

**U.S. INFRASTRUCTURE'S CONTRIBUTION TO ECONOMIC DISPARITY AND  
FAIRNESS: AN OVERVIEW**

Statement of

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before the

**Select Committee on Economic Disparity and Fairness in Growth  
United States House of Representatives**

**CONNECTING AMERICANS TO PROSPERITY: HOW  
INFRASTRUCTURE CAN BOLSTER INCLUSIVE ECONOMIC  
GROWTH**

February 9, 2022

\*The views expressed are my own and should not be attributed to the Brookings Institution or its Metro Program, the Institution's leadership and Trustees, or its funders. I thank my Brookings colleagues, Andre Perry, Anthony Barr, and Adie Tomer for their review.

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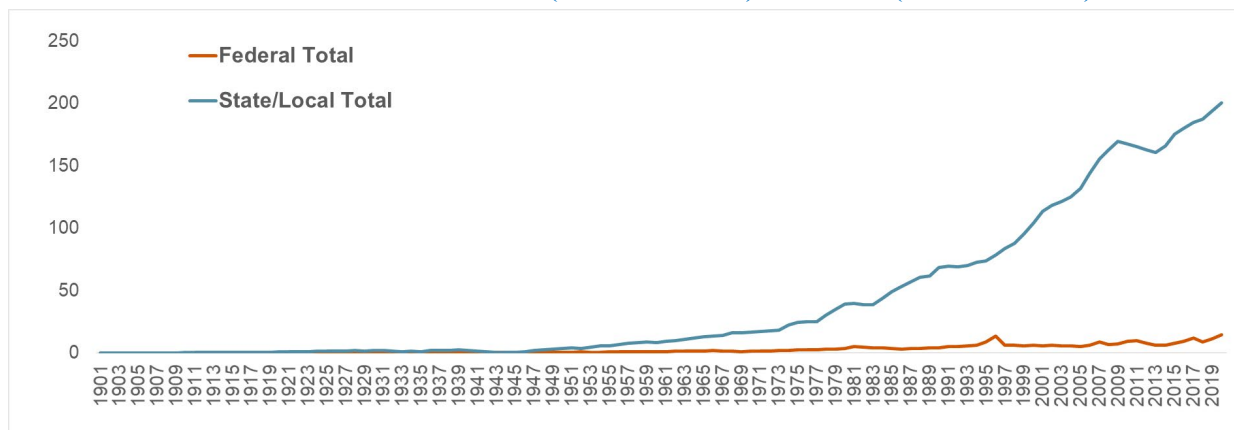
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The greatness of U.S. physical infrastructure is matched by its massive contribution to our nation’s economic growth. Public-sector investments in infrastructure and related fixed assets have been both a contributor to gross domestic product on their own, as well as the vehicle from which other economic activity locally, between communities and states, and globally flourishes. Physical infrastructure—defined as the design, construction, and maintenance of the hardware, technologies, services, and institutions that deliver water, energy, telecommunications, and related physical lifelines to settlements; remove solid waste, wastewater, and stormwater from them; and allow for mobility between settlements—is a fundamental mark of human civilization. Its reach is vast and importance for health, wellbeing, and economic productivity is critical. The United States has contributed massive quantities and revolutions in the history of global infrastructure, particularly after groundbreaking federal interventions such as the 1933 Public Works Administration, the 1956 Federal Highway Act, the 2009 American Recovery and Reinvestment Act and, recently, the 2021 Infrastructure Investment and Jobs Act (IIJA).

Infrastructure is a major source of economic activity on its own, with massive investments by national, state, and local government in the modern era.<sup>1</sup> According to the most recent annual tabulations from the US Bureau of Economic Analysis (that is, pre-IIJA), public infrastructure investments total almost \$250 billion (Figure 1).

