can reveal only the information contained in the data available; public involvement can unleash the power of crowd-sourcing. Many agencies appear to be missing out on simple, relatively low-cost opportunities to improve the quality of their planning analyses (particularly needs assessments) by engaging individuals and stakeholder groups who have a first-hand understanding of EJ-related needs and concerns.

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[7] 23 CFR 450.300

While most transportation plans involve the public and stakeholders in defining a vision, a performance-based plan places increased importance on developing clear, concerted goals and objectives. Additionally, it is critical for public involvement to engage EJ populations in defining desired outcomes. FHWA Order 6640.23A (6)(f)(4) directs the Agency to "identify and avoid discrimination and disproportionately high and adverse effects on minority populations and low-income populations by: providing public involvement opportunities and considering the results thereof, including providing meaningful access to public information concerning the human health or environmental impacts and soliciting input from affected minority populations and low-income populations in considering alternatives during the planning and development of alternatives and decisions." The public participation plan includes a process for soliciting information and considering the needs of all affected parties, especially those traditionally underserved by existing transportation systems, such as low-income populations and minority populations.[8]

Collaborative, Data-Drive Decision Making through Transportation Performance Management

The FHWA Transportation Performance Management (TPM) program supports transportation agencies in using system information to make data-driven investment and policy decisions that achieve national performance goals. Systematically applied in a regular ongoing process, TPM information helps decision makers to understand the consequences of investment choices across transportation assets or modes. **A key element of TPM is structured public involvement among decision makers, stakeholders, and the public to establish, track, and update collaboratively developed targets and measures for desired system performance.**

Appropriate communication of performance-related information should therefore be targeted to each stakeholder need and should consider effective ways to engage the community in a discussion about desired system performance outcomes and priorities. For example, if the MPO identifies a certain low-income community as having an unusually high rate of pedestrian fatalities, agencies may wish to consider engagement of EJ communities when developing safety performance goals and targets.

Understanding Needs at the Regional Level

One of the core U.S. DOT EJ principles is to ensure that EJ populations do not experience a significant delay, denial, or reduction in the benefits of the transportation system.[9] Agencies use a variety of approaches to assess how well the transportation system currently serves different population groups: from public survey methods to purely technical data analyses based on the

[8] 23 CFR 450.210 & 316

[9] https://www.transportation.gov/policy/transportation-policy/environmental-justice-strategy

travel model. By seeking out and studying potential adverse effects, agencies learn where gaps exist and can more easily identify remedies and mitigation.

Agencies often collect data on the quality and condition of their infrastructure, and agencies can compare the infrastructure condition in areas with high numbers of EJ populations to conditions in other areas. Relevant measures include roadway and bridge pavement condition, sidewalk connectivity and condition, and bicycle Level of Service. [10]

Several MPOs have used Fair Housing and Equity Assessments as a substantive starting point for understanding and discussing inequality. These in-depth assessments, often developed by regional planning commissions in the early 2000s with funding from the U.S. Department of Housing and Urban Development Sustainable Communities Regional Planning Grant program, involve analyzing access to opportunities for low-income, minority, and other disadvantaged populations. Metrics included population per square mile served by transit, jobs within 45 minutes by transit and by auto, and percent of commuters by mode. It is important to note, however, that access to transit in general does not necessarily equate to improved access to opportunity for all types of people. Agencies can consider transit access for specific populations by conducting a transit gap analysis, which is described later in this section.

Understanding Environmental Risk Screening and Estimating

Disproportionate exposure to environmental risks was the catalyst for creating the concept of environmental justice. [11] While some disproportionate exposure to environmental risk may still exist in low-income and/or minority communities, agencies can proactively assess potential risks and develop strategies to address these potential exposures. When community members realize the agency's commitment to public health, they are generally much more active during the public involvement process and more likely to support project development. By considering these risks and documenting the agency's response during the development of State and MPO programs and planning.

Focus Area
- Step 2: Understanding EJ Needs and Concerns

Tools and Techniques
- EPA EJ Screen
- Air quality, emissions, and dispersion modeling
- Crash data
- GIS

Examples Featured
- Morgantown Monongalia MPO, WV
- Southern California Association of Governments, CA

[10] A helpful reference on Bicycle Level of Service and other active transportation measures is the FHWA Guidebook for Developing Pedestrian and Bicycle Performance Measures.

[11] GAO Report, *Siting of Hazardous Waste Landfills and Their Correlation with Racial and Economic Status of Surrounding Communities* https://www.gao.gov/products/RCED-83-168

By considering these risks and documenting the agency's response during the development of State and MPO programs and planning activities, the agency can have that information available when entering the project development stage, which may help the environmental review process run more effectively.

Agencies may have an interest in determining if there EJ populations disproportionately exposed to other environmental risks related to air quality and crashes. For transportation agencies, air quality is generally maintained equally for all potentially exposed populations. In area known as "nonattainment areas" or "maintenance areas," transportation conformity is a way to ensure that Federal funding and approval goes to those transportation activities that are consistent with air quality goals. Transportation conformity helps link statewide air quality planning with metropolitan transportation planning and is applicable to metropolitan transportation plans, metropolitan transportation improvement programs (TIPs), and projects funded or approved by FHWA or FTA. As part of the conformity process, air quality models are used to estimate regional emissions for applicable pollutants. Estimating regional emissions from on-road mobile sources traveling on the planned transportation system helps consider future emissions estimates for the region. Conformity requirements include interagency consultation and public involvement. Regulations governing transportation conformity are found in Title 40 of the Code of Federal Regulations (40 CFR Parts 51 and 93).

An agency may also wish to analyze the geographic distribution of vehicle crashes, including vulnerable road users, such as bicyclists and pedestrians, to determine whether the region's minority populations and/or low-income populations continue to experience an increased exposure to these risks relative to the risk to the rest of the region or State's population.

MPOs and State DOTs can work collaboratively to reduce disproportionately high exposure to these risks and increase transportation system safety. Once an agency identifies its high-risk areas, it may wish to consider revising its project selection and prioritization processes to emphasize projects that address the risk in those locations. For example, if the MPO identifies a certain low-income community as having an unusually high rate of pedestrian fatalities, then it could consider awarding bonus points or additional consideration to a project sponsor that proposes meaningful and appropriate pedestrian safety solutions. Similarly, if a low-income and/minority community is experiencing a disproportionately high amount of air pollution from mobile source emissions, then the agency may wish to consider programming projects to reduce the disproportionate exposure. See focus area on deploying strategies to address disproportionately high and adverse effects for additional information.

Other environmental risks include extreme weather events and rising sea levels, particularly in coastal areas, impact transportation infrastructure and vulnerable populations – The National Oceanic and Atmospheric Administration developed a **Digital Coast Sea Level Rise Viewer**[12]

[12] https://coast.noaa.gov/slr/#/ layer/vul-soc/0/-8492022.939893581/4417792.327458745/11/satellite/none/0.8/2050/interHigh/midAccretion, image created 10/11/18

that shows areas of high human vulnerability to hazards in coastal areas based on the built environment and population attributes, such as age and income. This tool may help practitioners to understand where underserved populations may be particularly vulnerable to natural hazards because of sea level rise (**Figure 4**).

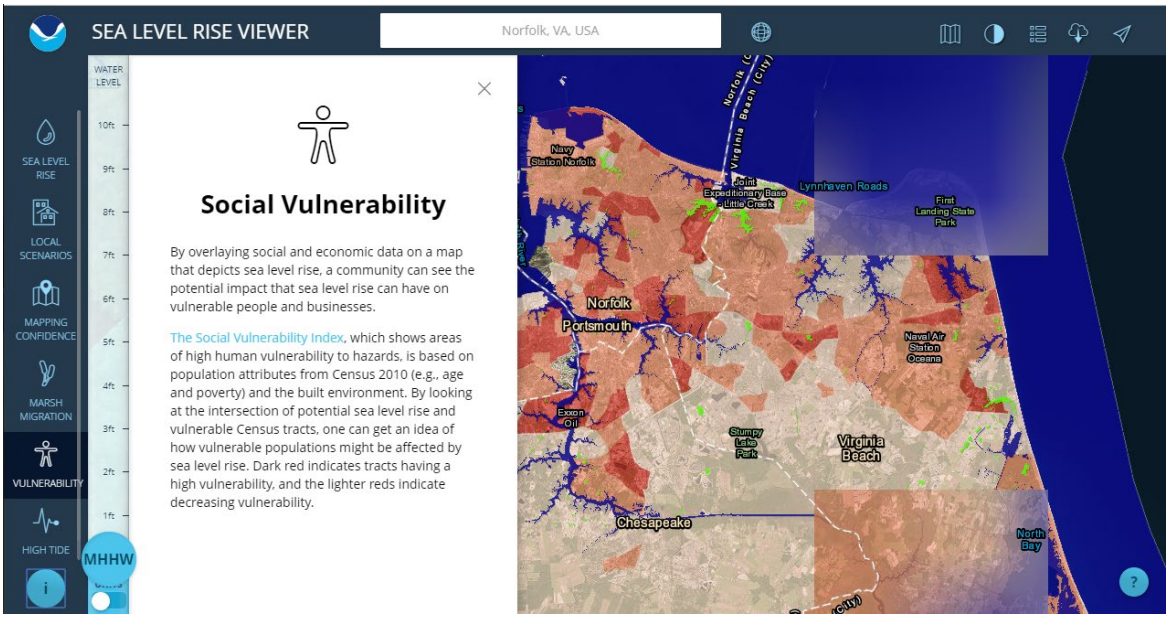

Figure 4: NOAA Sea Level Rise Social Vulnerability Index Map for Norfolk, Virginia
Source: https://coast.noaa.gov/slr/#/layer/vul-soc/0/-8492022.939893581/4417792.327458745/11/satellite/none/0.8/2050/interHigh/midAccretion

What are adverse environmental effects?

Adverse effects from highway projects may include—but are not limited to—disproportionately high exposure to air and noise pollution or crashes. As defined in the DOT and FHWA environmental justice orders, adverse effects include, but are not limited to[13]:

- Bodily impairment, infirmity, illness, or death.
- Air, noise, and water pollution; and soil contamination.
- Destruction or disruption of man-made or natural resources.
- Destruction or diminution of aesthetic values.
- Destruction or disruption of community cohesion or a community's economic vitality.
- Destruction or disruption of the availability of public and private facilities and services.
- Vibration.
- Adverse employment effects.
- Displacement of persons, businesses, farms, or nonprofit organizations.

[13] FHWA Environmental Justice Webpage Frequently Asked Questions: https://www.fhwa.dot.gov/environment/environmental_justice/faq/ accessed 10/11/18

- Increased traffic congestion, isolation, exclusion, or separation of minority and/or low-income individuals within a given community or from the broader community.
- The denial of, reduction in, or significant delay in the receipt of benefits of DOT programs, policies, or activities."

Estimating the existing levels of exposure to health and safety hazards across a region can help agencies identify areas where adverse effects may be disproportionately high and adversely effecting EJ populations. The analysis may lead agencies to understand where they can be most effective with using projects funds to implement safety countermeasures.

Why is understanding environmental risks notable for an EJ Analysis?

On aspect of environmental justice involves remedying cumulative adverse environmental effects borne by historically underrepresented communities. Executive Order 12898 requires each Federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. In practice, agencies should consider making a concerted and sustained effort to understand and document the extent to which their policies and investments may have disproportionately high and adverse effects on EJ populations. Minority populations, low-income populations, and other traditionally underserved populations may be particularly vulnerable to environmental risk exposure, and agencies may want to consider the extent their policies or investments to avoid, minimize or mitigate those risks as applicable.

Once an agency estimates the current levels of health and safety risks across its jurisdiction, it can prioritize investments in the areas that have the greatest potential exposure to these risks, which are often areas with high numbers of low-income populations and/or minority populations.

For example, if an agency is trying to decide how to best spend its transportation safety funds, it may wish to consider investments in areas with high crash rates that involve vulnerable road users (e.g. people in low-income areas where pedestrians walk near fast-moving traffic). An agency may wish to consider investigating as applicable, National Highway Performance Program (NHPP) funds for pedestrian bridges over freeways; STBG funds for general pedestrian improvements; RTP funds for connecting access to outdoor recreation; and STBG Transportation Alternatives set-aside funds for pedestrian and bicycle projects. More information about nonmotorized transportation funding sources is listed on the FHWA website: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/funding.

What are some techniques for understanding environmental risks screening?

There are a variety of online tools, some of which are not sponsored or endorsed by FHWA, that may help provide sketch evaluations and high-level screening of environmental and demographic indicators that can provide proxy estimates of risk. One example is the U.S. Environmental Protection Agency's (EPA) EJSCREEN. This GIS-based tool enables the user to conduct a preliminary estimate of environmental conditions by providing map layers of a variety of

demographic groups and environmental exposure risks, such proximity to nearby roadway; a user can even run reports about the demographics and environmental conditions of a user-defined area. However, users of such tools should understand that the relationships between demographics, exposure, and susceptibility are complex. EJSCREEN is not designed to explore the root causes of differences in exposure. The demographic factors included in EJSCREEN are not necessarily causes of a given community's increased exposure or risk. Additional analysis is needed to explore any underlying reasons for differences in susceptibility, exposure or health.

For safety risks, agencies can also assess the frequency and distribution of safety hazards, such as high-crash locations for vehicles, pedestrians, and cyclists. Agencies can gather their own crash data from local agencies, use the federal database of crashes called the Fatality Analysis Reporting System (FARS), and view regional maps of FARS data generated by the nonprofit organization Smart Growth America (https://smartgrowthamerica.org/resources/dangerous-by-design-2016/). This information is also available on FHWA's GIS website, https://hepgis.fhwa.dot.gov/fhwagis/#

Morgantown Monongalia MPO used the U.S. EPA EJSCREEN tool to identify affected populations and to measure exposure to environmental hazards adjacent to project locations. For example, the MPO created a .25-mile radius buffer around the location of a TIP project and analyzed the environmental conditions of that area as well as the demographic breakdown.

Southern California Association of Governments (SCAG) assessed existing air pollutant levels across various regions and neighborhoods. These current air pollution levels, broken down by geographical region, were used as a baseline to compare against projected levels in 2040 to forecast long-term changes likely under its MTP. The MPO observed a disproportionate share of minority populations and/or low-income populations living near freeways and heavily traveled corridors. **Figure 5** summarizes the presence of various demographic groups living within 500 feet of a freeway.

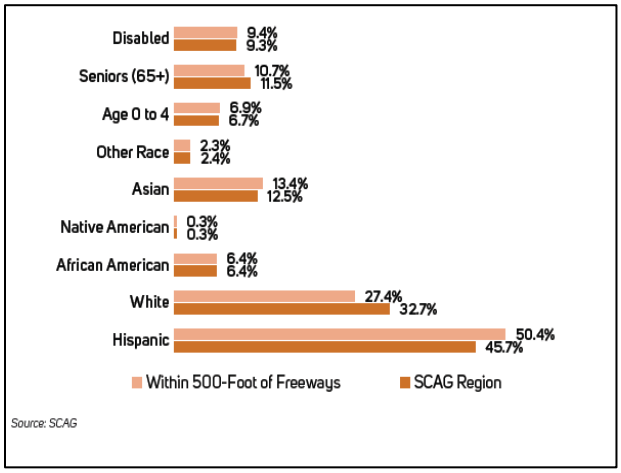

Figure 5. Demographics of those living near freeways and other highly traveled corridors (compared to percentage of group's overall representation within SCAG region)

The SCAG analysis also provides income-based and demographic breakdowns of travel-related hazards such as vulnerability to pedestrian and bicycle crashes. **Figure 6** shows that Hispanics constitute less than 50% of the overall population yet represent over 60% of pedestrian crashes.

The **Mid-America Regional Council (MARC)** identified that a disproportionate share of bicycle and pedestrian fatalities were occurring in the region's underserved communities. By discovering this current need, it could then analyze the distribution of safety funding (e.g., TA Set-Aside, FTA Capital funds) to assess whether it was responding adequately. Based on the results of that analysis, MARC began working with the highest risk areas to implement countermeasures.

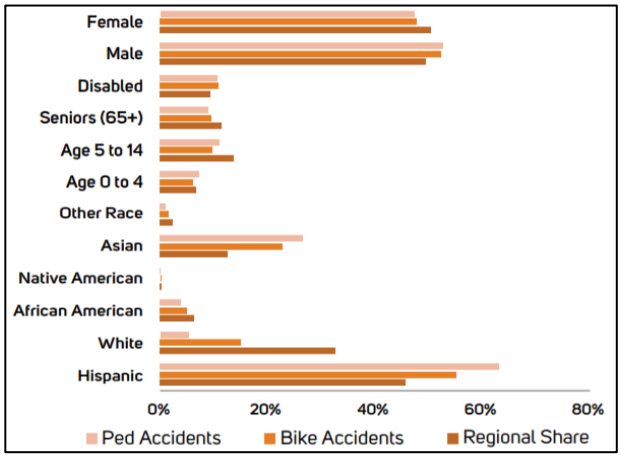

Figure 6: Relative incidence of pedestrian and bicycle accidents by gender, age, and racial/ ethnic group (SCAG)

What are the limitations of screening tools?

While some environmental screening tools such as EPA's EJSCREEN are good for estimating environmental hazards, there are some limitations. For example, the tool only allows users to compare the environmental conditions of a selected geographic region to the state or national average. Regional transportation planners cannot easily compare the environmental conditions of specific communities to the MPO regional average.

What resources are needed to help understand these tools?

Some screening tools are publicly available and free to use, and the resources required for implementing are generally minimal (e.g. time spent learning how to use the online software). Some more advanced tools, such as Cal/EPA's CALEnviroScreen tool (used by SCAG), may require additional training and dedication of staff with GIS skills.

Resources

Morgantown Monongalia MPO. 2017. 2017-2045 Metropolitan Transportation Plan Update, Appendix F: Environmental Justice Documentation. https://drive.google.com/file/d/0BxGrXumdvqOnUm10alc2d05kOU0/view

Southern California Association of Governments. 2016. Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS), Appendix F: Environmental Justice. http://scagrtpscs.net/Documents/2016/final/f2016RTPSCS_EnvironmentalJustice.pdf.

Mapping Transit Access and Gaps

What is mapping transit access?

