



Harnessing the Public Purse for Good

Defining Equity in the Context of Federal Infrastructure Funding

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Executive Summary

The federal government maintains a key role in supporting state and local governments with funds for infrastructure investment, including for projects that improve transportation, increase access to broadband, ameliorate water quality, and reduce housing costs. Federal infrastructure investments are distributed either through competitive grants—meaning awarded through the discretion of federal agencies, mediated through points-based judging—or formula-based awards—meaning distributed based on predetermined criteria, such as population size. The Biden Administration has argued it will prioritize efforts to advance equitable outcomes in distributing funds through channels including the 2021 Infrastructure Investment and Jobs Act (IIJA), or Bipartisan Infrastructure Law. This new federal focus follows a long history of national infrastructure funding mechanisms failing to promote social and/or racial equity. Scholars have demonstrated that:

- Competitive grants tend to favor jurisdictions with bureaucratic capacity, which is associated with higher local resident incomes and larger local government sizes (Axelrod et al. 2022; Collins and Gerber 2006; Hall 2008a; Hall 2008b; Lowe et al. 2016).
- The algorithms used to distribute many formula-based funds have not been updated for decades, meaning they may not be advancing the goals of said programs in the context of changing demographics (Jaroscak 2021).
- Local and state governments have considerable discretion over the projects for which they apply for competitive grants and the projects that they fund using formula dollars. They have often leveraged this discretion to reinforce inequities, such as by depriving Black and Brown communities of adequate access to clean water and by building highways through

neighborhoods where people of color predominate-- generating significant displacement, air, and noise pollution (Archer 2020; Clark et al. 2017; Rosenlieb et al. 2018).

These findings raise concerns about the use of federal infrastructure funds. The degree to which they further inequities is dependent on what we mean by *inequity*. In this document, we explore a variety of definitions for inequity, noting that it can mean *difference* (closest in meaning to inequality); *unrepresentativeness* (meaning outcomes do not reflect differences in the composition of affected people); and *unfairness* (meaning outcomes do not reflect need). Equity, too, can also be defined in terms of *procedure* (are decisions about outcomes made fairly); *distribution* (do outcomes reflect the population); and *space* (are outcomes fairly distributed across space). In this infrastructure context, achieving equity depends on whether investments improve communities (meaning, they have positive externalities such as economic development), or whether they degrade them (producing negative externalities such as air pollution).

Ensuring that future federal infrastructure funding mechanisms both eliminate past inequities and advance equity across a variety of domains requires new research to understand the way funds are distributed. To help advance the goals of the PERC Initiative and with the support of Melville Charitable Trust, Urban Institute is assessing the major grants funded by IJJA and the US Department of Urban of Housing and Urban Development (HUD) in FY2022 to answer whether programs are likely to support increased equitable outcomes—or reinforce harms. This literature review serves as a motivator for this research, which will ultimately encompass an online, interactive data tool and a report summarizing our findings.

This review summarizes federal funding disbursement, defines equity in the context of federal investments, and outlines how these equity measures will be operationalized as part of a broader research project. We break down how federal funds such as those disbursed through IJJA and from HUD reach state and local governments, differentiating between competitive and formula grant programs. Then, building off extant literature, we describe how we define equity for this work in the context of federal grantmaking—specifically in terms of procedural, distributional, and spatial equity—before applying the relevant measures of equity to our research plan. Finally, this review is accompanied by an “Externalities Table” (appendix A) that specifies potential positive and negative externalities associated with different infrastructure project types with the goal of identifying how they may influence the equity of program and project outcomes.

Table of Contents

Introduction.....	4
Infrastructure Investment and Compounded Inequities	5
How Does the Federal Government Invest in Infrastructure?	6
Competitive Grant Awards.....	6
Formula Grant Awards.....	7
The Roles of States and Local Governments in Influencing Grant Distribution.....	9
Measuring Equity	9
Conceptualizing Equity	10
Achieving Equity	11
Measuring Equity in Grant Distribution through PERC	14
Programs Supported by HUD.....	14
Programs Supported by IIJA	15
Notes	16
Appendix A. Table of Project-Related Externalities.....	18
References	28

Introduction

Ideally, infrastructure links all people to the resources they need to live a full life. It connects people to education and jobs, ensures access to quality homes, carries clean water, and provides parks to promote community health. Historically, however, race and class have determined who is harmed from infrastructure’s construction, who has access to it, and who benefits from it. The completion of urban renewal and highway projects in cities through the United States, for example, was associated with the razing of entire communities, intensifying racial and economic segregation, and now exposing communities of color to higher levels of air pollution than wealthier, predominantly white neighborhoods. Similarly, contaminated water in aging, lead pipes of older homes harms children of color at higher rates than white children. Black communities, finally, receive the brunt of flood damage from storms due to overwhelmed sewer systems and inadequate flood protections. Such inequitable conditions result in distressing disparities in health, poverty, and overall life outcomes. Today, the choices public agencies make about public investments in infrastructure have the potential to reinforce—or reverse—these inequities.

The federal government has recently expanded investment in infrastructure, including through the 2021 Infrastructure Investment and Jobs Act (IIJA) and annual spending for the Department of Housing and Urban Development (HUD). The distribution of dollars for safer roads, cleaner air and water, and affordable housing will have equity implications that are critical to understand to prevent exacerbating current disparities. We aim to explore the equity implications of federal infrastructure investments by evaluating the distribution of funds from IIJA and HUD. We consider equity in terms of difference, unrepresentativeness, and unfairness. By providing new insight into how infrastructure funds are being distributed, our work responds directly to the administration’s pledge to “allocat[e] federal resources to advance fairness and opportunity.”¹

This document summarizes federal funding disbursement, defines equity in the context of federal investments, and outlines how these equity measures will be operationalized as part of a broader research project. We break down how federal funds such as those disbursed through IIJA and from HUD reach state and local governments, differentiating between competitive and formula grant programs. Then, building off extant literature, we describe how we define equity for this work in the context of federal grantmaking, specifically in terms of procedural, distributional, and spatial equity. Finally, we apply the relevant measures of equity to our research plan. This document is accompanied by an “Externalities Table” (appendix A), which specifies potential positive and negative externalities associated with different project types with the goal of identifying how they may influence the equity of program and project outcomes. We will use this table to inform our evaluation of the impact of new projects on different communities nationwide, planned for the next step of this research. The project is an element of the Partnership for Equitable and Resilient Communities (PERC) initiative and funded by Melville Charitable Trust.

We define infrastructure here broadly, incorporating not only projects supported through grant programs funded by IIJA (state and local governments—plus local public agencies—are slated to receive

up to \$984 billion over the five fiscal years between 2022 and 2026),² but also housing investments funded through HUD. Though they represent a significant portion of the federal budget, we do not evaluate programs designed for individuals (such as Social Security and Medicaid) or corporations (such as investment tax breaks), nor do we consider programs whose primary recipients are federal agencies, such as the US military.³

Infrastructure Investment and Compounded Inequities

Large federal investments in the 20th century such as the New Deal policies of the 1930s and the Great Society policies of the 1960s funded housing production, brought better water, energy, and roadway infrastructure, and introduced new programs for public transportation. The intended benefits of the new federal investments, however, were not felt by all. In several ways, communities of color and those in poverty were broadly excluded. They continue to experience harm from the planning and implementation of these efforts.