**FIGURE 1. GOVERNMENT INVESTMENTS (FIXED ASSETS): 1901-2020 (US\$ BILLIONS)**

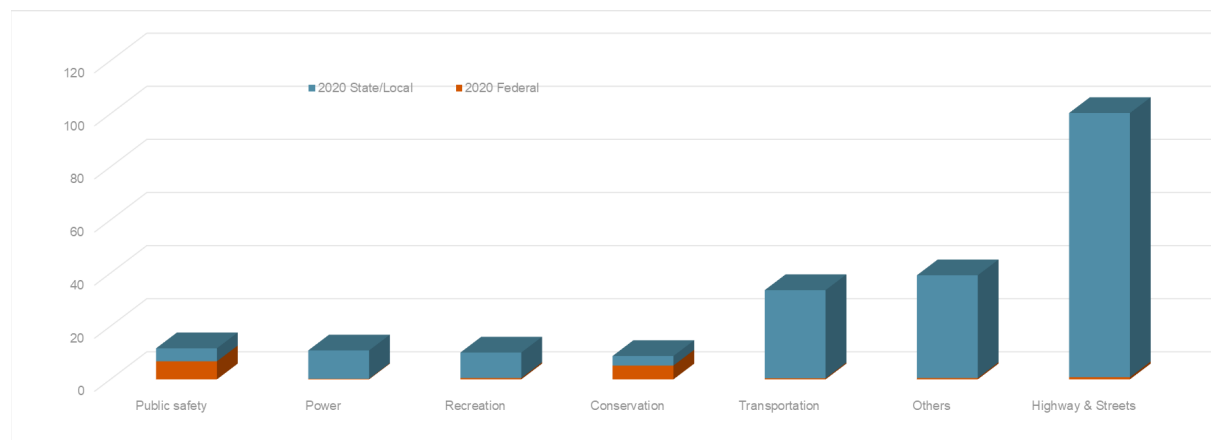


Source: Author tabulations of US Bureau of Economic Analysis. Investment in Government Fixed Assets

These expenditures provide a range of services and sectors, the most expansive by cost being the network of interstate and local highways and roads that connect our communities. This sector alone consumed over \$90 billion a year at last count (Figure 2).

<sup>1</sup> Mallett, W. J. (2018). Infrastructure Investment and the Federal Government. Congressional Research Service, November 19: <https://crsreports.congress.gov/product/pdf/IF/IF10592>; Weinstock, L. R. (2021). Infrastructure and the Economy. Congressional Research Service, November 29: <https://crsreports.congress.gov/product/pdf/R/R46826>

**FIGURE 2. GOVERNMENT INVESTMENTS BY SECTOR: 2020 (US\$ BILLIONS)**



Source: Author tabulations of US Bureau of Economic Analysis. Investment in Government Fixed Assets

Yet, all these expenditures do not match the needs of both a growing population and the maintenance of past investments. Additional investment—last estimated by the American Society of Civil Engineers at \$2.59 trillion over 10 years—is needed. Filling this gap could produce even more economic output from this just these sectors. Further, infrastructure’s full contribution to national economic growth and productivity, however, must also account for the billions of dollars in employment and activity that it enables. Several studies illuminate what infrastructure investments can provide regarding both additional employment in the short term, as well as their multiplying effect for the overall economy. For example, a 2015 Standard and Poor’s study estimated that a \$1.3 billion investment would add 29,000 jobs in the short term and would add \$2.0 billion to real economic growth.<sup>2</sup> These projections are mirrored by other scholars including those conducted by other scholars for the full range of infrastructure and for specific systems.<sup>3</sup>

Ultimately, the name says it all: infrastructure is a foundation for employment, business development, and trade expansion in addition to providing needed and basic human services and access to opportunities—ostensibly for all segments of a community. Yet, masked therein are persistent historical disparities in the process of designing and building infrastructure, in its upkeep and maintenance, and in its outcomes.<sup>4</sup>

I offer five points for the Committee’s consideration of how infrastructure contributes to universal economic prosperity.

<sup>2</sup> Bovino, B. (2015). “U.S. Infrastructure Investment: A Chance To Reap More Than We Sow.” Standard & Poor’s:

<https://img.equipmentworld.com/files/base/randallreilly/all/migrated-files/eqw/2014/05/sp-usinfrastructure201405.pdf>

<sup>3</sup> FHWA. (2011). “Employment Impacts of Highway Infrastructure Investment”: <https://www.fhwa.dot.gov/policy/otps/pubs/impacts/>; Escobari, M., C. Gandhi, S. Strauss. (2021). “How federal infrastructure investment can put America to work.” Brookings Institution:

<https://www.brookings.edu/research/how-federal-infrastructure-investment-can-put-america-to-work/>; Kane, J. “Biden needs to create an infrastructure talent pipeline, not just more jobs.” Brookings Institution: <https://www.brookings.edu/blog/the-avenue/2021/01/29/biden-needs-to-create-an-infrastructure-talent-pipeline-not-just-more-jobs/>; Bivens, J. (2017). The Potential Macroeconomic Benefits from Increasing Infrastructure Investment. Economic Policy Institute, July: <https://www.epi.org/publication/the-potential-macroeconomic-benefits-from-increasing-infrastructure-investment/>