Conducting a transit access or needs gap analysis involves spatial comparison of transit services and gaps relative to populations of interest. Analysis approaches include measuring how many people live within walking distance of a transit stop, calculating how many destinations a person can reach from a specific location within a given time frame, comparing differences in travel time to major destinations by automobile and transit, and mapping amenities within walkable distances from transit stops.

Focus Area
Understanding EJ Needs and Concerns

Tools and Techniques
- GIS Analytical Tools
- Transportation Demand Model
- General Transit Feed Specifications

Examples
- Atlanta Regional Commission, GA
- Delaware Valley RPC, PA/NJ
- Madison Area Transportation Planning Board, WI
- Memphis Urban Area MPO, TN
- Puget Sound Regional Council, WA
- State Planning Council, RI

Why is mapping transit access notable?

EJ populations are more likely than the general population to depend on transit to access employment, education, medical care, retail, and other services. Transit access enables people of all incomes, skills, and abilities to find and maintain jobs, supporting self-reliance on earned income and reducing the need for government assistance.

Transit access analyses can identify which amenities individuals can reach within a given timeframe from certain areas, helping the agency understand how effective the transit system is. Through transit gap analysis, agencies can identify barriers to accessing essential services, challenges relating to transit service areas, scheduling, and route geometries, as well as multimodal connections to transit. The analysis can thus inform discussions about altering, extending, or adding transit services to fill any gaps identified.

Involving EJ stakeholders and the public in transit access analyses can help the agency to identify and consider nuances that may not be picked up by traditional models or analysis tools. For example, transit travel times in standard models may not account for the variable amounts of time that transit riders spend waiting at stops, which can be a major problem for people that count on transit to reach work or appointments on time.

What are some techniques for mapping transit access?

Most approaches use General Transit Feed Specifications (GTFS) data, a standardized, open-source format that allows transit agencies to share and continually update their network data, including route geographies, stops, fares, and schedules. GTFS data is publicly available on the Web. This allows developers to create trip planning applications and other mapping tools, while transportation stakeholders can apply the data to transit needs gap analysis. Web based transit trip planners can also be useful for sampling service by origin-destination (OD), direction, and time by triangulating information from other sources.

Agencies can measure transit access using a variety of approaches, three of which are profiled in this section.

- The first uses traditional buffer analysis with a 1/4-mile walking buffer around transit stops to determine access to the transit system generally and at higher levels of service. Elements measured include, for example, the presence of compact, mixed-use development, walkability and multimodal conditions to/from transit stops, and variables that can be estimated from GFTS data such as route frequency, times of day, and direction of service
- The second uses origin-destination pairs to identify EJ areas and employment centers that are underserved by the transit system.
- The third method uses isochrone maps to examine access within a certain time frame from specified locations.

Buffer Mapping (Resident Proximity to Transit)

The Rhode Island **State Planning Council** drew a 1/4-mile buffer around transit stops to determine how many people reside within walking distance of transit service. The agency then broke out the numbers by different population groups to ensure that minority and/or low-income individuals had equitable access to transit. Considering transit frequency enhances the analysis because frequent service greatly improves accesss, enabling riders to travel with less planning around transit schedules. **Puget Sound Regional Council** (PSRC) drew a 1/4-mile buffer around transit stops to determine how many households have access to frequent transit, which it defined as routes with headways of 15 minutes or less. PSRC completed this analysis for existing conditions and for conditions with the 2040 plan fully implemented. It found that 31% of the region was within the 1/4-mile walking distance to frequent transit, including nearly 50% of both low-income populations and/or minority populations. With the 2040 Plan improvements, the MPO found that 37% of the region would be within the 1/4-mile walking distance of frequent transit, including 60% of both low-income populations and/or minority populations (**Figure 7**).

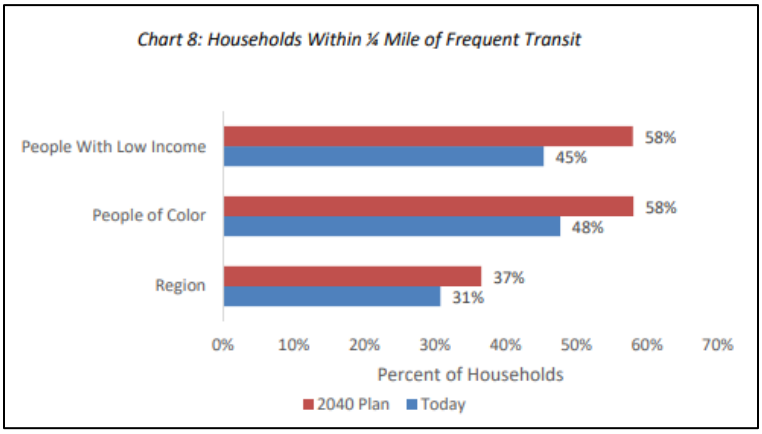

Figure 7. Low-Income Individuals and People of Color within ¼ mile of Frequent Transit. Source: Puget Sound Regional Council. 2018. Regional Transportation Plan.

Origin-Destination Analysis

Transit needs gap analysis can focus on high-priority origin and destination pairs that are underserved by transit, helping to identify needs for more frequent transit service, transit route changes, new routes, or extensions of existing routes. It is important to keep in mind, however, that simply improving access among existing origin-destination patterns is not always useful, especially for people living in areas such as food deserts, who need access to new and different places to improve their quality of life.

Memphis Urban Area MPO completed a planning-level transit needs gap analysis to identify potential new transit routes and extensions that would improve access for EJ communities. Using travel times from their travel demand model, the MPO selected origin and destination pairs with significantly higher travel times by transit than automobile to recommend new or extended transit routes. The analysis was restricted to EJ Census block groups that were already served by transit and destinations in major employment areas, such as airports and hospitals. The MPO identified a need for additional north-south access and transit service to industrial employment, companies, and distribution centers.

Isochrone Mapping
(Areas Accessible Within Given Travel Timeframe)
Madison, WI

Madison Area Transportation Planning Board (MATB) created isochrone maps to approximate how far a person can travel by public transit within a given timeframe from a specific origin. This analysis illustrated which neighborhoods might be isolated as opposed to those neighborhoods having reasonable access to jobs, retail, services, and other opportunities. The maps showed (a) areas accessible within a 30-minute bus ride from selected EJ areas in the weekday morning peak and midday periods; (b) areas accessible within a 45-minute bus ride from major employment centers in the weekday afternoon peak and midday periods; and (c) areas accessible within a 15-minute bus ride from a full-service grocery store.

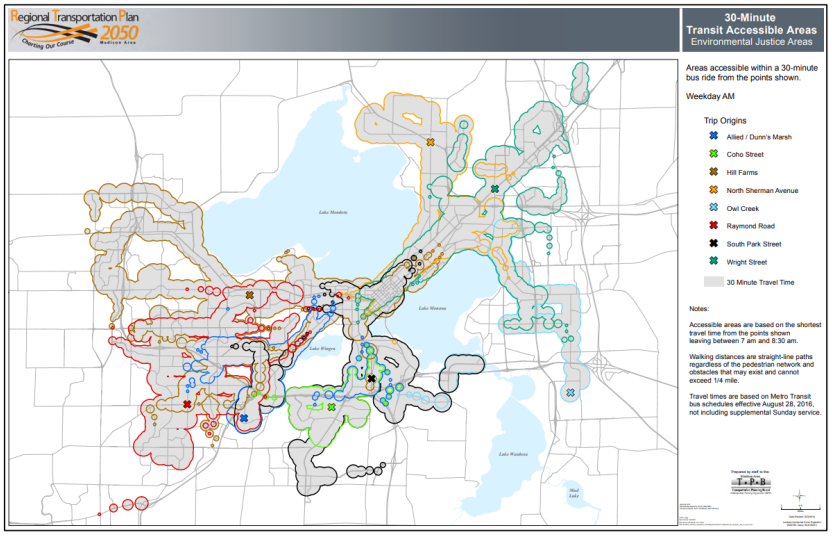

Figure 8. Access by a 30-minute bus ride from EJ neighborhoods during weekday morning peak period. Madison Area Transportation Board. 2015. Regional Transportation Plan, Appendix B: Environmental Justice
Source: Madison Area Transportation Board

The approach highlights the limited portions of the Madison area that are accessible to EJ neighborhoods within a 30-minute bus ride, revealing that it is difficult to reach crosstown destinations via transit (**Figure 8**). The area served at midday within a 30-minute bus ride is even smaller due to reduced headways, which is an issue for shift workers and tradesfolk whose travel schedules revolve around midday and evening hours. At the time of the study, the MPO was reported to be planning a new crosstown bus rapid transit route to increase the range of areas (and jobs) that populations of EJ areas can reach by transit within a reasonable travel time.

MATB also mapped 15-minute bus access from EJ neighborhoods to full-service grocery stores This measure evaluates access by EJ and low-income individuals to affordable and healthy food, which is essential for maintaining physical health and financial independence.

Atlanta Regional Commission (ARC) mapped EJ areas with transit travel sheds for 60-minute trips to destinations like schools, jobs, and hospitals; and 30-minute trips to grocery stores. Each transit shed included 0.5 miles of walking distance and assumed a 9 AM weekday departure time. ARC focused on transit sheds within EJ areas to better understand service gaps and found that 60-minute transit trips from entry-level jobs did not reach many EJ areas. The transit travel sheds were generated by the web-based tool Open Trip Planner Analyst, accompanied by travel demand modelling and traffic simulation. The analysis revealed where EJ communities experience gaps in transit service, which can influence future project selection.

Delaware Valley RPC conducted a transit access analysis to identify specific population groups, transit service gaps, and locations of essential services. The agency used the *Equity Through Access Toolkit*, a publicly available, online mapping tool that displays the location of three demographic groups: People Aged 65 and Over, Households in Poverty, and Households that include One or More Disabled Person(s). The tool also shows areas with essential services, areas where there is a mismatch between concentrations of vulnerable populations and those essential services, and areas with low transit accessibility. These last two factors are combined to create a Prioritization Score map that identifies areas having a relatively high level of spatial mismatch and relatively poor regional transit connectivity.

What are the limitations of mapping transit access?

The examples presented each have limitations. Creating a buffer map is feasible for any agency with GIS capability, but the analysis may not be useful if it fails to consider actual walking conditions. Rather than circular buffers, agencies could consider using GIS network analyses to generate buffers based on distance along the street networks surrounding stops. Buffer analyses also cannot determine how many destinations are accessible within a reasonable travel time from that transit stop.

Agencies may wish to conduct transit access analysis using isochrone maps to determine whether individuals have access to important locations and services within a defined timeframe. Isochrone analysis can be straightforward to conduct when EJ-identified tracts are small and distinct, though a single point within each tract may be a coarse spatial scale.

Because transit needs gap analysis may overlook important contextual information, it is essential to engage minority and low-income individuals through the public involvement process and to run travel demand models with multiple parameters. Soliciting feedback from affected stakeholder agencies and transit-dependent populations can assist in focusing research.

What resources are needed to map transit access?

Transit accessibility analyses can be challenging to structure effectively. However, an effective transit access assessment considers a range of variables such as times of day, service frequencies, existing and potential origins and destinations, the quality of connections to transit stations, predictability of travel times, and wait times at transit stops. Agencies can leverage public involvement input and data sources such as trip planning tools to enrich the information that is generated by traditional modeling and mapping tools.

Transit accessibility analyses can be challenging to structure effectively, because of the dynamic, multidimensional nature of transit usage patterns and needs. A strong assessment considers and cross-references a range of variables such as times of day, service frequencies, existing and potential origins and destinations, the quality of accessibility to transit stations, and the predictability of travel times and wait times to and from transit stops as well as along the routes. Agencies can leverage public involvement input and data sources such as trip planning tools to enrich the information that is generated by traditional modeling and mapping tools.

The resources needed to conduct transit accessibility and gap analyses vary based upon the technical requirements and purpose of the study. A 1/4-mile buffer analysis of transit stops can be completed by an MPO with GIS capabilities, but isochrone maps require additional technical capabilities. Some transit gap analyses, such as the one performed by the Memphis Urban Area MPO, require the use of a travel demand model. MPOs that do not run a model in house might contract out travel demand modelling or explore partnership opportunities with larger regions, nearby universities, or the State DOT.

Resources

ARC. 2018. The Atlanta Region's Plan. http://atlantaregionsplan.com/regional-transportation-plan/

Madison Area Transportation Board. 2015. Regional Transportation Plan, Appendix B: Environmental Justice Analysis. .http://www.madisonareampo.org/planning/documents/RTP_2050_Appendix_B_FINAL.pdf

Memphis Urban Area MPO. N.D. 2040 Regional Transportation Plan. http://memphismpo.org/sites/default/files/public/livability-2040-all-chapters.pdf

Puget Sound Regional Council. 2018. The Regional Transportation Plan, 2018: Appendix B, Equity Analysis Report.https://www.psrc.org/sites/default/files/rtp-appendixb-equityanalysis.pdf

Rhode Island State Planning Council. 2012. Transportation 2035: Long Range Transportation Plan. http://www.planning.ri.gov/documents/trans/LRTP%202035%20-%20Final.pdf

Understanding Needs at the Neighborhood Level

After conducting a regional needs assessment, an agency might find some gaps about which it would like more information. The agency may then want to understand the needs at the neighborhood scale.

Focus Area
- Understanding Needs and Concerns

Tools and Techniques
- GIS mapping
- Multimodal network quality analysis
- Public involvement
- Assessment of pavement and bridge conditions

Practice Examples
- Delaware Valley RPC, DE
- Flagstaff MPO, AZ
- Greensboro MPO, NC
- Memphis Urban Area MPO, TN
- Polk County TPO, FL
- Rogue Valley MPO, OR

To better understand and analyze neighborhood-level issues, agencies can use a combination of public input and technical analyses such as bicycling and pedestrian audits and communication tools such as mySidewalk to track, analyze, and communicate progress on improving active transportation infrastructure. Twenty four percent of Americans living in poverty do not own a vehicle. Many people in the U.S., particularly those in underserved populations, suffer from problems associated with inactivity, many of which could be addressed through improved access to safe walking and wheeling facilities. [14] Neighborhood-level active transportation assessments can help the agency understand what projects are needed at the local level to remedy disproportionately high and adverse effects identified at the regional level. The focus area on meaningful public involvement of EJ populations discusses outreach strategies and techniques in more depth, which can be applied throughout the EJ Analysis processes.

What is assessing neighborhood needs?

The research found that neighborhood-level assessments typically involve a combination of public input and technical analyses that produce a list of issues to address. A targeted needs assessment can examine the transportation assets and unique challenges of EJ neighborhoods, the results of which can be used to support project prioritization, selection, and development to address the identified issues.

Why is assessing neighborhood needs notable for an environmental justice analysis ?

A transportation needs assessment helps an agency to understand the community's perspective regarding existing disproportionately high and adverse effects that might warrant mitigation. The information from these assessments can help the agency develop project evaluation criteria to

[14] 2016 https://www.fhwa.dot.gov/environment/bicycle_pedestrian/resources/equity_paper/equity_planning.pdf

ensure that transportation investments made in these EJ communities address the neighborhood's needs and result in a net benefit rather than burden.

A neighborhood level assessment is more meaningful if the local community participates. The assessment process directs attention and time to identifying the transportation assets and challenges in the neighborhood. Public involvement can occur throughout the transportation decision-making process.

What are some techniques for assessing neighborhood needs?

A needs assessment can include various topics depending on the goals and focus on the assessment. Two examples presented below describe some notable analytical and outreach activities that have been conducted to assess travel and community needs among low income and minority populations.

Rogue Valley MPO completed a transportation needs assessment for its region that began with a mapping exercise. The MPO identified Census block groups that had more than twice the regional average of minority, low-income, older adult (65+), youth (under 18), and/or zero-car households. The MPO also mapped major employers (tax lots with 20+ employment density or 100+ employees), existing transit routes, and regional multi-use paths.

After identifying areas with high concentrations of underserved populations, the MPO mapped a 1/4-mile buffer around transit routes, sidewalks, bike lanes, multi-use paths, public school locations, and grocery stores serving those areas. It also mapped pedestrian and bicycle crash locations. It then described the transportation assets, gaps, and barriers for each area and identified the main transportation problems for two high-priority areas.

Rogue Valley MPO supplemented its analytical work with targeted surveys to organizations serving low-income, minority, older adult, and youth populations. Staff at the organizations (90% of whom worked with low-income populations) were asked multiple-choice and open-ended questions about transportation barriers and improvements that would provide the largest benefit. The respondents indicated that the largest barriers the MPO could address included a lack of transportation service to certain locations—particularly in the evenings and weekends—and infrequent service. Improvements that would address these barriers were viewed as having the greatest benefit.

Polk County TPO completed Neighborhood Mobility Audits for eleven neighborhoods with high concentrations of low-income, minority, and/or older adult populations using six steps:

(1) **Define the neighborhood.** Define the boundaries of the neighborhoods to be analyzed by examining Census block group data.
(2) **Provide an overview of the neighborhood.** The neighborhood overview describes land use, community services, important places, employment and commute patterns, and demographic characteristics. To define community services and important places, the TPO mapped community facilities (e.g., day care, social services, educational), medical, recreation, religious, shopping, financial, and governmental institutions. To determine commute patterns and the modes of transportation used by commuters, the TPO used

Longitudinal Employer-Household Dynamics data and ACS journey-to-work data. For demographic characteristics, it used ACS data to understand the community's racial and age composition, the number of people with limited English proficiency, and the number of zero-car households.

(3) **Discuss existing transportation infrastructure and safety of the neighborhood.** The TPO created an inventory and map of existing sidewalks, bicycle lanes, transit routes and stops; and bicycle and pedestrian fatalities and injuries from the past five years of data.

(4) **Describe the neighborhood access to community services and places.** In this step, the TPO described overall neighborhood mobility and parameters that may influence an individual's selection of an alternative travel mode. It developed a series of five indices – Walking Access Index, Biking Access Index, Transit Connectivity Index, Gaps Index, and Barrier index – that ultimately resulted in a composite Mobility Index. Each Neighborhood Mobility Audit includes maps for each of the five indices, and each factor within an index is generally assigned a score characterizing the access potential or the degree of the gap or barrier. **Table 5** identifies the indices and a description of the factors used to calculate each.