Housing investments, for example, became a symbol of the American dream in the 20th century but excluded people of color in practice. The housing programs designed to promote homeownership as part of the New Deal intensified racial and economic segregation and contributed to growing the racial wealth gap (Faber 2020). Race was a major factor determining who was qualified for and received investments for housing. Between 1934 and 1968, 98 percent of home loans distributed by the Federal Housing Administration went to white Americans.⁴

Expanded networks for transportation made possible through investments funded by the Federal-Aid Highway Act of 1956 enhanced the connectivity of people and services across the country through the construction of the Interstate Highway System. But program implementers at the local and state levels intentionally targeted Black communities for clearance and removal to make room for massive new roadways—on which white people disproportionately drove. Of the numerous harms, new highways rerouted vehicles to drive dangerously close to homes and places of work, overly burdening residents with air pollution. These harms continue today; people of color are systematically exposed to more nearby traffic than white people (Rosenlieb et al. 2018). People of color experience 37 percent higher exposure to transportation-related pollutants than white people (Clark et al. 2017). Over time, higher rates of exposure to pollution from emissions produces negative health outcomes—including greater risk for birth defects and disparate asthma rates by race (Archer 2020; Gray et al. 2014; Samuels and Freemark 2022).

Unfortunately, inequitable public investment remains a feature of recent federal initiatives. Over the past decade, researchers have identified distributional inequity in federal public education spending (Allegretto et al. 2022; Spurrier et al. 2021), COVID-19 relief funds (Buxbaum and Rak 2021), disaster recovery (Muñoz and Tate 2016), and infrastructure investments (Hansen and Hammer 2022; Lowe et al. 2016)—meaning funds are disproportionately allocated to people who are white and people with higher incomes. Even recent efforts by the federal government to rectify historical inequity through

Federal Equity Action Plans fall short of addressing system-level strategies to improve equitable outcomes (Balu et al. 2023).

When effective, federal infrastructure investments have the potential to improve peoples' lives (Blackburn et al. 2022). Federal programs funded by IIJA and from HUD have the potential to reinforce existing inequities or potentially reverse in funding distribution and downstream program outcomes (Huang and Taylor 2019). Many IIJA programs are new, or have received significantly higher levels of funding than in past years; as such, no research has yet identified how, exactly, these funds are being distributed. Our research seeks to assess if federal programs distribute funding equitably to ensure that people of color and families with low incomes benefit as much—or more—as their peers.

How Does the Federal Government Invest in Infrastructure?

Federal funds for infrastructure are distributed through two primary means. Competitive, or discretionary, grants are awarded through a competitive process by executive departments after a request for proposals that invites applicants to submit ideas that meet federal priorities. Formula grants are awarded to eligible entities based on a funding formula established by the US Congress, often based on population and other local characteristics. The primary recipients of federal infrastructure funds are states, tribal governments, and general-purpose localities (like cities and counties), but many funds are distributed to individual projects, private entities, and governmental agencies, depending on the program.⁵

Competitive Grant Awards

Although a large share of IIJA funds will be distributed to states and localities in the form of formula grants (see below), much of the law's funds will be allocated to projects through competitive processes.⁶ The Department of Transportation (DOT) Secretary will distribute more than \$100 billion in competitive funds.⁷ Through competitive grant programs, governmental bodies, public agencies, and occasionally non-profit and for-profit entities can apply for federal grants, typically announced through a request for proposals. These requests are called Notices of Funding Opportunity (NOFO) at DOT, Notices of Funding Availability (NOFA) at HUD, and Funding Opportunity Announcements (FOA) at the US Department of Energy (DOE). Requests describe program goals and rules for fund use, as well as the criteria by which the administering agency will use to decide how to distribute funds. Once received, applications are evaluated based on merit by a team of reviewers from the awarding agency. The application review process generally consists of four steps: An initial screening to ensure a complete application, a programmatic review and assessment of the application's substance, a financial review of the proposed budget, and the award decision and announcement. In the post-award phase, agencies distribute grants, after which awardees implement them, report about them, and finally the agency closes them out.⁸ Agencies will monitor grant distribution, in part through a White House Equitable Data Working Group.⁹

A wide range of departments and agencies are responsible for administering the pool of IIJA funds. DOT is the largest grant allocator, with the support of several of its agencies, including the Federal Transit Administration (FTA), the Federal Highway Administration (FHWA), the Federal Railroad Administration (FRA), the Maritime Administration, the Federal Aviation Administration (FAA), and the National Highway Traffic Safety Administration (NHTSA). Other agencies that will distribute funds authorized by the law include the Department of Agriculture, the Department of Commerce, DOE, the Department of the Interior, and the Environmental Protection Agency (EPA).¹⁰

These agencies, among others, will be working to manage IIJA's over 350 programs, more than 100 of which will distribute more than \$1 billion over the next five years (about 40 of these are competitive programs). These programs will fund a wide variety of projects aimed at improving American infrastructure. Several of the most notable of these grants are administered by DOT, such as the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) competitive grant program. RAISE grants are disbursed to an array of critical freight and passenger transportation projects. The Infrastructure for Rebuilding America (INFRA) program has similar aims, with a focus on nationally and regionally significant multimodal freight and highway projects.¹¹ Most of IIJA's competitive programs, however, are targeted at specific infrastructure needs. Some examples include the Bridge Investment Program (BIP), which is focused on repairing existing rail, road, and bike and pedestrian bridges, and the Buses and Bus Facilities Program, which will support local, state, and transit authority efforts to purchase or modernize buses, improve bus facilities, and support workforce development.¹²

HUD distributes some funds through competitive programs on an annual basis. These programs are administered by a number of offices within the department. Some recent examples of competitive grant opportunities offered by HUD include Continuum of Care Homelessness Assistance Grants and the Comprehensive Housing Counseling Grant Program.¹³

Formula Grant Awards

Formula grants are distributed via pre-determined formulas to states, federally recognized tribal recipients, local governments, and local agencies. The formulas are typically established in the authorizing legislation and vary by program, reflecting a variety of relevant metrics such as population distribution and program-specific issues (such as the number of highways miles in a state). Once distributed, recipients generally hold decisionmaking power over how to spend the funds, as long as projects meet federal grant guidelines defined by the law and agency rules.¹⁴ In many cases, states redistribute federal formula funds to units of local government or public agencies and combine them with other state- or locally generated revenues to fund investments.