<sup>4</sup> Dalton, P. A. (2008). Physical Infrastructure: Challenges and Investment Options for the Nation's Infrastructure. Government Accountability Office, May 8: <https://www.gao.gov/assets/gao-08-763t.pdf>

*First, the evidence is overwhelming and conclusive that there have been disparities in the quantity and quality of economic benefits that infrastructure provides across communities of different income and wealth and in the distribution of their burdens.* Past and current infrastructure has frequently been designed without the fair participation of all stakeholders and has resulted, often in visible ways, in economic disparities for the communities in which the infrastructure is placed. Differences in the benefits and access often parallel the disparities in environmental, health, and social burdens and costs that these communities must bear that lead to further uneven economic opportunities. Displacing families, blighting local businesses, exposing households to pollution, and limiting access to transport, clean water and other services have been a shameful part of our nation’s infrastructure history. In short, not every community and every household within each community has benefited equally from infrastructure’s economic promise.

This is particularly true of under resourced communities and those with concentrations of low-income households. Examples abound. Interstate 10’s construction cleaved the predominately Black Fifth Ward in Houston and Tremé in New Orleans in the early 1960s.<sup>5</sup> Maps of solid waste sites overlay consistently on low-income neighborhoods, such as the Warren County, North Carolina waste site that launched the environmental justice movement in the 1980s.<sup>6</sup> Deteriorating water systems hit the most vulnerable communities, causing irreparable harms such as those witnessed in Flint, Michigan five years ago. Hurricane Katrina’s storm surge overwhelmed levees, disproportionately devastating lower-income neighborhoods in the Greater New Orleans area. System failures in Texas’ electrical grid contributed to deaths in low-income communities from 2021’s Winter Storm Uri. More recently, rural and urban low-income communities have been the last to benefit from broadband installation.<sup>7</sup>

On the whole, then, low-income households and the communities in which they live have received the least benefit and the most burden from extent infrastructure—a pattern that correlates with race, geography, predominant local industry, and other factors.<sup>8</sup> The disparities do not derive only from the direct physical impacts of projects, however. Indirect devaluation of the properties surrounding infrastructure, long-term health effects from poor infrastructure maintenance, limitations on local business growth and channels for employment from effected communities create secondary disparities as well.<sup>9</sup>

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<sup>5</sup> Dillon, L. and B. Poston. (2021). Freeways force out residents in communities of color — again. Los Angeles Times: November 11: <https://www.latimes.com/projects/us-freeway-highway-expansion-black-latino-communities/>; Burch A. D. S. (2021). One Historic Black Neighborhood’s Stake in the Infrastructure Bill. New York Times, November 20: <https://www.nytimes.com/2021/11/20/us/claiborne-expressway-new-orleans-infrastructure.html>

<sup>6</sup> Chavis, B. and C. Lee (1987). “Toxic Wastes and Race in the United States: A National Report on the Racial and Socio-Economic Characteristics of Communities with Hazardous Waste.” New York: United Church of Christ Commission for Racial Justice: <http://uccfiles.com/pdf/ToxicWastes&Race.pdf>; Skelton, R., and V. Miller. (2016). “The Environmental Justice Movement.” March 17: <https://www.nrdc.org/stories/environmental-justice-movement>

<sup>7</sup> Rachfal, C. L. The Digital Divide: What Is It, Where Is It, and Federal Assistance Programs. Congressional Research Service, March 9: <https://sgp.fas.org/crs/misc/R46613.pdf>

<sup>8</sup> Bullard, R.D. (2000). Dumping in Dixie: Race, Class and Environmental Quality. 3rd ed., Boulder: Westview Press; Bullard, R.D. and G.S. Johnson, eds. (1997). Just Transportation: Dismantling Race and Class Barriers to Mobility. Gabriola Island, BC: New Society Publishers.

<sup>9</sup> Perry, A. M. (2020). Know your price: Valuing Black lives and property in America’s Black cities. Brookings Institution Press.