(5) **Identify neighborhood mobility improvements.** After completing the background research and analysis, the TPO identified whether any relevant improvements were already in the MTP, comprehensive plan, TIP, or local plans. It then recommended additional improvements. Once the audits were complete, Polk County TPO worked with local governments to identify three to five key projects to consider for funding through the Transportation Alternatives Program Set-Aside, Community Development Block Grant, or within the MTP or TIP.

(6) **Engage the public with results of the audit.** Polk County TPO completed significant public engagement after the Neighborhood Mobility Audits, which helped determine the priority projects to consider for funding.

Table 5. Polk County TPO mobility indices

Index	Description of Factors
Walking Access Index and Biking Access Index	The Walking and Biking Access indices are based on connectivity (number of intersections), dwelling density (number of residential units), and diversity in use (number of services for walking and for biking).
Transit Connectivity Index	The Transit Connectivity Index measures the location, intensity, and frequency of transit service by adding a 1/4-mile buffer to all the routes on the three fixed route bus systems in Polk County.
Gaps Index	The Gaps Index subtracts the linear feet of sidewalk from the linear feet of roadway centerline to determine the linear feet of sidewalk gaps. The linear feet of sidewalk gaps are divided by the linear feet of roadway centerline to determine the percent of the roadway network with no sidewalk.

Index	Description of Factors
Barrier Index	Barrier index measure include: • The linear feet of roadway with four or more lanes or a speed limit equal to or greater than 45 miles per hour. • The linear feet of rail lines. • The linear feet of rivers, streams, or canals.
Mobility Index	The overall Mobility Index is calculated by subtracting the gaps and barrier indices from the potential access score (the sum of the walking, biking, and transit connectivity indices).

What are the limitations of assessing neighborhood needs?

A Neighborhood Mobility Audit does not answer broader questions about equity of the overall transportation system or compare the benefits and burdens of specific projects. It provides a narrow focus on a single neighborhood or defined area, which can help to address local problems greatly effecting certain neighborhoods. Corridor studies or subarea plans can help an agency to consider issues at a similar level of detail, but at a broader scale.

What resources are needed for assessing neighborhood needs?

Resource commitments and costs vary based on the level of effort an agency puts into a needs assessment. Many of the methods require GIS capabilities.

The most important element of a neighborhood assessment may be the stakeholder engagement. A "desktop" needs assessment without active public involvement can easily overlook problems well known by the community, especially since much of the available data is not parsed to such a fine grain. Dedicating significant staff time to on-site visits with neighborhood members is key to many elements such as identifying important community locations, sidewalk and bicycle route coverage, and transportation gaps and barriers. One national resource practitioners may find helpful when assessing neighborhood needs is *The Why and How of Measuring Access to Opportunity: A Guide to Performance Management*.[15]

Who else has assessed neighborhood needs?

Delaware Valley RPC used the Equity Through Access Toolkit to identify planning-level information about specific population groups, transit service gaps, and locations of essential services.

[15] http://www.govinstitute.org/resource/measuring-access-to-opportunity/

Flagstaff, AZ MPO measured transit, pedestrian, and bicycle level of service in EJ communities to support planning and programming activities. These measures included indicators such as quality of pavements and bridges serving the area among other metrics.

Greensboro, NC Urban Area MPO measured several key neighborhood level characteristics for planning investments in EJ communities, including quality of pavements, bridges, and sidewalks.

Polk County, FL TPO used a planning-level Neighborhood Mobility Audit to identify transportation assets and needs in eleven communities with concentrations of minority populations and/or low-income populations.

Rogue Valley, OR MPO completed a needs assessment that led to identifying several towns with concentrations of low-income populations and/or minority populations. The MPO then completed more detailed assessments of the assets and gaps in each identified location to support planning activities.

Resources

Rogue Valley MPO. 2016. Transportation Needs Assessment for Traditionally Underserved Populations. https://www.rvmpo.org/images/plans-and-programs/needs-assess/TranspoNeedsAssessment_FINAL_March2016.pdf

Rogue Valley MPO. 2016. Transportation Needs Assessment for Traditionally Underserved Populations Map Series. https://www.rvmpo.org/images/plans-and-programs/needs-assess/NeedsAssessMapSeries.pdf

Polk County TPO. 2015. Neighborhood Mobility Audit Methodology. http://polktpo.com/docs/librariesprovider2/tpo/methodology.pdf?sfvrsn=3

Polk County TPO. Neighborhood Mobility Audit Website. http://polktpo.com/what-we-do/our-planning-documents/neighborhood-mobility-audits

Assessing Benefits and Burdens of Plans and Programs

To comply with EJ requirements and policies, agencies ensure programs, policies, and activities for which they are responsible do not have a disproportionately high and adverse effect on minority populations or low-income populations.[16] Adverse effects include not only burdens but also the reduction, delay, or denial of benefits. The research found that many agencies update these analyses when they make major updates or changes to plans, programs, and projects. This section of the report discusses how agencies select and measure indicators of the potential benefits, burdens, and effects of transportation agencies' plans and programs. The next chapter discusses how to compare the results and assess whether differences in adverse effects could potentially result in disproportionately high and adverse effects.

Virtually all plans and most programs rely upon some form of Transportation Performance Management (TPM)[17] processes to discuss the benefits of proposed improvements on regional system performance. TPM is a systematically applied, ongoing process that provides key information to help decision makers understand the consequences of investment decisions across transportation assets or modes. It improves communication among decision makers, stakeholders and the traveling public; and ensures that targets and measures are developed in cooperative partnerships and are based on data and objective information. Performance management requirements address safety, infrastructure condition, system performance, traffic congestion, on-road mobile source emissions, and freight movement. Agencies can usually start with their existing TPM metrics to analyze the effects of plans and programs on EJ populations compared to non-EJ populations.

Many agencies overlay maps of proposed LRTP projects (and sometimes TIP projects) on maps of EJ areas, which are often designated as such based on the zones' concentrations of low income and/ or minority residents. The maps, in and of themselves, indicate whether the proposed projects are physically located within the designated EJ areas. Such a mapping exercise gains value if it is accompanied by a discussion of how the proposed projects that may affect mobility, accessibility, and health for EJ populations, and how those potential effects relate to the identified needs of EJ populations. Agencies do not have to analyze every possible indicator of a benefit, burden, or effect. Rather, agencies can use targeted outreach and information gathered about EJ communities' needs and concerns to help understand which indicators are the most meaningful.

The agency can start with determining appropriate measures of potential adverse effects that are relatively easy to measure; other measures can be developed later to create a portfolio of relevant indicators. Ideally, a portfolio would include indicators capturing the *outputs* (e.g., the

[16] FHWA Order - https://www.fhwa.dot.gov/legsregs/directives/orders/664023a.cfm

[17] https://www.fhwa.dot.gov/tpm/plan.pdf

distribution of projects or funding) and the *outcomes* of transportation agency activities (e.g., long-term effects on transportation behavior and access).

Agencies have less control over their outcomes than their outputs, but most constituents expect that agencies will attempt to improve outcomes, which are the tangible results of the agencies' outputs. Outcomes are generally discussed by forecasting the effects of agency investments and policies over the long term. They can include measures such as numbers of displacements, numbers of jobs accessible within a given commute time travel times, and the amount of air pollution from mobile sources. Outcomes can be estimated at the project level or at the regional scale, depending on the measure. At the regional scale, agencies often produce these forecasts based on different scenarios, e.g., a build and a no-build scenario, and some agencies are adding an EJ component to these forecasts.

Assessing Investment Distribution

Many agencies overlay project locations onto maps of EJ areas. A typical underlying assumption (sometimes stated) is that all projects generate net benefits to the adjacent communities; few agencies document possible burdens. Based on this assumption, the level of benefit for each subarea is often conflated with the number and/or dollar value of investments physically located in or near the area. Better decisions, made with the overall system performance in mind, will result in the best "mix" of investments that will collectively maximize the performance gains of the system.[18] The maps and accompanying charts, therefore, often illustrate the numbers and (in some cases) dollar values of projects located within or near EJ areas.

The quality and meaningfulness of these investment analyses vary greatly, mostly depending on how agencies categorize the relative benefits to "EJ" and "non-EJ" populations expected to result from projects or funding programs projected to improve performance in terms of safety, infrastructure condition, system performance, traffic congestion, on-road mobile source emissions, and freight movement. The analysis is fundamentally shaped by the ways in which the agency has initially identified the locations and characteristics of EJ populations. Three other key factors affect the outcomes of investment-based assessments:

1. Many agencies conflate "spending" or "investment" with "benefit," which runs the risk of overstating potential benefits and underestimating potential burdens. The next chapter in this report will discuss how agencies determine whether any differences discovered constitute a disproportionately high and adverse effect, following a discussion of the approaches agencies are using to avoid, minimize or mitigate disproportionately high and adverse effects.
2. Many agencies allocate all of a project's cost as "EJ funding" if any part of the project touches an EJ area, which may overestimate the amount of funding that affects the EJ communities. Agencies can amend their allocation methods to improve their

[18] https://www.fhwa.dot.gov/tpm/plan.pdf

understanding regarding the portions of projects and funding allocations that benefit minority and/or low-income individuals.

3. Agencies often compare the amount of funding in EJ areas to the amount of funding in non-EJ areas without considering how many people live in each area. A funding comparison that makes the comparisons on a per capita basis may be more appropriate.

Differentiating Investments by Project Type, Per Capita, and Usage

In recognition of these challenges with location-based assessments of investments, agencies have developed approaches to provide more useful information on their investment distribution. These approaches tend to differentiate investments by project types, usage by mode, and per capita spending.

Focus Area
Assessing Benefits and Burdens of Plans and Programs

Tools and Techniques
- Demographic data
- GIS Tools
- Geographic details of projects and spending

Examples
- Metropolitan Area Planning Agency, NE
- Metropolitan Transportation Commission, CA
- Oahu MPO, HI
- Ocala-Marion County TPO, FL
- Richmond Area MPO, VA
- State Planning Council, RI
- Wichita Area MPO, KS

What is the differentiation of investments?

Comparing the distribution of transportation investments on a geographic or usage basis can help an agency determine whether spending is equitably distributed among EJ and non-EJ populations.

Why is the differentiation of investments notable for an EJ analysis?

These approaches enable an agency to differentiate between projects that are likely to have a net benefit to the adjacent community and those projects that may have a net burden. Differentiation based on modal usage can help ensure that the agency is not favoring certain populations as it invests in different modes. Finally, analyzing the spending on a per capita basis ensures that the agency is not investing less in people who happen to live in more densely populated areas.

What are some techniques for the differentiation of investments?

To use the distribution of transportation investments as a measure for equity analysis, the amounts of investments first should be allocated for analysis to the populations that are being compared (e.g., EJ population compared to non-EJ population). Spending amounts are typically ascribed to EJ populations and the comparison population in one of two ways: (1) by geographic distribution or (2) by project usage.

A geographic approach assigns the planned project funding (or a portion of it) to the populations in the project location; these investments can also be broken down by project type (e.g.,

roadway, transit, bicycle/pedestrian projects) before ascribing the spending amounts to EJ areas to help distinguish between investments that may convey benefits in contrast to those that may burden the areas. A use-based analysis assigns spending amounts for a project to EJ populations based on its use of that type of project (e.g., analyzing a transit improvement investment based on the use of transit by EJ populations in the region).

Once the investments are allocated to the populations, the spending amounts can be examined in various ways to develop a meaningful measure of equitable investment. For example, the allocated investments can be analyzed on a per capita basis to compare funding amounts normalized by population. The examples described in the following sections highlight some of the various approaches for using spending distribution to analyze potential effects on equity.

Geographic Allocation

Omaha's Metropolitan Area Planning Agency (MAPA) used a geographic approach to ascribe investments in its LRTP to EJ populations. It divided all its projects into EJ and non-EJ projects. Any project that crossed an EJ tract was considered an EJ project. If a project overlapped both EJ and non-EJ census tracts, MAPA broke down the percent of funding that was within an EJ census tract to approximate the portion of funding spent in EJ areas using the following approach:

- If the project is partially within an EJ area, the EJ area is proportionally allocated funding by the share of the project located within that area (e.g., if half of a planned roadway is within an EJ area, then 50% of the project funding would be ascribed to the EJ area and 50% to the non-EJ area)
- If a project's starting point or endpoint abuts an EJ area, the EJ area is allocated 10% of the project funds

MAPA used this approach to evaluate the distribution of funding in EJ areas for projects included in its 2017 long range transportation plan (Table 6). The results indicate that 55% of total spending is on EJ projects while 24% of the population lives within the designated EJ areas (Table 7).

Table 6. List of Projects in EJ Areas from the Metropolitan Area Planning Agency. Source: Metropolitan Area Planning Agency. 2017. Metropolitan Area Planning Agency Long Range Transportation Plan 2040.

Project Name	Lead Agency	Description	Total Cost	% EJ Funding	EJ Funding
23rd Avenue	Council Bluffs	4-Lane Divided with LTLs	$13,694,000	10%	$1,369,400
South Expressway Reconstruction - Phase 1	Council Bluffs	Reconstruction of Existing Roadway	$5,781,500	50%	$2,890,750
South Expressway Reconstruction - Phase 2	Council Bluffs	Reconstruction of Existing Roadway	$5,119,000	50%	$2,559,500
River Rd. Trail	Council Bluffs	Construction of multi-use recreational trail	$307,500	100%	$307,500
Iowa Riverfront Trail III	Council Bluffs	Construction of multi-use recreational trail	$286,250	81%	$143,125
Iowa 92 Resurfacing	Iowa DOT	Resurfacing	$1,559,976	78%	$1,216,781

Table 7. Summary Table of Project-Basis Funding Analysis for the Metropolitan Area Planning Agency. Source: Metropolitan Area Planning Agency. 2017. Metropolitan Area Planning Agency Long Range Transportation Plan 2040.

Project Type	Total Projects	Percent of Fed Funding	Percent of Population	Funding (1,000s)		
				EJ Funding	Non-EJ Funding	Total Project Cost
Non-Environmental Justice Projects	$719,742,615	45%	76%	$0	$719,742,615	$719,742,615
Environmental Justice Projects	$892,051,385	55%	24%	$634,343,211	$257,708,174	$892,051,385
Total	**$1,611,794,000**	**100%**	**100%**	**$634,343,211**	**$977,450,789**	**$1,611,794,000**

Project Categorization

Assessing equity based solely on the amount of investment attributed to EJ areas assumes that all projects have a positive effect on the area, but some investments may not be a benefit to the surrounding communities, such as transit stations that are not accessible by bike or walking or high-traffic roadways that increase respiratory health risks in adjacent areas. If this is a concern for the set of investments being analyzed, agencies are breaking down investment allocations by project type so that projects that have potential benefits for adjacent communities can be evaluated separately from those more likely to have limited benefit or even pose a burden.

Agencies categorize project types in several ways. At a minimum, many agencies measure expenditures by mode (e.g., roadways, transit, and bicycle/pedestrian projects). However, agencies can consider more detailed project types that meet the equity priorities specific to their region. Examples of other categorization approaches include the following:

- Categorizing projects as preservation, modernization, and expansion (Wichita Area MPO)
- Categorizing projects as bicycle/pedestrian; highway capacity improvement; multimodal capacity; preservation; safety/efficiency; transit capital and expansion; vehicles/equipment; and other (Puget Sound Regional Council)
- Categorizing projects as roadway, transportation systems management, or safety (Madison Area Transportation Planning Board)
- Categorizing projects as interchange modification, intersection modification, new interchange, access management controls, bicycle/pedestrian, new freeway, management and ops, new roadway, lane management, major widening, minor widening, transit, or corridor under study for high capacity transit (Mid-Ohio RPC).

While categorizing spending by project type may not indicate benefits or burdens, it provides agencies a relatively simple approach to begin assessing the potential effects of transportation investments.

Use-Based Allocation

Metropolitan Transportation Commission (MTC) conducted a population/use-based analysis to allocate the amount of spending on each mode (transit and roadway) to each EJ and non-EJ population (low-income/non-low-income and minority/non-minority) based on each population's

use of that mode. To determine the portion of spending to ascribe to low-income populations and minority populations for transit trips, MTC used transit operators' data on the number of trips taken by each population group. For roadway trips, MTC used the percentage of low-income populations and minority populations per county to determine the amount of roadway funding going towards low-income populations and minority populations per county.

MTC then multiplied the investment by each population's use of the mode to determine the percent of investment for each population. MTC found a higher proportion of transit and roadway spending was associated with low-income populations compared to their proportion of the population, and a slightly lower proportion of investments allocated to the minority populations compared to their proportion of the population (**Table 8**).

Table 8. Summary of Population/Use-Based Analysis. Source: Metropolitan Transportation Commission, 2017. Plan Bay Area 2040 Final Supplemental Report: Equity Analysis Report

	Share of People	Share of Trips			Share of Investments		
		Transit + Roadway	Transit	Roadway	Transit + Roadway	Transit	Roadway
Low-Income Status *	25%	28%	52%	27%	40%	48%	27%
Non-Low-Income Status	75%	72%	48%	73%	60%	52%	73%
Minority Status **	59%	54%	62%	53%	58%	61%	52%
Non-Minority Status	41%	46%	38%	47%	42%	39%	48%

Per Capita Spending Analysis

Agencies often compare the total amount of funding in EJ areas to the total amount of funding in non-EJ areas, but these comparisons only focus on the spatial distribution of funding and do not consider the number of people who reside in each area. Agencies may wish to consider calculating their investment analysis on a per capita basis to adjust for the relative size of the populations that are likely affected by the projects. To do this, an agency divides the spending amounts in EJ and non-EJ areas by the total population of the respective areas.

Ocala-Marion County TPO calculated per capita spending for several project categories, including cost-feasible roadways, unfunded roadways, transit, and trails (**Table 9**). For most categories, the per capita investment levels are similar. For transit investments, the per capita spending was much higher in EJ areas. Conversely, spending on trails was much higher in non-EJ areas. There is no discussion in the plan document regarding the similarities and differences; however, a separate summary report of the EJ analysis is referenced in the Appendix of the LRTP.

Table 9. Per Capita Analysis of Funding for Ocala-Marion County TPO. Source: Ocala-Marion County TPO. 2015. 2040 Long Range Transportation Plan.