IIJA sets aside a significant amount of funds for formula programs over the next five years. A number of these programs are administered by FTA, including the Urbanized Area Formula Grants and the Rural Area Formula Grants, which will support transit systems and transportation-related planning in urban and rural areas, respectively.¹⁵ Highway-specific formula grants are administered by FHWA, including National Electric Vehicle Infrastructure, the Appalachian Development Highway System, and the Bridge Formula Program.¹⁶ Other formula programs that are funded by IIJA include the Department

of Commerce's Broadband, Equity, Access, and Deployment (BEAD) program and DOE's Weatherization Assistance Program (WAP).¹⁷

HUD administers several formula programs focused on housing and community development each year. In total, the agency oversees six formula programs distributing more than \$1 billion annually, with three offices within HUD responsible for administering them. The Office of Housing administers Project-Based Rental Assistance and funds for Housing for the Elderly; the Office of Public and Indian Housing is responsible for Tenant-Based Rental Assistance and the Public Housing Fund; and the Office of Community Planning and Development administers the Community Development Fund (which includes the Community Development Block Grant, or CDBG, program) and the HOME Investment Partnerships Program.¹⁸

Congress rarely alters the formulas it uses to distribute funds through its large programs. Even so, there are examples of disagreement about how to design the most effective formulas. In the early 2000s, for example, governors from California, Florida, New York, and Texas formed a coalition of "donor states" referred to as such due to their disproportionate contributions to the federal highway trust fund relative to what they received in federal highway aid. This coalition, named the State Highway Alliance for Real Equity successfully lobbied to bring formula-based aid for federal highways more proportionate to state contributions to the highway trust fund (Gamkhar and Ali 2007).

BLOCK GRANT AWARDS

Block grants are formula programs by which the federal government allocates funding to state and local governments to assist them in addressing broad purposes; this style of funding provides local actors significant control over how dollars are used compared to categorical grants (CRS 2022). Block grants, which became common in the 1970s, are designed to decentralize decisionmaking about federal spending and prioritize the preferences of localities and states over those of policymakers in Washington.

The first block grant program was HUD's CDBG, established in 1974. CDBG's history and programmatic policies are indicative of the federal approach in general. The program's goal was to improve "relations between the federal government and units of general local government" (Richardson 2007: 48), replacing the widely criticized approach of the urban renewal programs that preceded CDBG and that often resulted in resident displacement. Instead, CDBG funds are distributed directly to local and state governments to allow them to prioritize projects related to housing, public facilities, services, and economic development (Collins and Gerber 2008). HUD rules require projects to benefit residents with low or moderate incomes, prevent or eliminate slums or blight, or meet urgent community needs. Other examples of block grant programs include the Surface Transportation Block Grants distributed by FHWA and the Energy Efficiency and Conservation Block Grant Program administered by the DOE.

Despite their improvement from past approaches, the distribution of block grants is imperfect. The CDBG formula, for example, has been found to become less effective over time given changing populations, but Congress has not introduced any formal proposals to rewrite the formula in recent years (Jaroscak 2021).

The Roles of States and Local Governments in Influencing Grant Distribution

State and local governments control most investment decisions for infrastructure projects in their jurisdictions. They prioritize which projects or which types of programs to support—within federal guidance—and then allocate funds to meet those priorities. When it comes to formula dollars, they make these allocations directly. When it comes to competitive funds, they are responsible for applying for federal grants. The federal government rarely makes any specific plans itself, rather relying on subnational government units, and their public officials, to plan.

It is therefore important to consider the characteristics of the governmental entities applying for and receiving funding. Is funding by formula and competitive grants being allocated equitably? Or, do certain programs distribute funding to jurisdictions and for types of projects in ways that deepen disparities along race and class lines?

As a start, recent studies have examined whether certain types of jurisdictions are more likely than others to receive federal competitive dollars. Some scholars find that municipalities with higher capacity—as defined by total agency employees and operating budgets—are more capable of applying for and receiving grants by developing more compelling proposals (Lowe et al. 2016). Others identify a positive correlation between such measures of local capacity and their total federal grants received per capita, as well as the quantity of federal awards received from federal grant programs, including the CBDG program (Collins and Gerber 2006; Hall 2008a).

Strong intergovernmental relationships may also influence the ability of local governments to successfully win federal grants (Bickers and Stein 2004; Lowe et al. 2016). At the regional level, localities that can leverage strong regional economic organizations are more likely to be able to make the case for federal funds (Hall 2008b). Some researchers have found that connections such as partisan alignment between federal administrations and state governors lead to increased funds for programs, such as those serving unhoused populations (Lee 2021).

Finally, the capacity of nongovernmental entities within certain geographies is sometimes associated with increased granting of federal funds. Collaboration among local business leaders (Alpert et al. 2006; Weir et al. 2009) and civic capacity, which can be measured by the presence of nonprofit or advocacy organizations in an area (Lowe et al. 2016), are each associated with the capacity to attract grant funding.

Measuring Equity

Our work seeks to measure the distributional equity of infrastructure funding from the federal government. In this section, we review how extant literature operationalizes equity considerations in the federal funding landscape. First, we detail how to conceptualize equity broadly and in two different forms. Then, we detail three different ways equity can be achieved: procedural equity, distributional equity, and spatial equity.

Conceptualizing Equity

Equity is “the state, quality, or ideal of being just, impartial and fair” (Keleher 2014: 5). Equity ensures each person and group receives a response that is in line with their needs. Achieving equity entails a response that matches the variation in need resulting from historical injustices and compounded disadvantage. Variations in need develop from a history of systems, practices, and ideas to exclude and neglect the needs of people with certain identities and lived experiences—commonly falling along lines of race/ethnicity, class, and gender.

To be considered equal, something must be equally available to and accessible by all parties, or evenly and consistently distributed. Social inequality refers to the unequal distribution of opportunities, benefits, and power experienced by individuals, within groups, or within groups in a society and its ties to social identities. In the context of community development, Li et al. (2022: 2) note that “equality means that everyone receives the same public service, which can lead to more harmonious social relationships, but may not meet individual needs.” Yet equality misses the opportunity to respond to variations in need and can sustain disparities where the needs of certain people remain unmet or continue to experience harm.

Equity, on the other hand, moves from equal access and/or distribution of some resource or phenomenon to tailored access and distribution to fully meet peoples’ needs. Equity—fairness—goes beyond equality, or sameness. For instance, Arias et al. (2017: 110) defines equity—in opposition to equality—as “fairness in outcomes across race, ethnicity, class, and other status.” In the realm of public policy, this focus on outcomes highlights how a certain policy or administrative decisions impact people differently based on their context, identity, and set of lived experiences. To assess the equity of something is to seek to understand how some phenomenon has varying impact on specific groups of people—while acknowledging the possibility that various approaches may be necessary to meet different peoples’ needs.

Racial equity can be defined as “a state in which life outcomes are no longer predictable by race” (The Ferguson Commission 2015). The process of achieving racial equity requires eliminating racial disparities and improving outcomes for everyone through reparative systemic change (PolicyLink 2021). As noted, scholars have demonstrated myriad racial disparities in public infrastructure quality and investments. For instance, one study identified that between 2016 and 2019, drinking water systems that consistently violated the Safe Drinking Water Act were 40 percent more likely to occur in communities of color (Fedinick, Taylor & Roberts 2019). Largely attributed to racial segregation, people of color are more likely to live with underdeveloped and underfunded water systems that increase risk and the incidence of contaminations. Such contamination has been linked to adverse health effects, including cancer and developmental delays.