Yet, the inverse of this acknowledgment is also true: equitable infrastructure produces fair economic growth. The equitable distribution of infrastructure's benefits and burdens is economically sound policy, in addition to its being socially demanded and legally ethical.<sup>10</sup> Fair processes and outcomes improve any intervention that informs local economies.<sup>11</sup> Inclusively developed infrastructure projects and maintenance that consider the fair distribution of effects—benefits and burdens—across populations produces economic gains higher than infrastructure that will only benefit a portion of the community. They also reduce community opposition during a project's development and potential legal action after. Perceptions of community trust, agency, information access, and procedural fairness can elicit stronger support or opposition than the purported benefits of a project alone.<sup>12</sup>

Unfortunately, the scholarly community cannot fully quantify the full effects of unfair infrastructure decisions and operations from the past. There has been insufficient post-project evaluation and systemic study of these disparities beyond specific historical cases.<sup>13</sup> This obfuscates much of the negative impact from past and currently used infrastructure and erases the counterfactual case of the social and economic outcomes if another project with the same technical scope but an alternate delivery process and approach had been constructed in its stead. I encourage this committee to support additional research that attempts to synthesize unfair processes and inequitable outcomes across the various infrastructure systems to determine the full extent of inhibited economic growth in local and national economies as well as disparities across groups.

The preponderance of individual cases, however, have produced such a clear pattern that infrastructure practices have evolved over the last century to include environmental review, community engagement requirements, health and safety standards, property acquisition statutes, and household relocation that integrate fairness, albeit modestly. Contemporary analytical methods for assessing the costs and benefits of infrastructure projects also reflect these realizations and engineering professional standards have changed because of them.<sup>14</sup> Today, repairing past harms and considering disparity in future infrastructure planning and projects need not be a radical departure from current business for most local public works and

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<sup>10</sup> Junod, A. N., Martín, C., Marx, R., & Rogin, A. (2021). Equitable Investments in Resilience. Urban Institute: <https://www.urban.org/research/publication/equitable-investments-resilience>

<sup>11</sup> Berube, A. and J. Irons. (2016). Measuring “inclusive economies” in metropolitan America. Brookings Institution: <https://www.brookings.edu/blog/the-avenue/2016/05/12/measuring-inclusive-economies-in-metropolitan-america/>

<sup>12</sup> Haggerty, J. H., M N. Haggerty, K. Roemer, and J. Rose. (2018). “Planning for the Local Impacts of Coal Facility Closure: Emerging Strategies in the US West.” *Resources Policy* 57:69–80; van Putten, I. E., C. Cvitanovic, E. Fulton, J. Lacey, and R. Kelly. (2018). “The Emergence of Social License Necessitates Reforms in Environmental Regulation.” *Ecology and Society* 23 (3):24; Zhang, A., T. G. Measham, and K. Moffat. (2018). “Preconditions for Social License: The Importance of Information in Initial Engagement.” *Journal of Cleaner Production* 172:1559–66.

<sup>13</sup> Heck, S. (2021). Greening the color line: Historicizing water infrastructure redevelopment and environmental justice in the St. Louis metropolitan region. *Journal of Environmental Policy & Planning*, 23(5), 565-580.

<sup>14</sup> Livermore, M. A., & Revesz, R. L. (2020). Reviving Rationality: Saving Cost-Benefit Analysis for the Sake of the Environment and Our Health. Oxford University Press, USA; Murthy, A. N., & Mohle, H. (2001). Transportation engineering basics. American Society of Civil Engineers; Jones, S. H., & Armanios, D. E. (2020). Methodological framework and feasibility study to assess social equity impacts of the built environment. *Journal of Construction Engineering and Management*, 146(11), 05020016.

engineering departments.<sup>15</sup> Federal investments and program rules should follow the trend of contemporary practice.

***Second, disparities manifest across all infrastructure systems and types.*** Gaps in infrastructure access, upkeep, and benefits have been found in all infrastructure sectors as they have been built and maintained over time. The American Society of Civil Engineers, in which I am a member, have categorized our nation's infrastructure into 18 different categories. Each of these have their own histories, nuanced with local cases, of unfair development, access, and effects. Indeed, the stories of intentional discrimination, purposeful exclusion, regressive funding rules, and negligence litter our country's highways, power lines, and water pipes.

However, there are other physical interventions into our communities, such as wetlands, forests, and related natural ecosystems that serve as barriers to hazards and foundations for local and indigenous economies, or recreational spaces and greenways in urbanized areas. There are also expansive climate adaptation investments that must be developed in the near future along with cybersecurity infrastructure, both for our nation's defense. I remind you, too that homes and households are at the end of virtually each of these system's maps. Housing, the final node in most infrastructure systems, is a critical infrastructure. Because it is so severely segregated by income and wealth, though, it also defines the distribution of economic outcomes of all other infrastructure systems. I encourage this Committee to consider this broader range of physical infrastructure in their assessment over infrastructure's economic value, as each sector produces different economic outcomes and manifests inequities variably.