	EJ Areas	Non-EJ Areas	Total
Population	140,848	192,655	333,503
Percent of Population	40.4%	59.6%	100%
Cost Feasible Roadway Projects	$142,975,000	$278,445,000	$421,420,000

Per Capita	$1,015	$1,445	$1,264
Mileage	22.2	21.4	43.6
Interchanges/Overpasses	$84,838,000	$38,000,000	$122,834,000
Unfunded Needs Roadways	$426,670,000	$388,311,000	$815,082,000
Per Capita	$3,030	$2,016	$2,444
Mileage	38.9	36.2	75.1
Transit Plan (Capital and Operating Costs 2020-2040)	$114,534,000	$38,766,000	$153,300,000
Per Capita	$813	$201	$460
Mileage	52.0	17.6	69.6
Cost Feasible Trails (2020-2040)	$3,406,000	$24,693,000	$28,100,000
Per Capita	$24	$128	$84
New Trails Mileage	8	58	66
Existing Mileage, All Trails	19	19	38

What are the limitations of the differentiation of investments?

Investment does not indicate effect. Increased investment in EJ areas for many projects (e.g. bike, pedestrian, multi-use trails or paths, and transit projects) may or may not confer benefits to those communities. For example, a major highway project might improve mobility for all drivers in the region but may also have some environmental impacts on nearby neighborhoods.

To some degree, projects that may have positive effects on EJ communities can be separated from projects that may have negative effects by analyzing investments by project type (see Project Categorization section). For example, low spending within the categories of bike, pedestrian, and transit projects might be of interest because EJ populations may be more likely to benefit from these projects. However, even analyzing investments by project type is only an initial step towards understanding if a set of projects is going be a benefit or burden to EJ populations; further analyses should be conducted.

Projects do not necessarily align with EJ areas. Many agencies allocate a project's entire cost to the "EJ funding" category if any part of the project touches an EJ zone. For example, if one mile of a proposed $10 million, 10-mile roadway project were adjacent to an EJ community, the agency would add $10 million to its count of total dollars invested to benefit EJ populations. This practice can lead to overestimating the amount of funding that benefits EJ communities. It is important to allocate funding appropriately among all the adjacent areas, whether EJ or non-EJ. Alternatively, using this example, if the roadway provides no access or other benefit to the EJ community, it should not be referenced as an investment in that community.

EJ populations can vary within an area. Many agencies identify Census tracts or block groups as EJ areas if they have an EJ population or combination of populations above a certain concentration; thus, a tract or block group is either all EJ or all non-EJ in this approach. These analyses will miss effects on EJ populations living in other areas.

To address this concern, agencies can implement a population-weighted spending analysis by splitting project funding within an area (e.g., Census tract or block group) proportionally by the relative sizes of the EJ and non-EJ populations in the area. For example, if a $100,000 project were located within a Census tract populated with 60% EJ populations and 40% non-EJ populations, the agency might consider the project funding to be $60,000 for EJ populations and $40,000 for non-EJ populations.

The reach of project effects can be small. Projects within an area may not affect the entire area equally. For example, a new pedestrian facility will not likely benefit individuals within the Census tract that live beyond walking distance of the facility. A strategy to address this type of situation could be to restrict the analysis to the population within a reasonable affected area of a project. In the example of the new pedestrian facility, the agency could restrict its analysis to the population within a quarter-mile buffer of the facility. For example, if the population within the quarter-mile buffer of a $100,000 project was 80% EJ populations and 20% non-EJ populations, the agency would use this distribution to interpret the spending as $80,000 for EJ and $20,000 for non-EJ. This method relies on having the spatial analysis capabilities and fine-grained data to create buffers and identify the population within these buffers.

Overall, investment distribution measures are most helpful when the public and decision makers understand that they convey relative orders of magnitude rather than exact percentages. Furthermore, it is important to clarify that an estimated distribution of funds does not signify benefits or burdens in and of itself; it is a coarse indicator that can help to flag potential investment concerns.

What resources are needed for the differentiation of investments?

Comparing the distribution of spending does not take significant resources. It requires knowing the proposed projects and their costs, grouping them into categories, and allocating their costs to EJ and non-EJ populations. Whether an agency chooses to divide the projects by EJ and non-EJ areas or to split the funding according to percentages of EJ and non-EJ individuals within the area, the process requires demographic data, which can be obtained from the ACS, and GIS capability, if using spatial variables (e.g., populations within a quarter-mile of a transit station) to allocate investments. Overall, this measure is a relatively quick and easy way to scan spending allocations across an entire array of proposed projects.

Comparing spending with a use-based analysis may take significantly more resources. Depending on the modes or project types included in the assessment, the analysis can require data on regional demographics, VMT, and transit ridership demographic data.

Who has used this practice?

Metropolitan Area Planning Agency developed a consistent approach for allocating investment amounts for projects that overlap both EJ and non-EJ areas.

Metropolitan Transportation Commission conducted a use-based analysis which allocated investments based on the use of a project or mode (e.g., trips on a transit route, VMT on a roadway) by different populations (e.g., minority vs. non-minority and low-income vs. non-low-income populations) to assess if spending patterns are in proportion with resident travel behavior.

Oahu MPO calculated per capita spending allocated to EJ and non-EJ populations.

Ocala-Marion County TPO calculated per capita spending and route miles in each of the following categories: funded roadway, unfunded roadway, transit, and trails.

Richmond Regional MPO calculated per capita spending for EJ versus non-EJ areas and total percentage of funding for EJ populations.

Wichita Area MPO compared per capita funding between EJ areas and non-EJ areas.

Resources

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Forecasting Environmental Risks

Many agencies utilize models to forecast potential effects related to mobile source emissions. Agencies may wish to consider using the same resources to assess potential future environmental risk at both the project-level and the regional scale. At the regional scale, agencies could explore using modeled outcomes of their planned projects to determine whether air quality could be a potential issue in areas with high numbers of EJ populations. Information on modeling techniques utilized to conduct air quality analyses is available on FHWA's Air Quality website.

Planning-level Project Assessments

Although detailed EJ assessments of specific projects are not conducted before the environmental review stages, planners can conduct high-level screening for potential EJ issues during the early stages of project planning and/or at the program level, such as in the LRSTP, MTP, TIP, STIP or corridor studies. Often the information about proposed locations and types of projects in an LRSTP is sufficient to support an initial screening for red flags as to potential effects. This approach supports FHWA's Planning and Environment Linkages (PEL) integrated approach to decision making. By taking a PEL approach, information can be obtained through a planning analysis (e.g. travel demands, regional development and growth, local land use, etc.) and planning decisions (e.g. the purpose and need for the proposed action, and preliminary screening of alternatives and elimination of unreasonable alternatives) to be adopted or incorporated by reference into the NEPA process.[19]

Mid-Ohio RPC conducted a high-level screening in its LRTP and TIP. The agency identified proposed projects located near areas with high numbers of EJ populations, and considering questions such as "Is this a project that is likely to require additional right of way, such as adding lanes to a roadway?" If so, then this project may carry a risk of displacing area populations and businesses. In a similar vein, Erie RPC, also in Ohio, added up estimates of how much right-of-way might be needed in EJ areas compared to non-EJ areas for the projects in its LRTP and TIP.

The transportation planning process includes active engagement with the public and stakeholders within the environmental justice communities using an approach that considers how roadways, transit, nonmotorized transportation, and intermodal connections can improve access to jobs and essential services and the operational performance of the multimodal transportation system. Planning products that include information that can be used in the environmental justice analysis during to inform the environmental review process include:

[19] "There are multiples PEL authorities - 23 CFR 450.212 & .318 and Appendix A of 23 CFR 450, 23 U.S.C. 168, 23 U.S.C. 169, 23 U.S.C. 134 (i)(2)(D) & 135(f)(4), 40 CFR 1500.4(j) and 1502.21, 23 U.S.C. 139(f)(4)(E) and 23 CFR 771.111(a)(2)

Planning analyses[20]-The relevant agency in the environmental review process may adopt or incorporate by reference analyses from a planning product, including-

(A) travel demands;

(B) regional development and growth;

(C) local land use, growth management, and development;

(D) population and employment;

(E) natural and built environmental conditions;

(F) environmental resources and environmentally sensitive areas;

(G) potential environmental effects, including the identification of resources of concern and potential direct, indirect, and cumulative effects on those resources; and

(H) mitigation needs for a proposed project, or for programmatic level mitigation, for potential effects that the lead agency determines are most effectively addressed at a regional or national program level

Using PEL, the Purpose and Need can be developed during the transportation planning process. Also, preliminary screening of alternatives and elimination of unreasonable alternatives can occur during the transportation planning process, as long as certain conditions are met. Practitioners can reduce duplication of effort, redundancies, and save time and resources over the course of a project's planning period, thereby realizing significant benefits to their project delivery timeframe by taking advantage of PEL. Because of the requirements associated with the development of purpose and need and alternatives under 23 U.S.C. 139, there should be consultation with FHWA or FTA, as appropriate.

Comparing Outcomes Regionally

Most agencies use travel models or other tools to forecast mobility and congestion-related outcomes of plans and programs. Agencies usually cite these outcomes as the major benefits of proposed plans and projects, which makes it appropriate to use the same measures to assess whether EJ populations are receiving a proportionate share of the benefits. Commonly used accessibility and mobility indicators include the following:

- Vehicle hours of delay
- Vehicle hours traveled
- Number of jobs within x miles or x minutes by mode

[20] 23 U.S.C. 168 (c)(2)

- Vehicle delays per capita
- Congested VMT during peak hours
- Person miles traveled
- Person hours traveled
- Person hours of delay
- Number of destinations (e.g., retail, college, hospital, park) within x miles or x minutes by mode
- Population (or percent of population) that can reach certain destinations (e.g., college, hospital, major retail, employment centers, grocery stores) within x minutes by mode

Access to destinations (i.e., accessibility) is the primary purpose of a transportation system; accessibility measures, therefore, should feature largely in an assessment of benefits. To truly understand whether all population groups are receiving comparable benefits of transportation investments, agencies apply accessibility indicators to their EJ analysis.

In addition to the accessibility and mobility indicators listed above, some agencies attempt to assess financial effects of transportation investments on system users, including comparative analyses of outcomes such as the following:

- Share of user fees, taxes or fares compared to income (i.e., ability to pay): the potential burden to low-income households from implementation of a mileage-based user fee (Southern California Association of Governments).
- Average annual out-of-pocket costs between today and 2040, including all immediate variable expenses like tolls, fuel, and transit fare. (Puget Sound Regional Council).
- A Regional Toll Analysis assessing whether all income groups would have similar travel time savings upon implementation of tolling (El Paso MPO).

When measuring outcomes based off the model, most agencies used a geographic-based approach, and a notable few used a population-weighted approach. Both approaches (which are described below) enable an agency to assess how modeled outcomes may vary, either by comparing outcomes in EJ and non-EJ areas or among population groups.

Assessing Geographic-based Regional Outcomes

Several MPOs determine how different plan outcomes – as forecasted by travel models – vary between their designated "EJ zones" and the rest of the region or to "non-EJ zones." These MPOs first designate EJ areas for analysis, and then compare the outcomes for those Census blocks or TAZs to the rest of the region. For example, the **Erie RPC** compared changes in outcomes (e.g., travel time savings) between EJ TAZs and non-EJ TAZs for a build scenario and a no-build scenario.

Focus Area
- Assessing Benefits and Burdens of Plans and Programs

Tools and Techniques
- Travel demand model
- Demographic data by traffic analysis zone

Practice Examples
- Baltimore Metropolitan Council, MD
- Metropolitan Transportation Commission, CA
- Puget Sound Regional Council, WA
- Southern California Association of

What are geographic-based regional outcomes?

MPOs often use regional travel demand models to forecast the outcomes of plan or program on transportation system performance. These analyses

may occur at the corridor level or regional scale and use TAZs as the geographic unit of comparison. When used in conjunction with land use and population forecasts, these models allow MPOs to quantify regional transportation system performance outcomes under various investment scenarios.

Among the most important of these model-based outcomes are accessibility measures, which gauge people's ability to reach services, activities and goods. These regional accessibility indicators may include factors like average highway or transit travel time to job centers, or to essential goods and services like grocery stores and hospitals.

While these types of model outputs are useful for quantifying the overall performance of investment scenarios and policies across a region, they may not account for disproportionate accessibility outcomes between the region's EJ areas and non-EJ areas. By using the regional travel demand model to compare accessibility outcomes for these areas, MPOs can evaluate whether accessibility benefits accrue disproportionately high and adverse to one group or another across alternatives and develop mitigation strategies if appropriate.

Why are geographic-based regional outcomes notable for an EJ analysis?

This approach provides a performance- and outcomes-based alternative to EJ analysis methods that rely solely on the distribution of funding between EJ areas and non-EJ areas. It enables agencies to objectively quantify and compare key accessibility indicators across different areas.

Based on the findings of these modeled outcomes, an MPO might decide to reject an alternative or to develop strategies to minimize and mitigate negative accessibility outcomes forecasted to result from such a project. These types of planning-level analyses can also help identify the equity implications of policies such as tolling or congestion pricing.

In addition to analyzing the potential effects of future investment or policy scenarios, these model runs can produce a better understanding of baseline accessibility conditions and help practitioners to identify gaps between EJ areas and non-EJ areas at the regional level. In this respect, model outputs can go beyond measuring the relative benefits and burdens of a proposed plan or program and begin to proactively address EJ populations' needs. Analyzing model outputs for factors like highway and transit trip travel time to key destinations can help MPOs develop strategies to address EJ population's accessibility needs.

What are some techniques for implementing geographic-based regional outcomes?

As discussed in the chapter on *Identify EJ Populations*, many MPOs designate each TAZ as either an EJ TAZ or a non-EJ TAZ based on its concentration of EJ populations relative to the rest of the region. When conducting an accessibility analysis, the MPO compares the modeled outcomes for EJ TAZs to the modeled outcomes for non-EJ TAZs to determine whether the benefits are proportionately distributed between these two types of TAZs.

These analyses have varying levels of complexity. The basic analysis simply compares modeled outcomes for the binary comparison of EJ to non-EJ zones. Some MPOs have conducted more complex analyses using additional categories or groupings of race/ethnicity and income.

Baltimore Metropolitan Council (BMC) conducted evaluated accessibility outcomes for the region's EJ populations resulting from two MTP investment scenarios. These scenarios compared outcomes for the plan's existing and committed (E+C) investments and the plan's preferred alternative (PA) investments, with respect to home-based work (HBW) and home-based non-work (HBNW) trips.

BMC evaluated the investment scenario outcomes by each scenario's ability to alter the ratio of labor force to jobs, the ratio of trip attractions to trip productions, and the ratio of trip attractions to population for 30-minute highway trips and 60-minute transit trips (transit trips included walk and wait time).

BMC compared these accessibility outcomes for five different concentrations of minority populations and four income quartiles. For the five concentrations of minority population, BMC staff set breakpoints so that approximately one-fifth of the 2010 regional population is in each grouping For more information on information on the Baltimore Regional labor force to job ratio by transit trip times visit https://www.baltometro.org/transportation/plans/long-range-transportation-plan/maximize2040 (Maximize 2040: A Performance-Based Transportation Plan for a Greater Baltimore Region, Appendix G-14: Effects of Projects and Program)

What are the limitations of geographic-based regional outcomes?

As noted in the chapter on Assessing EJ Populations, use of bright-line cutoffs of residential concentrations to designate zones as EJ TAZs can overlook some readily identifiable groups of low-income persons and/or minority persons. A TAZ with a small overall population and small EJ population might be designated as an EJ TAZ because its percentage of the EJ population is above a given threshold, while a more densely populated TAZ that houses a much larger number of low income or minority persons is not so designated, because its EJ populations make up a smaller percentage of the overall TAZ population.

Use of the population-based approach (describe in the next section) in the EJ analysis process can help overcome this type of limitation by weighting model outputs for each TAZ according to its population composition to produce a regionwide composite of transportation system performance outcomes for each population group.

Additional limitations of TAZ-based geographic assignments of EJ populations include the following:

- TAZs typically lack Census data on race and ethnicity, and their income data may be coarsely aggregated (e.g., high-, medium- and low-income groupings). To overcome these issues, agencies can use equivalency tables to align demographic data from Census geographies with TAZs.
- Rapid demographic changes are leading some experts to question the accuracy of model forecasts, especially over the 20+ year long range planning horizon, in urban areas grappling with gentrification, and in areas with rising immigrant populations.

- Travel demand models may not be able to keep pace with any major shifts in travel behavior that occurs because of technological changes.

What resources are needed for geographic-based regional outcomes?

The geographic approach to forecasting transportation system performance outcomes requires that agencies have a travel demand model with up-to-date inputs for the base and forecast years and the technical capacity to run this model. Additionally, detailed race and income data will need to be joined to the existing TAZs using an appropriate equivalency table.

A qualified professional should be able to accomplish the joining of Census data to TAZs and sorting of TAZs into the appropriate demographic categories with a modest level of effort. Overall, the commitments and costs of this approach are relatively low for MPOs with up-to-date travel demand models and the resources to run these models.

Who has used geographic-based regional outcomes?

Baltimore Metropolitan Council assessed accessibility outcomes for transit and highway trips for five different concentrations of minority populations and four income quartiles resulting from an existing and committed scenario and a preferred alternatives scenario.

Metropolitan Transportation Commission compared transportation system performance and equity outcomes using four integrated transportation and land use scenarios. Additionally, its equity analysis compared combined housing and transportation costs for EJ populations to the rest of the region's population.

Puget Sound Regional Council employed a complex land use model (UrbanSim) that simulates development and the locations of jobs and people in conjunction with a new travel model that uses person-level data from the land use model to predict how individuals will use the transportation system based on their preferences and needs.

Southern California Association of Governments compared person-mile travel benefits by race, ethnicity and by five income quintiles. Additionally, it compared travel time and travel distance reductions by regions (e.g., rural and urban) and population groups.