Economic equity may assess relative access to employment and advancement opportunities, investment, and wealth-building opportunities, as well as labor protections and class stratification. Numerous studies examine the realities of poverty and economic insecurity sharing roots in inequities in education, employment, credit and debt, and wealth (Brown & Robinson 2016; Gould 2020). For

example, access to education strongly influences access to opportunities for upward mobility and economic security. School districts in high-poverty communities, however, continue to be funded at inequitably lower rates per child than low-poverty communities (Edbuild 2019; Allegretto, Garcia & Weiss 2022). The current system creates a financial mismatch because funding is heavily dependent on local dollars raised proportionate to the amount of wealth in a community. Schools in high-poverty communities often lack the resources to adequately meet the needs of students and families, while school in low-poverty communities hold an abundance of resources for students. Such disparate access to resources, along with other factors, creates equity implications for opportunities in higher education and employment that contribute to disparities by socioeconomic class.

Inequity, whether in terms of race or economics, can be defined in a variety of ways:

- **Difference:** Something is unequal to something else (this is most closely related to equality).
- **Unrepresentativeness:** The support that is provided does not match the relative weight of different constituent groups in some way.
- **Unfairness:** Variations in need—sometimes caused by historical trends—are being unaddressed by variations in support.

We use these varieties of definitions of inequity throughout our research.

Achieving Equity

In this section, we outline three specific understandings of how to achieve equity central to this project—procedural equity, distributional equity, and spatial equity—before highlighting key methods for assessing equity derived from the literature. In table 1, we define the key characteristics of the major types of equity we evaluate. We then examine each type of equity in detail below.

TABLE 1

Defining Types of Equity Measures

Equity Measure Name	Definition in the Context of Grant Funding
Procedural equity	Ease of access for local applicants to respond to federal grantmaking processes. One question worth evaluating is the degree to which, for example, people of color participate in planning processes.
Distributional equity	Fair distribution of benefits and burdens across all segments of a community, prioritizing those with highest need. Highest need can be determined based on indicators such as race, socioeconomic status, health, and the environment.
Spatial equity	Fair distribution of benefits and burdens across geography. This is a mechanism to measure levels of access to resources based on where they are located.

Additional Reading: <https://www.urban.org/research/publication/pathways-equity>

PROCEDURAL EQUITY

Procedural equity can be understood as equity in *process* (Stokan et al. 2022). In the context of federal funding, evaluating for procedural equity is to study how decisionmakers involved in grant programs choose to release funds. For competitive grant programs, this could include reviewing how funding opportunities are announced, what the application process involves for applicant entities, what application review processes include, and who is making choices—while investigating how different applicants may or may not have fair access to and capabilities for participating in these processes.

Several studies assess procedural equity by examining whether certain entities are more able to participate in funding processes than others. These capacity components are perhaps better captured by terms like “access equity,” which Stokan et al. (2022) use in place of procedural equity. The characteristics of governmental entities applying for funding may impact equitable processes. Municipal administrative capacity (Axelrod et al. 2022; Collins et al. 2016), political alignment between federal administrations and state governors (Lee 2021), and the amount of representation at the local level advocating for or otherwise promoting equitable grantmaking (Ashley 2014; Nicholson-Crotty et al. 2011) all impact where grant funds end up. The capacity of a given entity to navigate the processes and requirements for securing funding—including the time and effort to complete applications—brings direct equity implications (Axelrod et al. 2022). The landscape of institutions, including non-profit organizations (NPOs), connected to a given funding stream or within a specific jurisdiction also impacts distributional equity. NPOs directly impact service distribution by creating the impression that governments do not need to invest where NPOs are working, and by establishing additional resource levels including through matching funding, and/or by engaging in patronage politics (Cheng et al. 2022).

Beyond the Urban Institute’s contributions in measuring equity as part of this project, the larger PERC Initiative, supported by a separate evaluation team from Urban, is focused on improving the procedural equity of grant distribution by working with stakeholders in four program partner cities. This element of the project is outside the scope of the work described in this paper.

DISTRIBUTIONAL EQUITY

If procedural equity is defined as fairness in the process of how grant funds are made available, “distributional equity focuses on the outcome of that process” (Ashley, 2014: 4). Distributional equity measures seek to evaluate where funding goes and what the distribution of funds reflect. These characteristics may include specific geographic, racial, economic, environmental, or administrative capacity-related attributes of grant recipients—which may be governments, government agencies, institutions, programs, or organizations. Although spatial equity (discussed below) specifically examines physical boundaries of funded or unfunded areas in relation to each other, evaluating distributional equity may also include higher-level analyses of geographic characteristics. For example, Ashley’s (2014) study of foundation grant making in the US South defines “distributive equity” as rural areas receiving a proportionate share of resources—according to any standard, be it need, merit, or representation—as urban areas.

Toutkoushian and Michael (2007) present two contending perspectives for understanding distributional equity. Under horizontal equity, districts with similar characteristics receive comparable levels of funding: “equal treatment of equals.” A vertical equity standard, meanwhile, calls for districts with higher costs to receive more funding than their counterparts to compensate, or an “unequal treatment of unequals.” For example, a federal bus infrastructure program following a vertical equity standard might intentionally allocate more funding to applicant municipalities with the fewest number of existing bus stops.

Taken together, the Urban Institute’s PERC research team defines distributional equity as a condition in which programs and policies result in fair distribution of benefits and burdens across all segments of a community, prioritizing those with highest need.

SPATIAL EQUITY

To study distributional equity across geography is to study spatial equity. Some researchers distinguish spatial equity work from broader distributional equity measurements by focusing on the concept of “access” and how geographies and infrastructure contribute to differing experiences for residents and others moving through space. This concept thus aligns with the idea of “equity mapping,” which “combines a focus on equity and spatial accessibility by assessing the spatial equity of public resource distribution” (Kochinsky et al. 2022: 2). For example, Urban's [Spatial Equity Data Tool](#) provides data to assess equity implications of how critical infrastructure and resources are located in relation to people who use and need them.

Factors relevant to spatial equity analyses may include distance between certain key resources by walking, taking public transit, or driving; spatiality of public parks and amenities; or dynamics of government districting and census tracts. Spatial equity can be difficult to attain and must be evaluated within specific contexts. According to Li et al. (2022), for neighborhood infrastructure (public utilities, parks, and facilities), “equal” access for all is often impossible to fully achieve. Equity, however, strives to ensure that certain resources are accessible to those who need greater proximity to them. Do children have access to schools and recreation spaces? Do workers have access to transportation routes to their employment? Do families in residential areas have access to broadband internet services? Potentially, differences result in part from variation in community development through zoning requirements or construction regulations and limitations brought about by physical infrastructure or terrain, such as bodies of water. Within a specific context, it is crucial to question whether infrastructure is distributed “fairly” in a way that centers equity and accounts for current disparities.

The Urban Institute’s PERC research project will examine spatial equity of federal resource distribution by mapping the distribution of federally funded infrastructure projects across the country and evaluating how funds are disbursed based on the characteristics of spatial units, such as census tracts.

Measuring Equity in Grant Distribution through PERC

We will evaluate equity in terms of four major questions related to the universe of large federal infrastructure programs, listed below. We provide a brief overview of our research strategy below each question.