***Third, infrastructure disparities take several forms.*** There are many definitions of fairness in relation to physical infrastructure, but my work has benefited from considering six fundamental dimensions:<sup>16</sup>

(1) understanding the local histories and experiences of past infrastructure effects to prioritize the projects, places, and people deserving immediate repair. Current fairness or opportunities for future fairness are predicated on acknowledging past unfairness. The aggregation of past infrastructure that resulted in physical disparities—or, more frequently, economic ones—may persist today. The places and people that have suffered these experiences should be prioritized for positive improvements and maintenance.

(2) monitoring the current demographic makeup of an infrastructure system's users, beneficiaries, and effected stakeholders. The identification of demographic and behavioral groups in the general service area

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<sup>15</sup> Organization of Economic Cooperation and Development. (2017). Getting Infrastructure Right: The Ten Key Governance Challenges and Policy Options. <https://www.oecd.org/gov/getting-infrastructure-right.pdf>; Bivens, J. (2017). How to improve infrastructure project selection: Account for positive regional spillovers, environmental impacts, and job creation benefits. Economic Policy Institute, October 18: <https://www.epi.org/publication/how-to-improve-infrastructure-project-selection-account-for-positive-regional-spillovers-environmental-impacts-and-job-creation-benefits/>

<sup>16</sup> Martín, C., & Lewis, J. (2019). The State of Equity Measurement. Urban Institute: <https://www.urban.org/research/publication/state-equity-measurement>

that are of interest to an infrastructure project is an essential step toward measuring differences between them. However, past infrastructure typically assesses overall served populations and rarely quantifies individual groups, particularly by income and wealth.

(3) involving all stakeholders within all levels of an infrastructure project's development, design, staffing, and management (often called "procedural" equity or fairness). This procedural dimension of equity has to do with the inclusiveness and representativeness of an infrastructure system's or project's administration. Steps for defining the dimension include ensuring that populations from potentially disadvantaged groups are at the table in designing the infrastructure through active community engagement, but also that they are proportionally represented or overrepresented in its management, staff, and contractor and consultant pools.

(4) ensuring that the eligibility and access to an infrastructure system are not exclusionary such as through geographic distance or excessive fees. Infrastructure projects such as roads or facilities often generate use requirements or prices that exclude certain individuals, intentionally or unintentionally. The methods and media for targeting and servicing individuals should be scrutinized to ensure that access to positive infrastructure use is inclusive.

(5) tracking differences in service use that indicate underlying economic disparities. Outputs are typically defined as measures of an infrastructure project's progress and completion. Yet, a service may be implemented in a qualitatively different way to one group than another or may not account for ways in which one group needs a qualitatively different type of infrastructure. In either case, this variance may potentially result in differences in completion rates and quality.

(6) measuring disparate impacts between groups across the range of health, social, and financial costs and benefits. Infrastructure projects intend to alter a specific fundamental outcome for their recipients—such as basic water access. Yet, these projects have other outcomes, including effects on individual households' finances and larger community economies. Addressing these dimensions for current and planned infrastructure in statute, program rules, and implementation will contribute to economic fairness.

These dimensions—though potentially named or articulated differently—reflect a broader consensus regarding ways for public interventions on behalf of historically underserved communities and implementing fair investments and physical interventions, such as guidance and recommendations from the current administration.<sup>17</sup> Several states have advanced methods for identifying underserved communities that may

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<sup>17</sup> White House. (2021). "M-21-28 Memorandum for the Heads of Departments and Agencies (re: Interim Implementation Guidance for the Justice40 Initiative. July 20: <https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf>; White House Environmental Justice Advisory Council. (2021). "Final Recommendations: Justice40 Climate and Economic Justice Screening Tool & Executive Order 12898 Revisions." May 21. Accessed August 18, 2021: <https://www.epa.gov/sites/default/files/2021-05/documents/whiteh2.pdf>

also be helpful for your consideration, though these methods are not directly tied to a specific infrastructure or its economic effects.<sup>18</sup>

I encourage the committee to explore how these dimensions are currently integrated into federally funded infrastructure by statutes or program rules versus state or local requirement. For example, even a cursory review of federal community engagement requirements demonstrates a broad range of duration, depth, and technique. Consistent definitions and their application would help underserved communities, but also be more efficient for infrastructure agencies and professionals.