Resources

Baltimore Metropolitan Council. 2015. Maximize 2040: A Performance-Based Transportation Plan for a Greater Baltimore Region, Appendix G: Effects of Projects and Programs. http://baltometro.org/phocadownload/Publications/Transportation/Plans/Maximize2040/AppG_TechnicalAnalyses_Details.pdf

Metropolitan Transportation Commission. 2017. Plan Bay Area 2040, Equity Analysis Report. http://2040.planbayarea.org/sites/default/files/2017-07/Equity_Report_PBA%202040%20_7-2017.pdf

Puget Sound Regional Council. 2018. The Regional Transportation Plan – 2018, Appendix B, Equity Analysis Report. https://www.psrc.org/sites/default/files/rtp-appendixb-equityanalysis.pdf

SCAG. 2016. 2016-2040 Regional Transportation Plan/ Sustainable Communities Strategy, Appendix: Environmental Justice. http://scagrtpscs.net/Documents/2016/final/f2016RTPSCS_EnvironmentalJustice.pdf

Assessing Population-weighted Outcomes

What are population-weighted outcomes?

The population-weighted (or population-based) approach can model outcomes (e.g., travel time savings or number of jobs accessible) for all minority and/or low-income individuals regardless of whether they live in a traffic analysis zone (TAZ) with a high concentration of EJ populations. The approach differs from the more commonly-used geographic-based approach, which simply compares outcomes between "EJ zones" and "non-EJ zones.". MPOs can apply the population-weighted approach to any of the typical performance measure outcomes produced from travel demand models, including travel times and number of destinations accessible.

Why are population-weighted outcomes notable for an EJ ?

A population-weighted method overcomes some of the limitations inherent in analyses that focus only on EJ areas (e.g., Census tract or TAZ). A population-weighted method considers all members of each population group in each TAZ, enabling more fine-grained comparisons among all the members of each group across the region. A population-weighted method does not require the designation of TAZs as EJ or non-EJ. All TAZs contribute to the regional outcome for EJ populations, and all TAZs contribute to the regional outcome for non-EJ populations.

Population-weighted methods, when combined with travel demand model outputs, can be useful for assessing the comparative benefits and burdens of transportation plans and programs on all types of population groups, including EJ populations. The results of such modeling can facilitate scenario planning and comparisons of typical effects, such as travel time savings and number of jobs or destinations available within a given travel time. Using baseline and future scenarios, transportation agencies can determine if their transportation plans and programs widen or close gaps between EJ and non-EJ populations regarding accessibility and other travel outcomes.

What are some techniques for implementing population-weighted outcomes?

To calculate a population-weighted outcome for any travel demand model indicator, the MPO calculates the output indicator for each TAZ, each of which is assigned a weight based on its relative share of either low-income or minority populations compared to the regional total. For example, if TAZ 1 has a total of 1,000 low-income populations, and the whole region has 60,000 low-income persons, then TAZ 1 would be assigned a weight of 0.017 (1,000/60,000) for calculating outcomes for low-income individuals. When calculating comparative outcomes for non-low-income individuals, TAZ 1 would receive a weight of 98.3 (59,000/60,000). Approaches used by Mid-Ohio RPC and Northwest Indiana RPC are described below.

The **Mid-Ohio RPC** calls this a "population-based approach" and contrasts it with the "geographic-based approach" that relies on designating TAZs as EJ TAZs or non-EJ TAZs. Mid-Ohio RPC used the following approach to conduct an EJ analysis for different population groups, rather than for EJ zones. The iteration described here (drawn from the regional MTP) used a

tour-based travel model; earlier MTPs used basic four-step and trip models. First, the agency used equivalency tables to find out the demographic makeup of each TAZ. Then it calculated travel time skims for the measures described below:

- **Average number of jobs close to a population** (also to shopping and non-shopping opportunities): "This measure estimates the average number of jobs there are within a specified travel time. The number of jobs by TAZ is one of MORPC's standard variables. First, the model was used to estimate peak period auto travel times and peak and off-peak transit travel times from each TAZ to every other TAZ. This is commonly referred to as a travel-time skim. Next, for each TAZ based on the skim, the total number of jobs within 20 minutes by auto and 40 minutes by transit were calculated. Finally, a weighted average of the number of jobs was calculated based on the number of each population group within each TAZ."
- **Percent of population close to a college** (also to a hospital, a major retail destination): "This measure estimates the percentage of population groups that are within a specified time to the closest college. A travel-time threshold of 20 minutes for auto and 40 minutes for transit were selected to match the thresholds used for job opportunities. The following colleges were used: [lists 8 colleges in the area]. The measure was developed by using the travel-time skims to identify the travel time from every zone to each college. The minimum time was then determined and the population for each group was summed for all the zones that were less than 20 minutes for auto and 40 minutes for transit."
- **Average travel time for mandatory purposes** (work, university and school) (same approach also used for shopping purposes, other purposes, and all purposes): "To compute this measure, first the different-period travel-time skims are matched up with each mandatory-tour record simulated in the model according to the starting and ending time of the tour. The travel time of the tour is calculated by summing up the travel time over all trips in the tour (the closed chain of trips). Because this time is total round-trip time, it is divided by two to get the average time between one's home and their work, university or school destination. Then, the average travel time for mandatory purposes originating from each zone is computed. Finally, the weighted average mandatory-purpose travel time by population group was calculated."
- **Average travel time to Columbus Central Business District (CBD)**: "This is a measure of accessibility to the downtown area. Use the travel-time skims and determining the time from each zone to the statehouse in the downtown. A weighted average for each population group was then calculated based on the population in each zone. For transit average travel time to the CBD, only the zones that have walk access to transit are included in the average."
- **Transit accessibility to Columbus CBD**: "This measure determines the percentage of each population group that has access to the CBD by transit; the entire region does not have transit service. This measure is determined by identifying zones that have walk access to transit service. Then the population within these zones for each group is summed and the percentage of the total population for the group calculated."

The **Northwest Indiana RPC** (NIRPC) also used its travel demand model and a population-weighted method to identify EJ populations and compare average travel times and accessibility

to key opportunity destinations. NIRPC first calculated the percent of the total regional minority population and low-income population living within each TAZ. The percentage of the regional EJ population within each TAZ was used as the weight within the model.
NIRPC developed eleven performance measures for accessibility and travel time measures at the TAZ level. These measures reflected the number of amenities accessible within 20 minutes (e.g. jobs, colleges, hospitals, and retail stores), the percent of the population within 20 minutes of amenities, and average travel times for trips to these amenities. The performance measures were compared for three different scenarios: the existing year baseline scenario, the long range fiscally constrained scenario, and the long range fiscally unconstrained scenario (including projects without a committed funding source). Each performance measure was reported across all three scenarios to compare each scenario's relative effects on EJ populations. The individual measures were also reported in terms of transit and auto trips.

Average travel times for commuting, shopping, and other home-based trips were calculated using the population-weighted methodology. NIRPC's methodology for these indicators is provided in the text box entitled "Population-Weighted Method: Calculating Average Travel Times for Commute Trips." The calculation for the average number of job opportunities using the travel demand model and the population-weighted method is provided in the text box entitled "Population-Weighted Method: Calculating Average Number of Job Opportunities for EJ Populations."

Sample graphics depicting the output of this population-based model by scenario and by automobile and transit are shown in Error! Reference source not found. for jobs accessibility and

Population-Weighted Method: Calculating Average Travel Times for Commute Trips

Travel times, trip volumes, and trip purposes between TAZs are outputs of the travel demand model. This measure focuses on travel times for home-based work (HBW) trips. For each origin-destination TAZ pair, travel times were weighted by a ratio of HBW trips for the given origin-destination pair to the total number of HBW trips from the origin TAZ to all TAZs. This number was then summed for all destinations from a given TAZ. The result was a trip-weighted HBW travel time measure for each TAZ. Each TAZ's trip-weighted HBW travel time measure was then multiplied by its EJ population weights and summed across the entire region to produce a weighted average commute travel time for each of the EJ populations.

Example calculation: TAZ 1 has the following HBW trip volumes to other TAZs. The trip-weighted HBW travel time for TAZ 1 is 8 minutes = (30 x 0/100) + (60 x 10/100) + (10 x 20/100).

Destination TAZ	HBW Trip Volume from TAZ 1 to Destination TAZ	Travel Time from TAZ 1 to Destination TAZ
1	30 HBW trips	0 minutes (all trips)
2	60 HBW trips	10 minutes (all trips)
3	10 HBW trips	20 minutes (all trips)
All Destinations	100 HBW trips	8 minutes (weighted average for HBW trips)

The next step is to weight the results for each EJ population group. If TAZ 1 houses 50% of the region's minority population, the weight-adjusted travel time in TAZ 1 for the minority population is 4 minutes = (8 minutes x 0.5 EJ minority population weight). This number is added to the minority weight-adjusted commute travel times of all other TAZs to produce a weighted regional average commute travel time for the minority EJ population.

Source: NIRPC. 2011. Plan 2040 for Northwest Indiana.

travel time to work measures. The graphs show that 2040 conditions are projected to improve trip times and the number of jobs accessible by transit and automobile for both EJ and non-EJ communities.

Population-Weighted Method: Calculating Average Number of Job Opportunities for EJ Populations

NIRPC used baseline job data from the Quarterly Census of Employment and Wages and the agency's employment projections to calculate estimated travel time to work to and from each TAZ. All jobs were identified within a 20-minute transit and auto travel time of a given TAZ. This number of accessible jobs was then multiplied by the EJ weight of the TAZ and summed for all TAZs to allow for regionwide comparisons.

Example calculation: TAZ 1 has three other TAZs within a 20-minute drive: TAZ 2, TAZ 3, and TAZ 4. The total number of jobs within TAZs 1-4 is 100. Ten percent of the region's minority population lives in TAZ 1, so it is given a weight of 0.10. Since the total number of jobs within a 20-minute automobile commute for TAZ 1 is 100, the weight-adjusted number is 100 x 0.10, or 10 jobs. A similar exercise is conducted to determine the weighted number of jobs within a 20-minute transit commute. This process is repeated for all TAZs and summed to determine the regional average number of jobs accessible within a 20-minute commute by auto and by transit for low-income, minority, and non-EJ populations.

Excerpted from NIRPC. 2011. Plan 2040 for Northwest Indiana.

For information on access to Jobs by Transit and Auto within 20 minutes and Average Travel Time to Work by Transit and in Northwest Indiana visit https://www.nirpc.org/2040-plan/ (2040 Plan for Northwest Indiana, Chapter 2: Transportation, Pages II-68 to II-76).

What are the limitations of population-weighted outcomes?

The population-weighted approach is subject to the limitations of travel demand models. In addition to those limitations listed in the geographic-based section above, the measure of average accessibility to job opportunities includes all jobs and does not stratify available jobs by required skills and education levels. Filtering the number of accessible jobs to those that match the skills of the populations would require more nuanced datasets and methods. Similarly, access to major retail centers may not always be particularly meaningful for low-income populations.

Interpretation can be challenging in circumstances when a future build condition improves model outcomes (e.g., jobs access or travel times) for all populations relative to the baseline, but the larger share of benefits is received by non-EJ populations. Agencies should evaluate such results with sensitivity to how regional benefits are distributed between EJ and non-EJ populations.

One strategy to add perspective to the results of a geographic- or population-based approach would be to compare not only the level of change but also the rate of change from the baseline to the long-range plan year for EJ and non-EJ populations. Comparing the percent change of accessibility and travel-time benefits experienced by EJ and non-EJ populations enables an analyst to assess which demographic groups may be experiencing faster or slower rates of improvement. Comparing the relative rates of change in benefits accrued to different populations would enrich the overall equity assessment.

What resources are needed for population-weighted outcomes?

The population-weighted approach to modeling EJ outcomes requires two key resources: a regional travel demand model and TAZ-level base year and projected socioeconomic data, including population (stratified by race and income), employment, and other commonly required model inputs such as numbers of vehicles per household. The MPO or State DOT may need to assess if they have or need to acquire technical capacity to run a sophisticated travel demand model. Whether the model is trip-based, tour-based, or activity-based, the quality of its outputs relies on appropriate input data. Datasets needed for modeling EJ performance outcomes include base year demographic data on race and ethnicity, poverty, and employment, which may require the use of equivalency tables to match Census data to TAZs.

Who has used population-weighted outcomes?

In addition to Mid-Ohio RPC and NIRPC, the **Licking County Area Transportation Study** uses a population-weighted approach to compare their outcomes forecasted using their travel demand model.

Resources

Licking County Area Transportation Study. 2015. Transportation for Progress 2040. http://www.lcats.org/documents/documents/2040Plan/Transportation_Plan_2040_Draft_for_Public_comment.pdf

Mid-Ohio RPC. 2017. 2016-2040 Columbus Area Metropolitan Transportation Plan, Appendix 3, Environmental Justice Analysis. http://www.morpc.org/wp-content/uploads/2017/12/MORPCTIP2018-2021Appendix3EJ.pdf

Northwest Indiana RPC. 2011. 2040 Long Range Transportation Plan: Chapter 2, Transportation. http://www.nirpc.org/wp-content/uploads/2017/01/ch.2_transportation.pdf

Assessing Whether Adverse Effects Are Disproportionately High

FHWA Order 6640.23A (5)(g) defines a "Disproportionately High and Adverse Effect on Minority and Low-Income Populations" as "an adverse effect that: (1) is predominately borne by a minority population and/or a low-income population; or (2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the nonminority population and/or non-low-income population."

After an agency gathers data on the benefits and burdens of existing conditions on the benefits and burdens of their proposed plans and programs, the agency will likely have identified that some effects are experienced differently by different populations. The agency then may determine if those differences constitute a disproportionately high and adverse effect borne by EJ populations. The next focus area discusses approaches for making that determination.

FHWA Order 6640.23A (8)(e) provides the following directions: "When determining whether a particular program, policy, or activity will have disproportionately high and adverse effects on minority populations and low-income populations, FHWA managers and staff should take into account mitigation strategies and enhancement measures and potential offsetting benefits to the affected minority and/or low-income populations." Other factors that may be taken into account include design, comparative effects, and the relevant number of similar existing system elements in nonminority and non-low-income areas."[21] The next chapter discusses some strategies agencies use to mitigate and prevent adverse effects. This chapter focuses on approaches for determining whether effects are disproportionately high.

No clear-cut, easy rule is available because different communities and indicators are different. Something that is significant under one situation might not be significant under other conditions. Agencies will need additional exploration into the causes of their findings and into whether their EJ constituents find that indicator to be important and a meaningful measure of adverse or disproportionately high and adverse effects. Employing a transparent process to determine transportation needs of EJ communities can result in better outcomes that build support with the local community, which can help accelerate project delivery.

Qualitative Approaches

Many agencies generally consider the net effect of any transportation activity as positive for the adjacent communities. For example, if the agency finds that most of its plan or program's

[21] FHWA Order https://www.fhwa.dot.gov/legsregs/directives/orders/664023a.cfm

investments occurred in EJ areas, it often concludes that EJ areas were receiving most of the benefit. Additional analysis is typically necessary, however, to verify that finding.

When anticipated project benefits or funding levels significantly differ between EJ areas and non-EJ areas in the LRTP or TIP, the agencies often provide countervailing information to convey that the differences are not disproportionate. Supplemental information may be needed to support a better understanding of the burdens and benefits of proposed investments. For example, a finding that most of the region's roadway projects or dollars were located outside of EJ areas could be interpreted in two distinctly different ways, absent other information: 1) one could decide that the agency was not investing enough in the EJ areas; or 2) one would decide that the agency was maintaining the cohesion of EJ communities by not disrupting them with major highway projects. More information would be needed to determine which conclusion is more accurate, or if another interpretation is more appropriate.

Quantifying Disproportionality Using Location Quotients

Focus Area
- Assessing Whether Adverse Effects Are Disproportionately High

Tools and Techniques
- Location Quotient
- Census Data

Practice Examples
- State Planning Council, RI (MPO and DOT)

The State Planning Council and Rhode Island DOT, which are institutionally combined into one entity, documented how EJ populations bore a disproportionately high and adverse effect related to poor air quality. Using location quotients, the agency determined that poor air quality caused by emissions from interstate and highway vehicular traffic had a disproportionately high and adverse effect because of the concentration of low-income populations and minority populations living within 250 feet of the facility. Once the agency identified this disproportionately high and adverse effect, they could evaluate mitigation strategies. The agency also performed the same analysis to understand whether EJ populations where proportionately benefiting from transit investments.

What are location quotients?

Location quotient is an economic theory used to determine relative concentrations of an industry, occupation, or group of individuals within a broader context. For an EJ analysis, it can be used to compare the concentration of low-income populations and minority populations within a specified study area.

The equation used to calculate location quotient is as follows:

$$Location\ quotient = \frac{\left[\frac{EJ\ population\ in\ the\ study\ area}{total\ population\ in\ the\ study\ area}\right]}{\left[\frac{EJ\ population\ in\ reference\ area}{total\ population\ in\ the\ reference\ area}\right]}$$

A location quotient of one indicates equal proportions of EJ populations in the study area and the reference area. A location quotient greater than one indicates a larger proportion of minority and/or low-income individuals in the study area compared to the reference area, while location quotient less than one indicates the opposite. Investments or issues impacting areas with proportionately larger or smaller EJ populations should be carefully examined for proportionately larger or smaller benefits and / or burdens.

For an example, an agency could compare the proportion of low-income individuals within a subgroup of the region's population that lives in a few TAZs with the highest rates of annual pedestrian crashes to the proportion of low income individuals within the entire MPO region. If the "high-crash TAZs" population was 1,000, of which 250 were low-income, and the total regional population was 100,000, of which 25,000 were low-income, the Location Quotient would be 1, based on this calculation: [250/1,000] / [25,000/100,000] = 0.25 / 0.25 = 1. This would indicate that low-income persons are not over- or under-represented in the high-crash zones. But if the number of low-income persons in the high-crash zones was much higher, say 500, the location quotient would double to 2, based on this calculation: [500/1,000] / [25,000 / 100,000] = 0.5 / 0.25 = 2. This indicator could serve as a "red flag" prompting the MPO to examine the possible reasons for the relative over-representation of low-income persons in high-crash zones.

Why are location quotients notable for an EJ analysis?

When used as part of a geographic or spatial analysis to evaluate projects for potential adverse effect on EJ populations, the location quotient offers a quick and relatively simple numerical metric for understanding current conditions or to evaluate the projects of an LRTP or TIP. By comparing the proportion of EJ populations in an area that is affected by a project to the proportion of the EJ population in the overall region, an agency can identify if EJ populations are disproportionately exposed to the benefits or burdens being analyzed. For example, the benefits of a bus route may only accrue to those within 1/4 mile of the route, not to all individuals in the Census tract that the route intersects.