- a. **How do programs fund projects? In other words, what is the mechanism by which grants are distributed?**
 - We will review legislation and agency grant-making documents to summarize what we know about each program's approach to funding.
- b. **How are funds distributed and spread out across places? Are funds more likely to support communities with some characteristics rather than others?**
 - We will catalogue grant funds by state and county, nationwide. We will compare the distribution of funds with the demographic and economic characteristics of those places.
- c. **To what extent do projects produce negative and positive externalities that have equity implications? Are these externalities disproportionately concentrated in communities with some characteristics rather than others?**
 - We will compare project impacts (as identified in our Externalities Table; see appendix A) with project locations, to identify whether some communities are more likely to be exposed to concerning negative outcomes.
- d. **Do funds appropriately match the needs of communities throughout the country, given varying program missions?**
 - We will compare funds distribution with local characteristics reflective of need for investment, identifying whether counties are receiving funds proportionate to what data indicate they necessitate.

By exploring these questions, we intend to assess the distributional and spatial equity of federal infrastructure grant programs. Below, we summarize the general approaches we are taking to analyze a variety of infrastructure programs funding distributed by HUD and the IIJA legislation.

Programs Supported by HUD

HUD's mission is to create strong, sustainable, inclusive communities and quality affordable homes for all.¹⁹ The department operates a variety of programs to increase the supply of housing, support housing stability, create paths for homeownership, invest in community resources and infrastructure, and protect peoples' rights. Each year, HUD receives over \$70 billion to execute its duties through programming and supporting local operations of housing authorities.²⁰

We will conduct an equity assessment on the distribution of HUD's formula and competitive grant dollars to states and localities through programs focused on affordable housing, housing stability, and community development. Major programs planned for analysis include, but are not exclusive to, the Housing Choice Voucher program, CDBG, and Continuum of Care program (CoC). By assessing the

equity of HUD funding, we can better understand whether the communities that demonstrate highest needs based on community conditions related to affordable housing, housing stability, and community development receive HUD funding proportional to those needs.

Understanding distribution: We will collect data on HUD funding obligations from publicly available sources for fiscal year 2022 and following years (based on data availability). We will analyze these data to observe how HUD funding across the select programs was distributed across jurisdictions.

Understanding recipient needs: We will develop a community index using select data sources with indicators to understand the level of housing and economic need across jurisdictions receiving HUD program funds. Such data will include indicators on the demographic composition of recipient localities and conditions related to housing, environment, health, and local economy. Our analysis will ultimately produce a scale identifying the level of need across state and county levels.

Assessing equitable distribution: We will conduct a comparative analysis to identify if communities with high levels of need related to program priorities are receiving proportionate resources through HUD programs. The final product will include multiple comparative maps designed to display the spatial equity of HUD funding relative to need. We may, for example, compare communities in terms of their housing cost burdens and level of support for housing choice vouchers.

Programs Supported by IIJA

IIJA will fund more than a trillion dollars in transportation, water, energy, broadband, and resilience infrastructure over five years, representing one of the largest infusions of federal funding in decades. The Biden Administration prioritizes equity in the way it has framed the funding: one stated goal is “growing the economy sustainably and equitably for decades to come.”²¹

We will conduct an assessment of the distribution of IIJA’s formula and competitive grant dollars to states and localities. Major programs planned for analysis include, but are not exclusive to, DOT’s RAISE and Bridge Investment programs, DOE’s Smart Grid Investment Matching Grant Program, and the Department of Commerce’s State Digital Equity Competitive Grant.

Understanding distribution: We will collect data on IIJA funding distribution from publicly available sources for fiscal year 2022 and the following year (based on data availability). We will focus on programs that will distribute more than \$1 billion over the five-year period of the legislation (about 100 of the 350 total funded programs). For competitive programs, we will spatially map individual awardee project locations and will conduct a neighborhood-level analysis of the characteristics of census tracts receiving funding, compared against those that do not. For formula programs, we will analyze the equity of formula distributions to states and counties. Our analysis will show how IIJA funding among multiple programs was distributed across localities in the US at the state and county levels.

Understanding recipient needs and assessing equitable distribution: We will leverage similar approaches as those described in the HUD section above.

Notes

- ¹ Executive Order On Advancing Racial Equity and Support for Underserved Communities Through the Federal Government. January 20, 2021. White House. <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/>
- ² Nikhita Airi, “Understanding How Infrastructure Bill Dollars Affect your Community,” Urban Institute, September 2022, <https://www.urban.org/sites/default/files/2022-09/Understanding%20How%20Infrastructure%20Bill%20Dollars%20Affect%20Your%20Community.pdf>.
- ³ “How much has the U.S. government spent this year?,” updated February 2023, FiscalData.Treasury.Gov, <https://fiscaldata.treasury.gov/americas-finance-guide/federal-spending/>
- ⁴ Sam Fullwood III, “The United States’ History of Segregated Housing Continues to Limit Affordable Housing,” Center for American Progress, December 15, 2016, <https://www.americanprogress.org/article/the-united-states-history-of-segregated-housing-continues-to-limit-affordable-housing/>
- ⁵ “How much has the U.S. government spent this year?,” updated February 2023, FiscalData.Treasury.Gov, <https://fiscaldata.treasury.gov/americas-finance-guide/federal-spending/>
- ⁶ “Infrastructure Investment and Jobs Act (IIJA) Implementation Resources,” Government Finance Officers Association, accessed February 27, 2023, <https://www.gfoa.org/the-infrastructure-investment-and-jobs-act-iija-was>.
- ⁷ “Bipartisan Infrastructure Law,” Federal Transit Administration, June 7, 2022, <https://www.transit.dot.gov/BIL>.
- ⁸ “4 Types of Grant Funding,” eCivis, accessed February 27, 2023, https://cdn2.hubspot.net/hubfs/68523/docs/Resource_Library_Slate/Four_Types_of_Grant_Funding.pdf?t=1478460699437; “Grants 101,” Grants.gov, accessed February 28, 2023, <https://www.grants.gov/web/grants/learn-grants/grants-101.html>.
- ⁹ The Release of the Equitable Data Working Group Report. April 22, 2022. White House. <https://www.whitehouse.gov/ostp/news-updates/2022/04/22/the-release-of-the-equitable-data-working-group-report/>
- ¹⁰ “Infrastructure Investment and Jobs Act (IIJA)”, Clark Hill, accessed February 27, 2023, <https://www.clarkhill.com/infrastructure-investment-and-jobs-act-iija/>.
- ¹¹ “Biden-Harris Administration Announces \$1.5 Billion Available through the 2023 RAISE Grant Program,” U.S. Department of Transportation, December 15, 2022, <https://www.transportation.gov/RAISEgrants>; “The INFRA Grants Program,” U.S. Department of Transportation, October 19, 2022, <https://www.transportation.gov/grants/infra-grants-program>.
- ¹² “Bridge Investment Program,” U.S. Department of Transportation Federal Highway Administration, January 31, 2023, <https://www.fhwa.dot.gov/bridge/bip/>; “Grants for Buses and Bus Facilities Program,” U.S. Department of Transportation Federal Transit Administration, accessed March 13, 2023, <https://www.transit.dot.gov/bus-program>.
- ¹³ “Fiscal Year 2022/2023 Funding Opportunities,” U.S. Department of Housing and Urban Development, accessed March 13, 2023, <https://www.hud.gov/grants>.
- ¹⁴ “Overview of Funding and Financing at USDOT,” U.S. Department of Transportation, July 23, 2021, <https://www.transportation.gov/rural/toolkit/overview-funding-and-financing-usdot>.
- ¹⁵ “Bipartisan Infrastructure Law,” Federal Transit Administration, June 7, 2022, <https://www.transit.dot.gov/BIL>.
- ¹⁶ “Bipartisan Infrastructure Law: Funding,” U.S. Department of Transportation Federal Highway Administration, February 14, 2023, <https://www.fhwa.dot.gov/bipartisan-infrastructure-law/funding.cfm>; “Bipartisan Infrastructure Law,” U.S. Department of Transportation NHTSA, accessed March 13, 2023, <https://www.nhtsa.gov/bipartisan-infrastructure-law>.

- ¹⁷ “NTIA’s Role in Implementing the Broadband Provisions of the 2021 Infrastructure Investment and Jobs Act,” Broadband USA, accessed March 13, 2023, <https://broadbandusa.ntia.doc.gov/news/latest-news/ntias-role-implementing-broadband-provisions-2021-infrastructure-investment-and>; “About the Weatherization Assistance Program,” Office of State and Community Energy Programs, accessed March 13, 2023, <https://www.energy.gov/scep/wap/about-weatherization-assistance-program>.
- ¹⁸ “Budget Authority by Program,” U.S. Office of Housing and Urban Development, 2022, https://www.hud.gov/sites/dfiles/CFO/documents/2_2022CJ_FY22BATable.pdf.
- ¹⁹ “Mission,” U.S. Department of Housing and Urban Development, accessed March 13, 2023, <https://www.hud.gov/about/mission>.
- ²⁰ Hud Public Affairs, “Statement by HUD Secretary Fudge on the President’s Fiscal Year 2023 Budget,” U.S. Department of Housing and Urban Development, https://www.hud.gov/press/press_releases_media_advisories/HUD_No_22_055.
- ²¹ “UPDATED FACT SHEET: Bipartisan Infrastructure Investment and Jobs Act,” The White House, August 02, 2021, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/02/updated-fact-sheet-bipartisan-infrastructure-investment-and-jobs-act>

Appendix A. Table of Project-Related Externalities

An externality is an outcome, effect, or consequence of some project, whether positive or negative. While positive externalities are the planned or unplanned beneficial outcomes of some effort, a negative externality is an outcome and/or byproduct of some phenomena that causes harm (often referred to as a “cost”). In the context of infrastructure work, negative externalities are undesired byproducts of construction and development, such as the air pollution and traffic noise nuisances associated with highway development. Each project funded by the various programs under IJJA reviewed in this study is likely to generate some level of negative externalities that affect the community where work is taking place—as well as its surrounding region. Although some of these effects are inevitable (e.g., short-term traffic increases following lane closures for repairs), research offers evidence-based measures to mitigate the harms of more longitudinal negative externalities (e.g., increased air pollution impacting childhood respiratory health) in development work.

Understanding negative externality considerations in infrastructure development is particularly important when seeking to assess racial equity dynamics across a project or community. Communities with a disproportionate share of low-income and/or non-white residents disproportionately face negative externalities such as air pollution, water contamination, and the division of neighborhoods due to highway or major roadway construction.

Other scholars have developed recommendations to address negative infrastructure externalities. For example, governments of various jurisdictions can set new regulations related to air pollutions and gas emissions and encourage the use of public transportation and hybrid and electric vehicle use (Sofia et al. 2020). Alternatively, action has been taken to address the ways highway construction has broken apart some communities; the construction of cap parks in some cities reconnects communities divided by freeway construction, reduces air pollution, and increases urban green space (Houston and Zuñiga 2019). While this is a start, more action needs to be taken on city, county, and state levels to mitigate infrastructure project-related harms, and especially those that disproportionately affect communities of color.

The following table details a select number of externalities associated with the various infrastructure projects involved in IJJA- and HUD-funded projects, including increases in road capacity, bridge construction, bus infrastructure, freight rail, and transit-oriented development. These externalities are split into those affecting the surrounding community and those affecting the broader region. We have also elaborated on how the impacts of infrastructure projects are tied to racial equity.

Project type	Potential positive externalities	Potential negative externalities	Racial inequity	Sources
Road capacity increase	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Roadways increase accessibility for the surrounding community, potentially contributing to increased property values. <p>Region:</p> <ul style="list-style-type: none"> - Roadways increase scale and interconnectedness of transportation network, potentially increasing economic efficiency and expanding potential areas for development. - Creating new roads to connect cities and communities increases accessibility for residents, making it easier for them to commute to work, for example. - It could also give residents more access to higher paying jobs if they can travel farther places to work. - Local businesses could also attract qualified and hardworking employees from outside the given community. This could improve productivity and the quality of their products/services. 	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Presence of highways/major roadways, particularly with high levels of slow-moving or stopped traffic, produce air pollutants (ultrafine particulates, black carbon, carbon monoxide, etc.). - Children who live near major highways are more likely to develop asthma/wheezing or reduced lung function. - Particulate matter in the air increases cardiac and pulmonary deaths and lung cancer. - When exposed to black carbon (air pollutant), males experienced less sleep compared to females and people of lower SES experienced less sleep compared to people of higher SES. If air pollutants affect sleep health and duration, it appears individuals and communities may be affected differently depending on certain demographics (incl. SES). - Highways/major roadways are loud and often produce significant ambient noise. Continued exposure to loud, unwanted sounds can lead to hearing loss. - Noise interference can threaten healthy sleep and relaxation (e.g., insomnia) or simply cause people to lose concentration. Continued loud noises can also be associated with stress, depression, annoyance. - Highway/major roadway construction typically requires demolishing portions of existing neighborhoods, breaking up neighborhood blocks. This construction often creates a separation between white and black communities, for example. - Adjacency to highways is associated with poor conditions for pedestrians. This can lead to a reduction in foot traffic despite a potentially growing population. - Because of the air and noise pollution impacts of highways, property values near roads can go down. <p>Region:</p> <ul style="list-style-type: none"> - Increased availability of highways shifts modal choice away from transit, walking, and biking and toward car use, which increases carbon emissions. - Availability of highway road capacity increases suburban and exurban development, destroying natural and agricultural land, while diminishing development in central areas. - Could reduce success of local (and small) businesses, especially in rural areas. Constructing new roads improves access to rural areas by larger external firms, which may encourage them to move in and disrupt the local economy. 	Highways have historically been disproportionately built through neighborhoods with more minority (and low-income) residents. These individuals are thus disproportionately affected by air and noise pollution, both of which can lead to health challenges.	Brugge, Durant, and Rioux (2007); Fang et al. (2015); Karas (2015); Levkovich, Rouwendal, and van Marwijk (2016); Matos and Lobo 2023; Welde and Tvetter (2022); Vernez Moudon (2009)