What are some techniques for implementing location quotients?

The location quotient can be used to calculate the concentration of low-income populations and/or minority populations within a specified study area compared to their concentration within a reference area, such as the agency's service area.

The **State Planning Council** MPO and Rhode Island DOT used location quotients to determine potential disproportionate benefits and burdens of projects across two measures. One analysis assessed if there was a potential disproportionate exposure to asthma risks among EJ populations based on their homes' proximity to mobile source pollution generated along freeways. The other analysis evaluated if transit access might be improved for EJ populations.

Asthma Risk Analysis

Rhode Island has a relatively high rate of asthma. On-road mobile source emissions and the resulting poor air quality can aggravate respiratory conditions, The State Planning Council MPO wanted to assess disproportionate asthma risk related to the location of transportation facilities.

To conduct the spatial analysis, the MPO selected a study area in Rhode Island that would include populations at potential high risk for pollution from mobile sources. The agency focused on interstate highways and freeways and excluded other principal arterials, which may provide countervailing benefits of access to commercial services, residential neighborhoods, and non-motorized and public transport options. The RI MPO then mapped Census tracts and EJ populations within a 250-foot buffer around interstate highways and freeways **(Figure 9)**. After applying the location quotient to that study area and the reference area of the MPO's service area, the analysis revealed a disproportionate number of low-income populations and minority populations living within 250 feet of interstates and highways and determined that there was a disproportionate adverse effect attributable to this proximity.

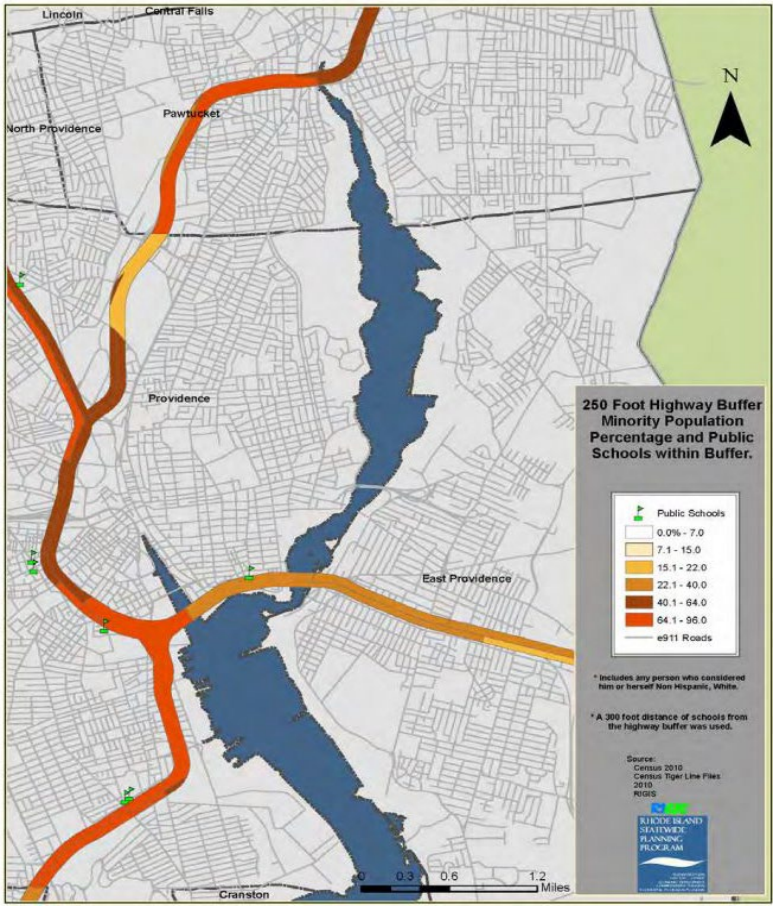

Figure 9. Map of EJ Populations within 250' Buffer of Interstates and Highways. Source: State Planning Council. 2012. Long Range Transportation Plan: 2035

Table 10 illustrates how the location quotient ratio was calculated for minority populations and low-income populations based upon 2010 Census population data.

Table 10. Example of Population-Based Location Quotient Calculation, Proximity to Interstate Highways 2010 Census. Source: State Planning Council. 2012. Transportation 2035.

	EJ Population of Study Area	Total Population of Study Area	EJ Population of Reference Area	Total Population of Reference Area	Location Quotient
Minority	7,691	20,367	248,882	1,052,567	1.68
Below Poverty	3,538	20,367	123,396	1,052,567	1.48

The MPO deployed several strategies to reduce or mitigate the disproportionately high and adverse effect: (1) amending the project selection process to prioritize projects that improve air quality within 250 feet of a highway; (2) retrofitting diesel school buses in these areas first; and (3) building more natural buffers between highways/interstates and neighborhoods.

	Target Population of Study Area	Total Population of Study Area	Target Population of Reference Area	Total Population of Reference Area	Location Quotients
EJ Populations	283,839	533,487	372,882	1,052,567	1.14
Zero-Car Households	37,563	533,487	38,137	1,052,567	1.94

Table 11. Location Quotient Calculation for Proximity to Transit Stops

Transit Access Analysis

The MPO also used the location quotient method to assess access to transit benefits. The MPO defined the study area as a half-mile radius buffer around transit stopes **(Figure 10**). The agency determined the number of people, of different demographic groups, in the study area. In addition to analyzing the location quotients for EJ populations, the agency also used the location quotient to assess transit access for zero-car households (see **Table 11**).

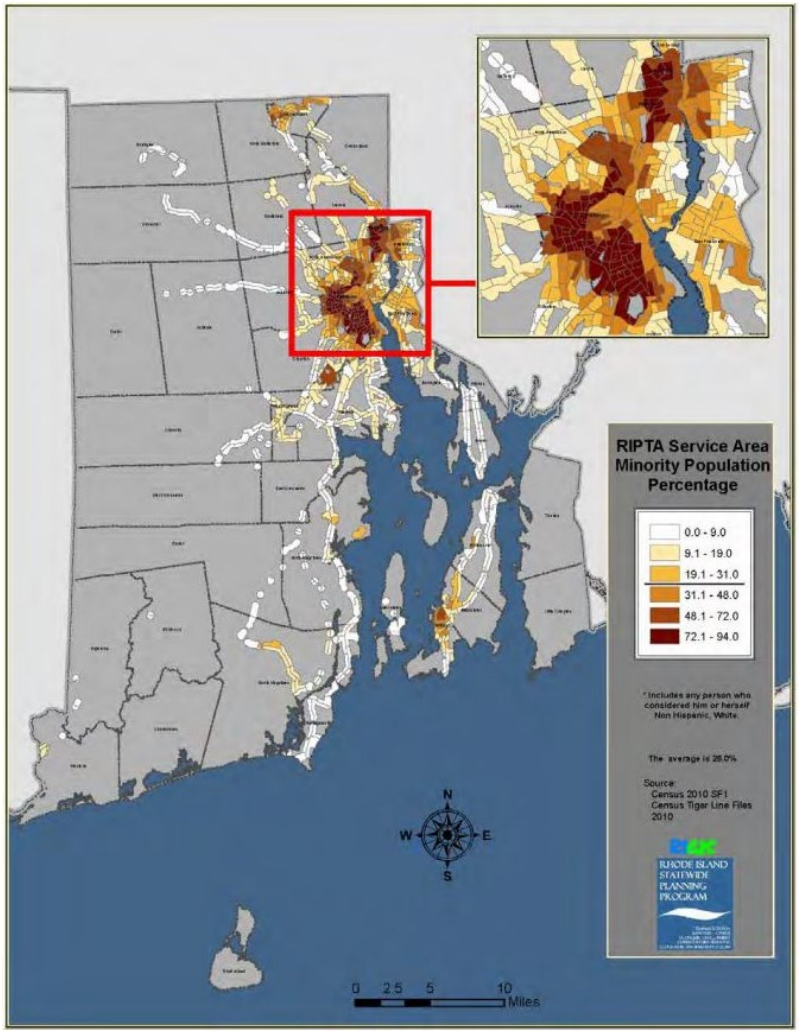

Figure 10. Map of EJ Populations within half mile buffer of transit service. Source: State Planning Council. 2012. Long Range Transportation Plan: 2035

What are the limitations of location quotients?

Due to inevitable lack of precision in the data, location quotients can provide a rough indicator of the potential for disproportionately high effects (negative or positive) among EJ populations. While it can certainly be a good indicator that a difference is disproportionate, it cannot be used to conclude that adverse effects are not disproportionate – there may be other variables that are not factored into the simple location quotient. Therefore, once again, outreach with the affected populations is critical to helping the agency make a reasonable conclusion.

What resources are needed to calculate location quotients?

Calculating the location quotient requires population data by EJ demographic, a defined area of study, and some simple math. Depending on how the study area is defined, the assessment may require spatial (GIS) analysis, such as for measuring populations within 250 feet of a roadway.

Resources

State Planning Council. 2012. Transportation 2035.
http://www.planning.ri.gov/documents/trans/LRTP%202035%20-%20Final.pdf

State Planning Council. 2017. Transportation Improvement Program: FFY 2018-2027.
http://www.planning.ri.gov/documents/tip/2018/STIP_Full%204-16-18.pdf

Deploying Strategies to Address Disproportionately High and Adverse Effects (Imbalances and Needs)

The research identified one agency (the Rhode Island State Planning Council) that documented a finding of disproportionately high and adverse effect and that identified mitigation actions in its LRTP. Other agencies proposed steps to guard against potential adverse effects on minority populations and/or low-income populations, without documenting specific findings. This chapter moves from the most general of these approaches to the most specific:

- Some DOTs provide technical assistance and guidance on EJ at the state, regional, and local level.
- Agencies of all types enhance their ability to improve EJ by partnering with other organizations.
- Some agencies document a concerted effort to include low-income representatives and minority representatives on advisory committees and other decision-making bodies.
- Many agencies include in their plans or programs some high-level policy goal relating to equity and, often, EJ. A smaller subset of these agencies developed measurable goals with performance measures for tracking progress.
- Some agencies fund additional research and specific activities to reduce adverse effects.
- Many agencies have project selection and/or prioritization evaluation criteria to advance alternatives that include beneficial impacts on the EJ community or communities. A few of these agencies use measurable, objective evaluation criteria, as would be recommended for performance-based planning and programming.

Providing EJ technical assistance and guidance

Some DOTs provide handbooks and guidance to DOT and MPO planners as well as to engineers involved in the NEPA review process. For example, **PennDOT** includes several EJ-related activities in its State Planning and Research (SPR) work program, such as improving EJ processes in a specific county, completing EJ requirements for rural transportation planning, and coordinating EJ inclusion in the STIP. PennDOT's *Every Voice Counts EJ Guide* (2004, updated 2012) recommended the formation of a formal EJ Advisory Committee; the 2012 update shows that the Committee was created and worked on the update. The guide includes technical resources for identifying EJ groups, conducting public involvement, and integrating EJ concerns into plans and programs. The guide also provides a robust list of performance measures. The 2012 update recognizes that organizations vary in their staff, resources, and abilities; the recommendations therefore vary for organizations that have limited, moderate, or substantial resources and limited or proficient GIS and travel demand modeling capabilities. On a related note, PennDOT's guidance for creating LRTPs includes information on EJ and recommends coordinating environmental decisions within the planning stage to link planning and environmental processes.

Seeking Partnerships to Enhance Capacity

While a transportation agency may not be able to solve all problems within its region, the agency can achieve more when it works with other organizations. Agencies can pool resources, such as an MPO seeking planning assistance from the State DOT while working with local transportation agencies to conduct walking audits and implement pilot projects. Universities and colleges can supplement agencies' staff and technical capabilities. College professors and students are often looking for real-world research experience and are valuable resources for external staffing support to conduct research studies or public outreach.

Many agencies partner with community-based organizations, often to improve public outreach. The **Together North Jersey** (TNJ) initiative funded several local planning programs. One of these, the NGO-Microgrant Program, funded community-based organizations that regularly interact with, are trusted by, and include members of traditionally underrepresented populations to foster participation in the development of the TNJ Regional Plan for Sustainable Development and to undertake small planning projects or training workshops in their communities.

Finally, private sector partners might have an interest in participating in implementing projects to improve EJ outcomes. For example, some MPOs have worked with bike-share system operators to ensure that stations are accessible to EJ neighborhoods and without the use of a credit card.

Including Minority and/or Low-income individuals on Planning and Advisory Committees

FHWA Order 6640.23A directs "Where relevant, appropriate and practical, agencies should include low-income representatives and minority representatives on planning committees and boards."[22] By ensuring strong EJ representation on committees, agencies can get the information and knowledge needed for effective EJ analysis and outreach. Some agencies use informal methods, such as an advisor network, to get input from a network of people matching the area's demographics.

Other agencies have committees with bylaws that require diversity in membership, such as by reserving a certain number of seats for minority individuals or for low-income individuals. **Mid-Ohio RPC**'s Citizens Advisory Committee bylaws require broad representation of the community including low-income populations, minority populations, and others.

[22] FHWA Order https://www.fhwa.dot.gov/legsregs/directives/orders/664023a.cfm

Adopting an Overarching Policy Goal Related to Equity

Agencies have started incorporating high-level policy goals to advance equity, but most of these goals are not accompanied with actionable next steps or specific enough details to measure the agency's progress toward achieving the goal. These goals are generally framed as promoting equity and access for disadvantaged populations.

These high-level goals can be used to help explain to constituents why the agency wants to improve equity. For example, the **St. Paul Metropolitan Council** lists equity as one of five outcomes it hopes to achieve with the region's vision, using the following rationale:

> "Equity connects all residents to opportunity and creates viable housing, transportation, and recreation options for people of all races, ethnicities, incomes, and abilities so that all communities share the opportunities and challenges of growth and change. For our region to reach its full economic potential, all of our residents must be able to access opportunity. Our region is stronger when all people live in communities that provide them access to opportunities for success, prosperity, and quality of life."

Other agencies name goals related to specific equity issues in their region, such as avoiding displacement or reductions in transportation access. These goals usually focus on either reducing burdens or improving access to benefits for minority populations and/or low-income populations.

Agencies also incorporated EJ goals into their LRTPs. For example, the pedestrian element of the plan could have a goal to improve pedestrian infrastructure in neighborhoods with high numbers minority populations and/or low-income populations.

Adopting a Goal and Measuring Progress

In addition to adopting high-level goals, some agencies defined performance measures, set targets, and measured progress toward achieving goals. Defining and tracking success in measurable ways makes progress much more likely. It also can provide the agency a useful means to communicate its intentions clearly and to hold itself accountable.

Hattiesburg-Petal-Forrest-Lamar, Mississippi MPO developed these measurable objectives to achieve its goal of equitably distributing benefits and burdens of the transportation system:

- Minimize the disparity between EJ communities and other areas regarding the percentage of households that spend 45% of their income on housing and transportation;
- Minimize the disparity between EJ communities and other areas regarding the average travel time to work.
- Minimize the disparity between EJ communities and other areas regarding travel time to primary employment centers and major medical and educational destinations.
- Minimize the disparity between EJ communities and other areas regarding exposure to arterial traffic and associated air and noise pollution.
- Minimize the disparity between EJ communities and other areas regarding bicycle and pedestrian crashes.
- Increase the ratio of sidewalk and multi-use path length to roadway length in EJ areas and in locations that are within a half mile of fixed-route transit service.

Hawaii DOT has several equity goals, including a goal that considers the equitable distribution of transportation fees: "Identify and implement user fees that equitably spread the cost burden over all modes of transportation without impacting environmental justice populations."

San Francisco's Metropolitan Transportation Commission tracks the following equity measures (and others) for goals related to economic vitality and equitable access:

- the share of jobs that are accessible by auto and transit in congested conditions, within and outside Communities of Concern;[23]
- the share of middle-wage jobs in the region, within and outside Communities of Concern.
- the share of affordable housing within and outside Communities of Concern;
- the share of low- and moderate-income households within and outside Communities of Concern;
- the share of income consumed by transportation and housing costs by low-income households and by higher-income households.

Mid-Ohio Regional Planning Council in Columbus, OH adopted long range plan objectives to keep the average trip travel time for disadvantaged populations within 5% of the regional average trip travel time.

To assess progress toward a goal of ensuring equitable access to alternative modes of transportation, **Wichita MPO** measures the percentage of population, employment centers, and human services within a quarter-mile of a transit line; and the percentage of various population groups that are within a quarter-mile of a transit line or one mile of a bike facility.

Funding Studies and Activities to Identify and Mitigate Disproportionately High and Adverse Effects

EJ analyses are most meaningful when they help an agency develop strategies for reducing disproportionately high and adverse effects. Many agencies develop ideas for new proposed projects based on their findings of EJ needs (e.g., existing gaps in the transit network) or adverse effects (e.g., poor air quality). Agencies identify these strategies in a variety of documents, including LRTPs, UPWPs, and Title VI or EJ plans.

The **Rhode Island State Planning Council** was the only agency to document a finding of a disproportionate adverse effect. The adverse effect was related to exposure to mobile source air emissions, which led the Council to recommend the following mitigation steps:

- Amending its CMAQ criteria to award more points to projects improving air quality in areas close to freeways,

[23] MTC's "Communities of Concern" concept includes all EJ populations, as well as some others.

- Beginning diesel retrofits for school buses with school districts in affected areas, and
- Increasing the use of natural buffers along the highway to trap particulates and improve air quality.
- Considering air quality when siting high-density housing because air pollution affects anyone close to a highway or interstate.

Other agencies appeared to be implementing mitigation approaches without documenting a finding of disproportionately high and adverse effect, such as the following:

- **Northwest Arkansas RPC** recommended investigation into adding new transit service to neighborhoods identified as having high demand for transit based on high concentrations of low-income households, zero-vehicle households, and older adults.
- The **South-Central Region COG** learned that a high percentage of EJ households did not have access to a vehicle, and the LRTP recognized transit service as critical to meeting their needs and ensuring access to jobs. Strategies proposed included adequately maintaining the existing transit service, further study of how to meet the transit needs, and consideration of how any proposed fare increases would burden EJ populations.
- **St. Paul Metropolitan Council's** Better Bus Stops Program focused its investments in "areas of concentrated poverty where more than half the populations are people of color" for its bus stop/shelter improvements.