Project type	Potential positive externalities	Potential negative externalities	Racial inequity	Sources
Road design (e.g., streetscapes, repaving)	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Improving road design can prevent accidents (e.g., redesign right-of-way, re-pave, create medians, add street lighting). - Adding bright streetlights leads to a reduction in crashes. - Improved streetscapes designed for pedestrians and cyclists can improve quality of life, increasing willingness to walk and bike through a neighborhood. - Improvements can increase nearby property values and increase customers to surrounding businesses. 	<p>Surrounding community:</p> <ul style="list-style-type: none"> - If streets are in better shape, residents in the community may become more likely to drive than walk or bike. This reduction in exercise could have negative health impacts. - Improved streetscapes could result in increased property values in the surrounding areas, which could displace or increase the costs of living for nearby residents. 	Roads tend to be improved (e.g., repaved) more often and at faster rates in more white, affluent neighborhoods compared to those with more minority residents. Thus, neighborhoods with more minority residents could be disproportionately affected by the issues road improvements aim to fix (e.g., more accidents).	Cain et al. (2014); Duncan (2022); Eves (2009); Jactett and Frith (2013); Raifman and Choma (2022); Sallis (2015)
Bridge	<p>Region:</p> <ul style="list-style-type: none"> - Building more bridges may shorten commutes for residents who previously had to travel on long, less direct routes. - By providing a faster route from point A to point B, bridges may give individuals access to better education or employment. <p>Surrounding community:</p> <ul style="list-style-type: none"> - Bridges with allocated space for pedestrians and bikes also increase the amount of foot and bike traffic in a city by making it easier for bikers and pedestrians to get around. 	<p>Surrounding community:</p> <ul style="list-style-type: none"> - The construction of bridges can cause water pollution and impact or potentially threaten marine ecosystems. - Bridge construction can (like road expansion) require using eminent domain to acquire surrounding parcels. <p>Region:</p> <ul style="list-style-type: none"> - The construction of new bridges for cars can serve as a mechanism to increase highway/road capacity, and produce the negative externalities associated with roadway capacity noted above. 		McCartney et al. (2012); Moore, Berejikian, and Tezak (2013)

Project type	Potential positive externalities	Potential negative externalities	Racial inequity	Sources
Bus infrastructure (e.g., new buses, bus depots, bus stations)	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Better bus infrastructure gives residents the opportunity to travel farther to work if they do not own a car. This could ultimately increase the incomes of residents which would then improve the local economy. - Improved bus infrastructure gives people without cars better access to jobs, educational opportunities, and healthcare services they may not have been able to reach otherwise. <p>Region:</p> <ul style="list-style-type: none"> - Improved bus facilities encourage mode shift away from cars and onto public transit, which can (a) reduce carbon emissions; (b) encourage more infill development rather than suburban/exurban sprawl; (c) support greater investment in existing communities. - Constructing new operations facilities also has the power to strengthen the local economy by creating new jobs. 	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Diesel buses and bus depots emit significant air pollution and that has the potential to encourage health problems. - Construction of new bus operations facilities can also emit various forms of pollution including air, water, noise, and landfill. 	Compared to white people, people of color are less likely to have a personal car on average and therefore may rely more heavily on public transportation including buses.	Forbes et al. 2012; Fu, Ramos, and Axelrod (2022); Jain, Gupta, and Pandey (2016); Stacy et al. (2020)
Freight rail	<p>Surrounding Community:</p> <ul style="list-style-type: none"> - Compared to trucks that would drive along roads near other cars and potentially pedestrians, freight rail is separate from the road and cars/pedestrians. This can reduce exposure to truck-generated air pollution. <p>Region:</p> <ul style="list-style-type: none"> - Freight rail removes trucks from roads, reducing traffic throughout a region. Compared to trucks, which produce significant CO2 and other forms of particulate pollution, freight rail produces significantly lower levels of air pollution. 	<p>Surrounding communities:</p> <ul style="list-style-type: none"> - Construction of freight rail facilities can require large land acquisitions from surrounding areas; low-income residents are more likely to live in such communities. - Though freight rail is less polluting than truck, it can still expose nearby residents to high levels of particulate pollution, causing lung disease. 	Railroads often create a racial divide in communities, separating the more low-income, neighborhoods of color from the economic centers of communities.	Ananat (2011); Mahmudi and Flynn (2006); Pinto et al. (2018)

Project type	Potential positive externalities	Potential negative externalities	Racial inequity	Sources
Passenger rail (urban)	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Urban rail stations can support considerable urban development projects, creating the opportunity to invest in mixed-use, dense neighborhood developments. - Rail stations are associated with increased property values, increasing the value of development. <p>Region:</p> <ul style="list-style-type: none"> - Urban rail has the capacity to reduce traffic congestion because residents of the community are encouraged to ride trains rather than driving their individual vehicles. - Urban rail reduces energy consumption and air pollution, especially if electric. 	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Urban rail stations are associated with increasing property values and higher rents, each of which can be associated with gentrification and displacement. 	Compared to white people, people of color may be less likely to have a personal car and therefore may rely more on public transportation including urban rail.	Ewing et al. (2014); Grass (1992); Hess and Almeida (2007); Tehrani, Wu, and Roberts (2019); Zhu et al. (2022)
Passenger rail (intercity)	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Communities located along the routes of intercity passenger rail systems can also experience economic growth as rail passengers disembark and purchase goods and services in their communities. - Residents living near intercity rail services gain access to travel destinations, improving their quality of life and connections with the rest of the nation. <p>Region:</p> <ul style="list-style-type: none"> - Intercity rail has the capacity to move people between different cities whether for work, education, or to purchase goods and services. - Through connecting people and businesses across cities, intercity rail can integrate separate city/community economies into a larger regional economy. - If intercity rail results in a mode shift away from car or air travel, it can reduce overall carbon emissions. 		Railroads often create a racial divide in communities, separating the more low-income, neighborhoods of color from the economic centers of communities.	Ananat (2011); Kasu and Chi (2019); Sperry, Taylor, and Roach (2013)

Project type	Potential positive externalities	Potential negative externalities	Racial inequity	Sources
Pedestrian and cycling infrastructure (e.g., cycle tracks, sidewalks)	<p>Surrounding community:</p> <ul style="list-style-type: none"> - More opportunities to bike and walk give people more exposure to daylight and fresh air, which can improve physical and mental health. - Encourages people to walk/bike, can lead to many health benefits, including reducing rates of chronic disease. Health benefits also lead to decreased health costs for individuals down the line. - Installing separate bike lanes on roads can reduce the frequency and severity of collisions between cars and bicycles. The location and characteristics of bike lanes impact perceptions of safety. <p>Region:</p> <ul style="list-style-type: none"> - A connected bike and pedestrian network can make it feasible to travel throughout a region without a car in a fashion that is impossible if sidewalks or bike paths abruptly end. 	<p>Region:</p> <ul style="list-style-type: none"> - Could provide incentives for people to travel by car if the government is investing in subsidies specifically directed at them, rather than other types of projects, like those that support transit, pedestrian, or cycling facilities. 	<p>White, more affluent neighborhoods may be more likely to have parks and outdoor communal spaces. Thus, there could be a greater need for the construction of promenades for pedestrians in neighborhoods with more minority residents.</p>	<p>Lee and Buchner (2008); Márquez, Cantillo, and Arellana (2021); Marshall and Ferenchak (2019); van den Berg (2005)</p>
Vehicle emissions reduction or electrification	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Reduces air particulate and noise pollution and the detrimental health impacts associated with it. <p>Region:</p> <ul style="list-style-type: none"> - Reduces carbon dioxide emissions. 	<p>Region:</p> <ul style="list-style-type: none"> - Could provide incentives for people to travel by car if the government is investing in subsidies specifically directed at them, rather than other types of projects, like those that support transit, pedestrian, or cycling facilities. 	<p>More individuals of color and those earning lower incomes tend to live near highways and large, busy roads compared to white people. Thus, minorities are likely more affected by the air pollution from highways and roads. Vehicle electrification is vitally important for these communities and would greatly reduce the amount of air pollution to which they are exposed.</p>	<p>Peters et al. (2020)</p>