Several agencies included studies and initiatives in their UPWPs or State Planning and Research (SPR) work programs, some of which are described below. These practices are most useful if they are clearly targeted to produce data or information that supports a tangible follow up activity, rather than a report that sits on a shelf:

- **Madison MPO** plans to complete a level-of-traffic-stress (LTS) analysis[24] of its bikeway network, and to identify important gaps in the low-stress network serving EJ areas. The agency also plans to complete a strategic plan for improving its travel model and other planning tools to better evaluate and forecast transportation system performance in relation to MTP goals, which include equity goals.
- **Minnesota DOT** plans to develop an "advancing transportation equity" report modeled after an Advancing Health Equity Report completed by the Minnesota Department of Health, which will identify transportation strategies and approaches to reduce disproportionate adverse effects and improve equity.
- The **Polk County TPO**'s UPWP includes an objective to have 100% sidewalk coverage within one mile of all schools. In the first year, it plans to evaluate the 10 schools with the

[24] For more information about LTS analyses, see *FHWA Guidebook for Developing Pedestrian and Bicycle Performance Measures*

worst coverage and, in the second year, address sidewalk coverage in school areas in the bottom third.

- **St. Paul Metropolitan Council**'s LRTP says that the MPO will undertake several UPWP activities to improve equity, including:
    - Studying potential disproportionate adverse effects in preservation and maintenance spending, infrastructure condition, and safety outcomes;
    - Improving methods for analyzing effects to use in project prioritization; and
    - Studying whether and how to use project evaluation or prioritization measure to incentivize jurisdictions to improve housing affordability.

Developing Evaluation Criteria for Unverifiable EJ Benefits

Many agencies have incorporated evaluation criteria to encourage investments in EJ communities, but many simply award points to proposed projects located in an EJ area without requiring documentation about specific benefits. This trend risks incentivizing projects that may burden the adjacent EJ communities.

Some agencies require project sponsors to provide a narrative description of the effects on EJ populations, but it is rarely clear how these answers are evaluated or how they influence project selection. Other agencies require project "benefit" or "improve access to" the EJ community without requiring any method for measuring whether the project does these things.

Seeking accountability from project sponsors about the EJ benefits of proposed investments can be an effective method for pushing progress toward achieving EJ goals, but only if the agency clearly conveys its standards and requirements for accurate assessments. Consistent with other performance-based planning and programming approaches, other agencies have created evaluation criteria that measure the potential benefit, as discussed below.

Developing Evaluation Criteria for Verifiable EJ Benefits

Some agencies' evaluation criteria require verifiable benefits to EJ populations, consistent with performance-based planning and programming approaches. Performance-based approaches provide transparency about the progress toward meeting goals of programs and plans. Communicating expected future performance targets and measures can help the public and stakeholders to understand and provide informed input to prioritize alternative investment options. Agencies use a variety of approaches to highlight those projects that truly benefit EJ populations; some agencies also deduct points from projects that have net burdens to EJ populations. The focus areas described in this report may reveal assessment evaluation criteria practitioners may wish to consider.

What are evaluation criteria for verifiable EJ benefits?

Agencies use evaluation criteria to select or prioritize projects in for inclusion in their long-range plans or transportation improvement programs. When selecting which transportation projects to include in their plans and programs, agencies can use evaluation criteria to assess the extent to which a potential project measurably benefits or burdens minority populations and/or low-income populations.

Focus Area

- Deploying Strategies to Address Disproportionately High and Adverse Effects (Imbalances and Needs)

Tools and Techniques

- Project selection or prioritization criteria
- Census and other data

Practice Examples

- Association of Central Oklahoma Governments, OK
- Cartersville-Bartow MPO, GA
- Metropolitan Council, MN
- Mid-Ohio RPC, OH
- North Jersey Transportation Planning Authority, NJ
- Polk County TPO, FL
- Puget Sound Regional Council, WA
- State Planning Council, RI
- Rogue Valley MPO, OR

Why use evaluation criteria for verifiable EJ benefits?

Well-crafted evaluation criteria can help prevent delays in (or prevent the denial of) minority populations and/or low-income populations receiving the benefits of transportation investments. Using EJ-based criteria for project selection is a scalable practice that prioritizes projects that yield the most benefits for low-income communities and/or minority communities. These criteria can be particularly relevant for addressing the continuing challenges that these populations face, including limited multi-modal transportation options to reach essential destinations.

What are some techniques for developing evaluation criteria for verifiable EJ benefits?

The specific criteria adopted should be based on the needs and concerns of EJ populations, other information collected during the prior focus areas discussed in this report, as well as the agency's priorities, goals, and resources.

Criteria can range from being straightforward (e.g., does the project address a need identified in an EJ needs assessment?) to being highly technical (e.g., do the project's modeled opening day users' demographics match the region's demographics?).

As demonstrated by the following examples, an agency can award points to projects that demonstrate measurable benefits or subtract points from projects that have measurable burdens:

The Metropolitan Council in Minnesota applies equity and housing performance criteria to every project submitted for consideration. In the MPO's regional solicitation for transportation funding, a Housing Performance Score rewards jurisdictions that actively seek to create and preserve affordable housing; the measure assigns points based on housing affordability and diversification, local initiatives to facilitate and preserve affordable workforce housing, and density of residential developments. The MPO also requires applicants to reference a

socioeconomic map, and points are given to projects that focus on providing environmental benefits to regions with higher concentrations of traditionally underserved populations.

The Polk County TPO in Florida requires project sponsors to answer six categories of questions, including project linkage, system continuity, community benefit, cost-to-benefit comparison, public/private support, and commitment. Three out of six categories contain questions related to benefiting EJ communities, which include:

- Does the project enhance access to essential services in a traditionally underserved neighborhood or Environmental Justice area?
- Will the project provide benefits to a large segment of the community? Will the proposed project serve a traditionally underserved neighborhood or Environmental Justice area? The benefits derived can be related to safety, quality of life, or the economy.
- Is there demonstrated public and/or private support for the project? Project sponsors can demonstrate support via written endorsements, public comments, financial donations, local plans, or by demonstrating that the project was identified as part of a Neighborhood Mobility Audit, which typically emphasizes EJ concerns.

The **Rogue Valley MPO** in Oregon prioritizes projects that fulfill identified needs of EJ populations and projects that the adjacent community supports. For projects seeking CMAQ funding, projects located in "Areas of Concern" (i.e., areas containing more than twice the regional average of low-income, minority, senior, or youth populations) are evaluated more favorably if the project addresses the needs identified in the agency's 2016 Transportation Needs Assessment for Traditionally Underserved Populations.

The **Puget Sound Regional Council** considers social equity and access to opportunity within its project selection criteria. Proposed TIP projects earn more points if they increase by at least 10% the number of minority and/or low-income individuals with access to frequent transit. The TIP also seeks to improve environmental health, mobility, and access to opportunity for minorities, low-income populations, older adults, people with disabilities, and members of zero-car households.

The criteria define access to opportunity by a series of 20 measures representing five major categories of opportunity, including education, economic health, housing and neighborhood quality, transportation and mobility, and health and environment. **Figure 11** outlines the specific criteria that applicants need to meet to achieve different scores, which can earn a project 10 out of a total 90 points

What are the limitations of evaluation criteria for verifiable EJ benefits?

EJ-based evaluation criteria may involve significant value judgements by the individuals completing the scoring. This is a limitation for scoring of any kind, especially when criteria categories are unclear or difficult to define. To improve the process, agencies may wish to reconsider defining their evaluation criteria in a way that can be measured and uniformly evaluated. Other considerations include:

	Purpose: Improve environmental health. How well does the project avoid creating new, mitigate existing, or eliminate previous negative impacts for the following populations: minority, low-income, elderly, youth, people with disabilities, and households without vehicles.		
Points	2		The project avoids creating new negative environmental health impacts or physical barriers for these populations[17]
	Choose one	4	The project improves environmental health for three or more of these populations
		3	The project improves environmental health for two of these populations
		2	The project improves environmental health for one of these populations
	Purpose: Improve access to opportunity. How well does the project improve access to areas of opportunity?		
	Choose one	4	The project improves access[18] to an area with a low ranking for opportunity and connects it with an area with a high ranking for opportunity (as defined by the Growing Transit Communities opportunity mapping[19]).
		2	The project improves access to an area with a low ranking for opportunity (as defined by the Growing Transit Communities opportunity mapping).
		1	The project improves access to an area with a high ranking for opportunity (as defined by the Growing Transit Communities opportunity mapping).
Total	10 (max)		

Figure 9. Social Equity and Access to Opportunity Measures for Puget Sound Regional Council

- Before awarding points to a project located in an EJ area, consider whether the adjacent community will necessarily benefit.
- If the evaluation criteria will incentivize projects in core "revitalization areas," agencies can help prepare for potential gentrification by working with other area agencies to implement neighborhood stabilization strategies.
- Agencies may wish to consider defining the terms of their evaluation criteria to ensure, for example, that "accessibility benefits" measurably improves access for the adjacent EJ community.
- Given that the points for EJ-related evaluation criteria will be pitted against a variety of competing considerations (e.g. multimodal networks, economic development, infrastructure age, safety, congestion and air quality, cost-effectiveness), the weight of the EJ-related evaluation criteria should be sufficient to influence the outcome.
- To help project sponsors understand how to help the agency meet its EJ goals, agencies can work with project sponsors to help them understand the evaluation process and criteria, the data sources, and methods used to ensure accuracy and objectivity.

What resources are needed to develop and apply evaluation criteria?

Several factors shape the costs and resources required for developing and implementing EJ-based evaluation criteria. Depending on an agency's goals, staff may need to devote significant time to selecting specific criteria and evaluation methods. For an agency that already has a robust performance-based evaluation process, adding EJ-related criteria should take less time than for an agency that is less experienced with performance-based evaluations. Furthermore, depending on how technical an agency's evaluation method is, certain evaluation criteria could require

specific software and/or data sets to evaluate. Evaluating effects on the EJ population around a project could require data on demographics, transit networks, jobs, and amenities, as well as GIS mapping tools and travel demand modelling.

Who has created evaluation criteria for verifiable EJ benefits?

While many agencies have EJ-related evaluation criteria, most of them have been found to simply ask whether the project is in or adjacent to a designated "EJ area." The following agencies are a few notable exceptions to this practice; they are more precise in ensuring that their criteria differentiate between benefits and burdens to EJ communities:

Association of Central Oklahoma Governments allocates 5 out of 135 possible TIP points in its project selection process to various EJ-related criteria. Projects in EJ areas can earn one point for each of the following: improving transit service, improving access to jobs, improving livability, shortening commute time, and ensuring that a project does not result in displacement.

Cartersville-Bartow, GA MPO uses a transit dependency rating for identifying areas in which to prioritize and locate new bus routes in transit plans and the LRTP.

St. Paul's Metropolitan Council applies equity criteria to the TIP project solicitation process, which also includes a discussion of the region's housing conditions. For more information, refer to the example in "what are some techniques for implementing this practice" section.

Mid-Ohio RPC in Columbus prioritizes LRTP projects based on the travel demand model's forecast of the percentage of opening day users expected to be minority, in poverty, older adults, and persons with disabilities. The agency compares the forecasted user demographics to the region's demographics to understand whether the project serves a representative sample of the region.

North Jersey Transportation Planning Authority includes EJ-explicit criteria in its TIP project prioritization criteria for Highway and State Bridges Projects, Local Bridge Projects, and Transit Projects. Out of 1,000 possible points, a project may be awarded up to 36 points for meeting EJ criteria. To be awarded points under the EJ criteria, highway and bridge projects should provide benefits (such as improving access or repairing facilities without adding more traffic or taking right of way) or reduce burdens (such as addressing safety problems, reducing truck traffic, or reducing noise) for EJ populations; transit projects in EJ areas should improve transit service to EJ populations and American with Disabilities Act requirements.

Polk County TPO in Florida has six categories of TIP project solicitation questions that project sponsors must answer for projects, and three of these categories include questions regarding benefits to EJ communities, as described above.

Puget Sound Regional Council in the Seattle area allocates 10 out of 90 points in its TIP project selection process to the category Social Equity and Access to Opportunity. This category seeks to improve environmental health, mobility, and access to opportunity for minorities, low-income populations, older adults, people with disabilities, and members of zero-car households.

Rhode Island's State Planning Council found a disproportionate adverse effect of air pollution in its LRTP and recommended amending its CMAQ funding project selection criteria to award more points to projects improving air quality in areas close to freeways.

Rogue Valley MPO in Oregon prioritizes TIP projects based on the needs of EJ areas and adjacent communities.

Resources

Association of Central Oklahoma Governments. 2011. Environmental Justice Analysis of the Encompass 2035. http://www.acogok.org/wp-content/uploads/2017/05/EJ-Analysis.pdf

Hattiesburg-Petal-Forrest-Lamar Metropolitan Planning Organization, 2015. 2040 Metropolitan Transportation Plan. http://www.hattiesburgms.com/wp-content/uploads/HPFL2040FinalDraft.compressed-ilovepdf-compressed.compressed.pdf

Metropolitan Council, St Paul. N.d. Introduction to the Regional Solicitation for Transportation Projects. https://metrocouncil.org/Transportation/Planning-2/Transportation-Funding/Regional-Solicitation/DraftRegionalSolicitation2016.aspx

Metropolitan Council, St. Paul. 2016. Equitable Development Principles and Scorecard: A Tool for Communities and Planners. .https://www.metrotransit.org/Data/Sites/1/media/equity/equitable-development-scorecard.pdf

Puget Sound Regional Council. 2012. Transportation 2040 Prioritization Measures. https://www.psrc.org/sites/default/files/prioritization-measures.pdf

Polk County TPO. 2017. TIP, Appendix C. http://polktpo.com/docs/librariesprovider2/tpo/02-12-18-admin-mod-2017-tip.pdf?sfvrsn=10

North Jersey Transportation Planning Authority. 2017. 2018-2021 TIP. http://www.njtpa.org/getmedia/412c7d4a-082a-4414-9160-56a9a69a0b13/FY2018-2021-TIP_1.pdf.aspx

Overarching Best Practices

During the EJ analysis research process, the study team observed several overarching best practices that can advance EJ in transportation planning processes and decisions. These observed overarching practices, which are employed by some but not all agencies, are summarized below.

Integrating EJ Analyses with Plans and Programs

The study team identified numerous cases in which an MPO or State DOT developed detailed maps and descriptions of EJ populations in plans dealing with Title VI or public involvement and participation, but the information did not seem to influence the long-range plans or TIPs/STIPs. MPOs were more likely to address EJ and related topics than DOTs. Both types of agencies were more likely to address these issues in their long-range plans than in their transportation improvement programs. EJ or related terms and topics were addressed explicitly in 90% of the MPO LRTPs reviewed, in 61% of the SLRTPs, in 47% of the MPO TIPs, and in 36% of the STIPs.

An agency may be researching and addressing EJ issues, but much of the value of that work is lost if the findings are buried in studies rather than clearly reflected in the LRTPs and TIPs that publicly define the agency's priorities and intentions. The focus areas described in this report provides information agencies may wish to consider with to integrate when analyzing adverse effects of transportation plans and programs, and to inform application of performance-based planning and programming principles by using the assessment data to develop and track EJ-related goals, targets, performance indicators, and project evaluation criteria.

For example, the Delaware Valley Regional Planning Commission *Equity Through Access* (ETA) project is an approach DVRPC developed to update its Consolidated Human Services Transit Plan. The online, interactive ETA mapping tool generates regional and neighborhood level data to help planners pinpoint EJ-related transit accessibility gaps. While its primary purpose is to inform regional transit plans, the ETA mapping toolkit could also provide useful data to support analyses and project prioritization processes for the LRTP and TIP (**Figure 12**)

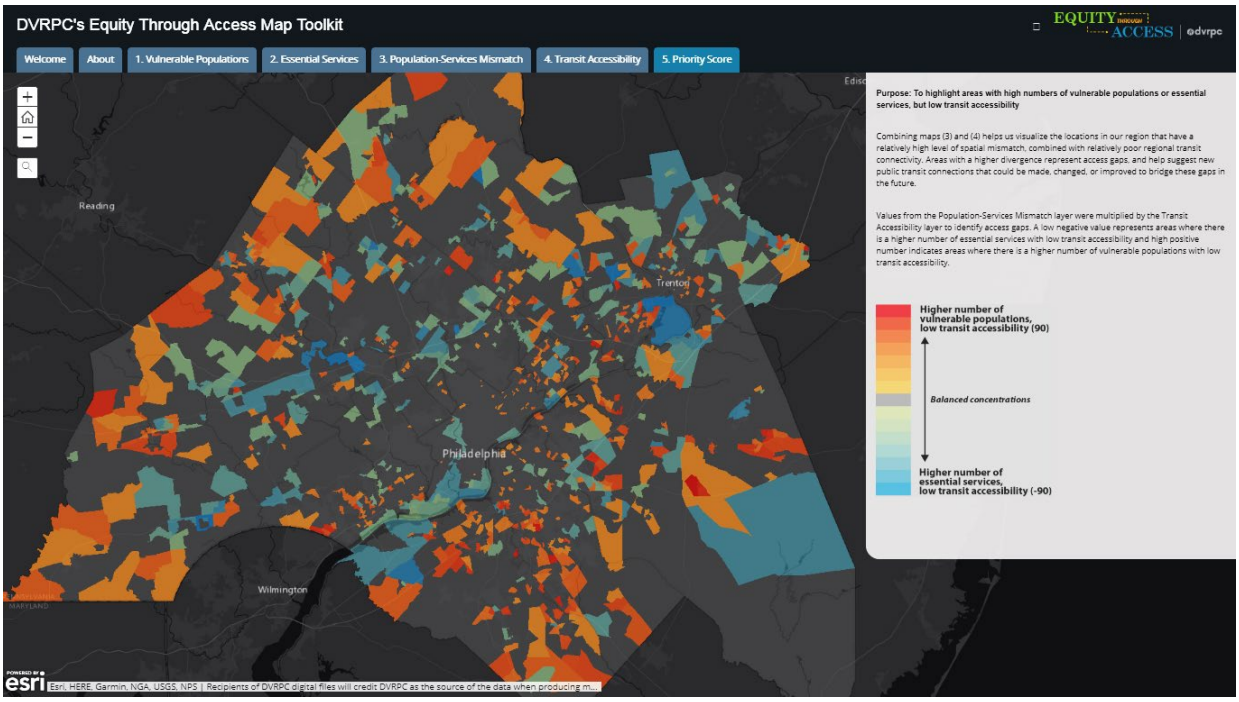

Figure 12: DVRPC Equity Through Access Map Toolkit
Source: https://www.opendataphilly.org/dataset/dvrpc-s-equity-through-access-map-toolkit

Approaches for Integrating EJ Analyses at the Statewide Scale

The research conducted for this study indicated that statewide SLRTPs generally reflect detailed EJ analyses far less frequently than MPO regional LRTPs. This relative lack of detail at the statewide scale may be related to the fact that State DOTs (unlike MPOs) are not required to include fiscally-constrained lists of proposed investments in the LRTP. Statewide plans can, and often do, consist of broad policy statements and generalized statewide goals and performance targets that are not location-specific.

As system owners and operators, State DOTs are typically capable and experienced with conducting in-depth EJ analyses for major projects that require environmental assessments in accord with the National Environmental Policy Act (NEPA). The methods for conducting detailed, geographically specific assessments, however, may be challenging to adapt for application to a broad policy document.

Some State DOTs create statewide project investment plans that cover a moderate time horizon, such as ten years, which falls between the 20-year SLRTP and the four-year STIP. These medium range plans are not subject to EJ planning and project development regulations. Since they are more geographically specific than the 20-year plans, however, they could serve as useful vehicles for DOTs to voluntarily investigate EJ issues and potential impacts, and to reflect those insights in broader policy documents.

Regardless of whether a State DOT develops a medium-term statewide project investment plan, it can increase the degree and sophistication with which its SLRTP and STIP address EJ

concerns by using the output from the EJ analysis to inform a collaborative decision-making process.

Using EJ Analysis to Support Collaborative Decision Making

EJ assessments and analysis process may be used to support or inform collaborative decision-making approaches such as Planning and Environment Linkages (PEL), Community Impact Assessments (CIA), and Context Sensitive Solutions and Design (CSS/D). FHWA encourages States, MPOs, or other project sponsors to incorporate EJ principles into planning products and documents. EJ is important because it helps to ensure full and fair participation by potentially affected communities in every phase of the transportation decision-making process, from the earliest planning stages through project development and construction.

Support Planning and Environment Linkages with EJ Assessment

PEL represents a collaborative and integrated approach to transportation decision-making that considers benefits and impacts of proposed transportation system improvements to the environment, community, and economy during the transportation planning process. PEL uses the information, analysis, or products developed during planning to inform the environmental review process, including the National Environmental Policy Act of 1969 (NEPA). Public involvement activities targeting EJ populations, as well as potential transportation planning mitigation or other information in transportation planning could be documented to inform the project development and NEPA decision-making process. By taking a PEL approach, information can be obtained through a planning analysis (e.g. travel demands, regional development and growth, local land use, etc.) and planning decisions (e.g. the purpose and need for the proposed action, and preliminary screening of alternatives and elimination of unreasonable alternatives) to be adopted or incorporated by reference into the NEPA process.[25]

Understanding community needs is a vital component of identifying project concepts during the transportation planning process, from long rang plans to project-level environmental review, and helps shape project decisions and outcomes under NEPA. This information is important when considering EJ. However, the assessment conducted for this research found planning-level EJ assessments were the exception rather than the rule, especially at the statewide scale. Transportation agencies interested in learning more about PEL practices and techniques may wish to review FHWA's PEL FAQs and report on PEL benefits[26]

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[25] "There are multiples PEL authorities- 23 CFR 450.212 & .318 and Appendix A of 23 CFR 450, 23 U.S.C. 168, 23 U.S.C. 169, 23 U.S.C. 134 (i)(2)(D) & 135(f)(4), 40 CFR 1500.4(j) and 1502.21, 23 U.S.C. 139(f)(4)(E) and 23 CFR 771.111(a)(2)

[26] PEL Benefits: Measuring the Benefits of Planning and Environmental Linkages. FHWA. 2015. https://www.environment.fhwa.dot.gov/env_initiatives/pel/PEL_Benefits_report.pdf

Community Impact Assessment

CIA is an iterative process to evaluate the effects of a transportation action on a community and its quality of life. The assessment process is an integral part of transportation planning and project development that can shape the outcome of transportation decisions. It involves understanding the needs of communities and documenting the existing and anticipated social environment of a community with and without the proposed action. The information revealed from this iterative process can inform decisions concerning transportation planning, project alternatives, design, and implementation.

Context Sensitive Solutions and Design (CSS/D)

CSS/D is a collaborative, interdisciplinary, and holistic decision-making process and design approach to develop transportation projects that contextual appropriate for a given physical setting. The CSS/D process involves all stakeholders and values equally the needs of agency and community, considering all trade-offs in decision-making.

Conclusion

The state of the practice research provided in this report **is not guidance nor does it establish any new requirements**, however it may be useful resource for FHWA and transportation agencies to consider when conducting EJ analyses during transportation planning and programming. FHWA encourages States, MPOs, and operators of public transportation to incorporate EJ principles into planning products and documents. EJ is important because it helps to ensure full and fair participation by potentially affected communities in every phase of the tranpsortation decision-making process.

Agencies may wish to consider the focus areas outlined in this report based on their specific context and capacity. For example, large MPOs and State DOTs with extensive resources may wish to consider the focus areas to identify and address the needs of diverse, rapidly changing EJ populations, while small MPOs and State DOTs that serve small cities and rural areas may wish to consider the focus areas to conduct simpler, yet equally rigorous, assessments.

Agencies may find that use of the focus areas described in this report helps to advance its ability to conduct a well-documented, effective EJ analysis that supports decision making during the transportation planning process. This process involves seeking out and considering the needs of those traditionally underserved by existing transportation systems who may face challenges accessing employment and other services; and by identifying and avoiding, minimizing and addressing any potential disproportionately high and adverse effects experienced by low-income populations and/or minority populations.

This research may also help supplement other State DOT and MPO resources such as handbooks, webinars, and checklists on complying with EJ requirements. Additionally, the focus areas could be used to help inform future national research on EJ considerations as it relates of several emerging issues; such as the deployment of automated and connected vehicles, health and transportation, shared mobility, tolling and road pricing, changing demographics, indirect and cumulative impacts, and performance management.

Appendix

Study Advisors

Subject Matter Expert Panel

- Monica Haines Benkhedda, Baltimore Metropolitan Council
- Tom Bruff and Saima Masud, Southeast Michigan Council of Governments
- Matt Carpenter, Sacramento Area Council of Governments
- Rusty Ennemoser, PhD., Florida DOT
- Gloria Jeff, Minnesota DOT (formerly Wichita MPO)
- Kendall Miller, Hampton Roads Transportation Planning Organization
- Veronica Trecazzi, Ohio DOT

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Cover Photos

Photo credits: bicyclists (Michael Grant, ICF); light rail train station (Michael Grant, ICF); women at meeting (City of Seattle, WA).

MPOs in Study Sample

MPO Name	Central City	State	2010 Population
Adirondack/Glens Falls Transportation Council	Glens Falls	NY	143,664
Albany Area MPO	Albany	OR	57,721
Ames Area MPO	Ames	IA	59,824
Association of Central Oklahoma Governments	Oklahoma City	OK	1,140,532
Atlanta Regional Commission	Atlanta	GA	4,819,026
Baltimore Regional Transportation Board	Baltimore	MD	2,662,204
Bangor Area Comprehensive Transportation System	Brewer	ME	67,763
Bay County TPO	Panama City	FL	168,852
Birmingham MPO	Birmingham	AL	853,551
Bismarck-Mandan MPO	Bismarck	ND	100,165
Brownsville MPO	Reading	TX	226,282
Cartersville-Bartow MPO	Cartersville	GA	90,128
Casper Area MPO	Casper	WY	71,077
Centre County MPO	State College	PA	154,016
Charlotte County - Punta Gorda MPO	Port Charlotte	FL	161,230
Charlottesville-Albemarle MPO	Charlottesville	VA	113,074
Chicago Metropolitan Agency for Planning	Chicago	IL	8,444,660
Chippewa-Eau Claire MPO	Eau Claire	WI	112,671
Chittenden County RPC	Winooski	VT	156,567
Clarksville Urbanized Area MPO	Clarksville	TN	175,269
Collier MPO	Naples	FL	321,518
Community Planning Association of Southwest Idaho	Meridian	ID	550,359
Delaware Valley RPC	Philadelphia	PA	5,626,318
Denver Regional COG	Denver	CO	2,827,082
East-West Gateway COG	St. Louis	MO	2,571,253
El Paso MPO	El Paso	TX	853,190
Erie RPC	Sandusky	OH	82,976
Fairbanks Metropolitan Area Transportation System	Fairbanks	AK	72,565
Fargo-Moorhead Metropolitan COG	Fargo	ND	187,695
Farmington MPO	Farmington	NM	96,917
Fayetteville Area MPO	Fayetteville	NC	325,323
Flagstaff MPO	Flagstaff	AZ	83,912
Floyd-Rome Urban Transportation Study	Rome	GA	96,317

MPO Name	Central City	State	2010 Population
Fond du Lac Area MPO	Menasha	WI	58,537
Genesee County Metropolitan Planning Commission	Flint	MI	425,788
Goldsboro Urban Area MPO	Goldsboro	NC	91,112
Great Falls Planning and Community Development Department	Great Falls	MT	68,620
Green Bay MPO	Green Bay	WI	216,347
Greensboro Urban Area MPO	Greensboro	NC	370,025
Gulf RPC	Gulfport	MS	308,313
Hattiesburg-Petal-Forrest-Lamar MPO	Hattiesburg	MS	97,272
Hernando County MPO	Brooksville	FL	313,992
Hinesville Area MPO	Hinesville	GA	70,695
Kingsport MTPO	Kingsport	TN	125,260
Kokomo & Howard County Governmental Coordinating Council	Kokomo	IN	68,479
Lancaster County Transportation Coordinating Committee	Lancaster	PA	519,430
Licking County Area Transportation Study	Newark	OH	138,039
Lower Connecticut River Valley MPO	Old Saybrook	CT	175,636
Lubbock MPO	Gettysburg	TX	250,960
Madera County Transportation Commission	Madera	CA	150,865
Madison Area Transportation Planning Board	Madison	WI	401,808
Maui MPO	Wailuku	HI	142,829
McLean County RPC	Bloomington	IL	137,415
Memphis Urban Area MPO	Memphis	TN	1,077,697
Metroplan	Little Rock	AR	621,397
Metropolitan Area Planning Agency	Omaha	NE	753,949
Metropolitan Council	St. Paul	MN	2,849,557
Metropolitan Transportation Commission	Oakland	CA	7,150,828
Mid-America Regional Council	Kansas City	MO	1,895,535
Midland Area Transportation Study	Midland	MI	90,645
Mid-Ohio RPC	Columbus	OH	1,426,183
Morgantown Monongalia MPO	Morgantown	WV	96,183
Nashville Area MPO	Nashville	TN	1,382,526
North Central Texas COG	Arlington	TX	6,417,630
North Jersey Transportation Planning Authority	Newark	NJ	6,579,801
Northeastern Indiana Regional Coordinating Council	Ft. Wayne	IN	333,752
Northwest Arkansas RPC	Springdale	AR	424,404
Northwest Indiana RPC	Portage	IN	771,648

MPO Name	Central City	State	2010 Population
Oahu MPO	Honolulu	HI	952,502
Ocala - Marion County TPO	Ocala	FL	331,558
Okaloosa-Walton TPO	Pensacola	FL	214,967
Polk County TPO	Bartow	FL	602,278
Portland Area Comprehensive Transportation System	Portland	OR	1,499,844
Puget Sound Regional Council	Seattle	WA	3,690,866
Regional Transportation Commission of Washoe County	Reno	NV	412,326
Richmond Area MPO	Richmond	VA	934,060
Roanoke Valley MPO	Roanoke	VA	227,507
Rogue Valley MPO	Central Point	OR	167,859
Salisbury-Wicomico MPO	Salisbury	MD	76,494
Santa Fe MPO	Santa Fe	NM	116,386
South Central Regional COG	North Haven	CT	569,816
South Jersey TPO	Vineland	NJ	594,419
Southeastern Connecticut COG	Norwich	CT	256,139
Southern California Association of Governments	Los Angeles	CA	18,051,203
Southern New Hampshire Planning Commission	Manchester	NH	261,258
Southwest Michigan Planning Commission	Benton Harbor	MI	127,004
Springfield Area Transportation Study	Springfield	IL	169,319
St. Lucie TPO	Fort Pierce	FL	277,097
State Planning Council	Providence	RI	1,052,527
Sumter Urban Area Transportation Study	Sumter	SC	85,635
Sun Corridor MPO	Casa Grande	AZ	108,061
Texarkana MPO	Texarkana	TX	94,278
Tri-Lakes MPO	Hot Springs	AR	90,507
Tyler Area MPO	Beckley	TX	199,597
Valdosta-Lowndes MPO	Valdosta	GA	79,176
Watertown-Jefferson County Transportation Council	Watertown	NY	66,322
Wichita Area MPO	Wichita	KS	518,985
Winchester-Frederick County MPO	Front Royal	VA	78,440
Winston-Salem Urban Area MPO	Winston-Salem	NC	397,772
York Area MPO	York	PA	434,962

Public Involvement Resources

FHWA Publications and Training from Other Organizations	
Publications and Training	
Community Connections Innovation Handbook	https://www.fhwa.dot.gov/planning/community_connections/handbook/
Developing and Advancing Effective Public Involvement and Environmental Justice Strategies for Rural and Small Communities	https://www.fhwa.dot.gov/environment/environmental_justice/publications/effective_strategies/index.cfm
Environmental Justice Reference Guide	https://www.fhwa.dot.gov/environment/environmental_justice/publications/reference_guide_2015/fhwahep15035..pdf
How to Engage Low-Literacy and Limited-English-Proficiency Populations in Transportation Decision Making	http://www.fhwa.dot.gov/planning/publications/low_limited/index.cfm
National Highway Institute Fundamentals of Environmental Justice Web Based Training #142074	https://www.nhi.fhwa.dot.gov/course-search?tab=0&sf=0&course_no=142074
National Transit Institute - Advanced Environmental Justice Training Workshop	http://www.ntionline.com/advanced-level-environmental-justice-workshop/
National Transit Institute – Introduction to Environmental Justice	http://www.ntionline.com/environmental-justice/
Public Involvement Techniques for Transportation Decision Making	http://www.fhwa.dot.gov/planning/public_involvement/publications/pi_techniques/index.cfm
U.S. DOT	
FHWA Bicycle and Pedestrian Program	https://www.fhwa.dot.gov/environment/bicycle_pedestrian/
FHWA Environmental Justice Web page	www.fhwa.dot.gov/environment/environmental_justice/overview/index.cfm
FHWA Every Day Counts Virtual Public Involvement Web page	www.fhwa.dot.gov/innovation/everydaycounts/edc_5/virtual_public_involvement.cfm
FHWA Public Involvement Web page	www.fhwa.dot.gov/planning/public_involvement/

FHWA Publications and Training from Other Organizations	
FHWA Public Involvement Statutes, Regulations and Executive Orders	www.fhwa.dot.gov/planning/public_involvement/orders/
FHWA Scenario Planning and Visualization Web page	www.fhwa.dot.gov/planning/scenario_and_visualization/
FHWA/FTA Transportation Capacity Building Public Engagement Web page	https://planning.dot.gov/focus_publicEngage.asp
FTA Public Involvement Web page	www.transit.dot.gov/regulations-and-guidance/environmental-programs/public-involvement
US DOT Every Place Counts Leadership Academy, Transportation Toolkit	https://www.transportation.gov/leadershipacademy
Other Organizations	
American Association of State Highway and Transportation Officials Center for Environmental Excellence, Environmental Justice	www.environment.transportation.org
American Planning Association	www.planning.org
Association of Metropolitan Planning Organizations Public Involvement Working Group	www.ampo.org
International Association for Public Participation (IAP2)	www.iap2.org
Pew Research Center on Internet and Technology	www.pewinternet.org
Transportation Research Board (TRB) Committee on Public Involvement (ADA-60)	https://sites.google.com/site/trbcommitteeada60
TRB Standing Committee on Environmental Justice in Transportation (ADD50)	https://sites.google.com/site/trbcommitteeadd50/

FHWA Resources in Development (2019)

Environmental Justice Analysis Course (NHI) – This 2-day instructor-led course will build on an existing web-based course on the Fundamentals of Environmental Justice (EJ). It will provide intermediate-level training on practical tools, approaches, and "how-to" process of conducting an EJ analyses during transportation planning and project-development.

Public Involvement in Transportation Decision Making Course (NHI) – This free, web-based course will provide an overview of requirements, tools, and techniques for involving the public (including EJ populations) in transportation planning, programming and project development.

Addressing Changing Demographics in Environment Justice Analysis, State of the Practice Report – This study will provide information on changing demographics in the U.S. and discuss implications for transportation practitioners as it relates to identifying EJ populations and determining adverse effects and disproportionately high and adverse impacts. The research will highlight national demographic trends, effects of demographic changes on travel demand in EJ communities, and best practices for addressing the transportation needs of EJ populations based on an understanding of the current pattern and rate of demographic change.

Improved Techniques for Public Participation Video Case Studies – The objective of this research is to develop of a series of videos featuring case studies about innovative techniques and technologies in public involvement, as well as a how-to guide to provide information to transportation agencies seeking to improve the outcomes of their public participation process.

Meaningful Public Involvement in Transportation Decision Making, New Case Studies – This research effort will produce 10 or more new case studies to demonstrate how meaningful public involvement of environmental justice (EJ) populations in transportation decision making can help support accelerated project delivery. The case studies will highlight strategies and notable practices for addressing the challenges and barriers to meaningfully involving EJ populations during transportation planning, project development and NEPA, design, right-of-way, construction, and operations and maintenance.

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