Project type	Potential positive externalities	Potential negative externalities	Racial inequity	Sources
Ports	<p>Surrounding Community:</p> <ul style="list-style-type: none"> - Ports can be associated with the creation of local jobs. <p>Region:</p> <ul style="list-style-type: none"> - Ports promote economic development in a region by facilitating the purchasing, trade, and movement of goods and services. - If integrated into a multi-modal freight system, ports can help facilitate more efficient and less carbon-intensive transportation options. 	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Ports are often associated with significant traffic of large trucks (e.g., dieselized containers), which are transporting goods to and from ships at the port. This can increase air pollution in the surrounding community. 	Residents living near port facilities have historically been more likely to be people of color and people with low incomes.	Kozawa, Fruin, and Winer (2009); Rodrigue and Notteboom (2022)
Airports	<p>Region:</p> <ul style="list-style-type: none"> - Airports increase tourism in a region, thus promoting regional economic development. - Expanded airport facilities can offer new travel options for local residents, increasing quality of life. 	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Airports produce significant noise pollution, with planes landing and taking off all through the day and night. This can cause significant disruptions to the residents living nearby, especially during the night. - When planes at airports spend time idling on the runway, it produces air pollution in the surrounding community that affects the health of nearby residents. - Airports also significantly increase traffic in the nearby communities, which can cause inconveniences like increased commute times for local residents. 	-	Doerr et al. (2020); Sadr et al. (2014); Schlenker and Walker (2016)
New affordable housing	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Affordable housing has been variously associated with a small but statistically significant increase in property values, or no effect on property values at all. - As residential stability is improved by affordable housing, schools can experience improved educational outcomes because of reduced student mobility. - This residential stability also increases spending and produces a larger labor market, which can support local economies. <p>Region:</p> <ul style="list-style-type: none"> - Availability of affordable housing can reduce overall housing costs in a metropolitan area. 	<p>Surrounding community:</p> <ul style="list-style-type: none"> - The construction of affordable housing developments can create disruptions for pedestrian and car traffic in communities as well as produce temporary air and noise pollution. 	Families of color are more likely to be extremely low-income than white families, thus making them more likely to rely on affordable housing in their communities.	Jain, Gupta, and Pandey (2016); Lubell, Crain, and Cohen (2007); National Low Income Housing Coalition (2019); Stacy and Davis (2022)

Project type	Potential positive externalities	Potential negative externalities	Racial inequity	Sources
Homelessness response and related services	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Approaches to reduce homelessness can benefit the surrounding community by reducing the number of people living on the streets. - While severe homelessness may discourage people from visiting a city or community, reductions in homelessness caused by various services could encourage tourism and boost local economies. <p>Region:</p> <ul style="list-style-type: none"> - Services responding to homelessness can improve regional economies because homelessness is expensive. For example, services that aim to reduce homelessness may reduce the amount of taxes people in the region have to pay for fund the medical and social services for people who are homeless. 		Compared to white people, people of color tend to be more affected by homelessness. Thus, local and regional policies to reduce homelessness would provide significant benefits to minority individuals and families.	Burt (2017); Olivet et al. (2021); Seo, Choi, and Shin (2021)
Transit-oriented development	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Residents living near transit stations are more likely to walk and take public transit as opposed to driving personal vehicles. - Walking more (and driving less) can provide personal health benefits for these residents as well as reduced air pollution for all members of the community. - Property values also tend to increase near transit stations, where it is more appealing for people to live. This can increase tax revenue of local municipalities as property taxes increase. <p>Region:</p> <ul style="list-style-type: none"> - Transit-oriented development can boost regional economies because it increases the number of commuters travelling through the area and purchasing goods and services. - TOD can also increase the use of non-automobile transportation modes, which can reduce environmental pollutants. 	<p>Region:</p> <ul style="list-style-type: none"> - By increasing property values and drawing new residents, transit-oriented development can contribute to residential segregation, gentrification, and the displacement of low-income families and families of color. 	Public transit development and revitalization is more common in white communities while communities mainly comprised of people of color often lack those developments. Thus, white people may receive more benefits from transit-oriented development than non-white individuals do.	Marshall and Ferenchak (2019); Purifoye (2020); Tehrani, Wu, and Roberts (2019)

Project type	Potential positive externalities	Potential negative externalities	Racial inequity	Sources
Broadband access	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Broadband access expands opportunities (see below) for small businesses and community organizations, especially in rural areas - Enhances productivity (e.g., stable wifi, wireless credit card transactions, online planning and bookkeeping) - Expands reach of businesses (e.g., videoconference with businesses/customers outside of the local community, create/improve website design, enhance digital advertising presence such as through customer attraction on social media) - Opportunity for residents to save money on goods and services by purchasing them online from vendors outside their local, geographic community <p>Region:</p> <ul style="list-style-type: none"> - Broadband access throughout a region can better connect small businesses with other businesses and organizations - Greater connectivity between businesses and organizations across a region could lead to more socially responsible outcomes (e.g., a group of small businesses across a region come together in philanthropy or events for the broader community) 		<p>People of color tend to have lower access to stable and reliable internet compared to their white counterparts. This "digital divide" was exacerbated during the COVID-19 pandemic, when most schools and businesses transitioned online.</p>	<p>Chen et al. (2022); Pant and Hambly Odame (2017)</p>

Project type	Potential positive externalities	Potential negative externalities	Racial inequity	Sources
Electricity transmission infrastructure	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Provides more stable, reliable electricity to households and businesses in the local community 	<p>Surrounding community:</p> <ul style="list-style-type: none"> - Adverse environmental impacts (e.g., pollution during construction, potential wildfire risk if overhead lines cut through trees) - Health risks (e.g., pollution during construction, exposure to electromagnetic fields can increase childhood cancer risks) - Increase of road closures/traffic during construction and maintenance - Visual intrusion of electric transmission lines into rural/suburban landscapes <p>Region:</p> <ul style="list-style-type: none"> - Electricity transmission infrastructure (e.g., overhead lines) can worsen an area's "amenity" and property values 	<p>People of color (incl. Black, Hispanic, and Native American households) have significantly higher energy burdens than their white counterparts. Communities of color are more likely to be affected by power outages and their consequences (e.g., loss of food, medical challenges due to lack of electricity).</p>	<p>Devine-Wright (2015); Tobiasson and Jamasb (2016); Welton (2022)</p>

Source: The authors based on a review of the scholarship.

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