I have presented a range of infrastructure systems and several ways in which each may create exclusive or unfair economic outcomes. Considering fairness across all infrastructure and in all local economies is obviously a technical challenge. *Fortunately, fourth, there are several realized examples of infrastructure plans and projects from which we can draw lessons.* One example documented in my research is the Antelope Valley Redevelopment Project of Lincoln, Nebraska. Completed in 2016, the project braided funding from the Army Corps of Engineers, the US Department of Housing and Urban Development, and the Federal Highway Administration to improve flood control, transportation, and revitalize a low-income community. Local project teams conducted extensive community engagement planning and activities and prioritized historically marginalized populations in project scope and objectives.

Around the same time as that project was advancing, state and local governments performed a range of cross-silo efforts to increase fair infrastructure investments in relation to other community benefits such as: transit access to local health services in Stamford, Connecticut; road safety along the Route 52 corridor in St. Charles Parish, Louisiana; the alignment of housing, transportation, water infrastructure plans with the East Arkansas Planning and Development District; the replacement of stormwater and sewer lines in Frostburg, Maryland in a way that revitalizes the town's historic downtown and enabled new housing and economic growth; and the revision of suburban development codes via the Mid-America Regional Council in Kansas City, Missouri. These projects, supported through past cross-federal efforts like the Partnership for Sustainable Communities are discrete, quiet, and localized, but representative of most infrastructure work.

This committee should review the challenges that these projects have faced about braiding funds and negotiating conflicting program rules. The committee should then apply those observations to reform the statutes and rules that prohibit comprehensive, fair infrastructure governance. Legislative efforts to reduce federal agency siloes and bureaucracies will help yield both the routine and futuristic projects that are needed as well as funding, and the costs of investing in more thoughtful, fair infrastructure could be offset with a more consistent federal framework.

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<sup>18</sup> Luskin Center for Innovation. (2021). Making Justice40 a Reality for Frontline Communities: Lessons from State Approaches to Climate and Clean Energy Investments. UCLA, September: <https://innovation.luskin.ucla.edu/wp-content/uploads/2021/10/luskin-justice40-final-web-1.pdf>



In addition to making the more routine aspects of our nation's infrastructure more efficient, there are also infrastructure "megaprojects" which, though fewer in number, have more room to integrate technological innovations that ensure fair access and shared economic benefits. I hope to see these kinds of combined engineering-social innovations through the funds released in the recent Infrastructure Investment and Jobs Act, such as the Rebuilding American Infrastructure with Sustainability and Equity, National Infrastructure Project Assistance, and the Rural Opportunities to Use Transportation for Economic Success programs among others. Yet, Congress could provide additional resources for multidisciplinary infrastructure research through the nation's research agencies and incentivize pilot programs in the larger infrastructure funding programs that reward socio-technological innovation. I encourage the committee to look at ways in which innovations in fair planning, design, and maintenance of infrastructure can be developed in conjunction with cutting-edge engineering revolutions.

On this point regarding resources, it is critical to note that knowledge resources are a critical partner to financial ones to ensure fair infrastructure. Communities need extensive knowledge sharing in addition to financial resources to take advantage of these opportunities and implement these solutions. ***Consequently, fifth, technical assistance (TA) and capacity building must be provided to rural communities and to underserved urban and suburban ones.***

Examples of model TA efforts can be found in the post-Hurricane Sandy's Rebuild by Design in New York and Louisiana's Strategic Adaptations for Future Environments, both of which received federal funds. Several states have developed their own assistance programs as well, such as California Strategic Growth Council's BOOST program. These engagement and capacity building efforts are as worthy of funding as infrastructure's "hard costs." Local, trusted civil society groups should be harnessed as conduits to residents. Otherwise, the states and localities with extensive preexisting resources for conducting analysis, outreach, and innovation will continue to be more competitive in discretionary federal fund applications and in being able to advocate for state formula allotments.

I urge the Committee to consider resourcing further, consistent, and high-quality technical assistance for underserved communities through all relevant agencies that provide infrastructure funds to state and local government (e.g., Transportation, Commerce, Housing and Community Development, Interior, and Energy and the Environmental Protection Agency, Federal Emergency Management Agency, and Army Corps of Engineers).

Infrastructure fairness must be regional as well as localized and integrating urban and rural communities within regional infrastructure plans as well ensuring that each jurisdiction has the financial and knowledge resources to collaborate effectively will be critical for optimizing each project's economic benefit. Congress could also encourage more regional infrastructure planning through new competitive grant programs as well

incentives in existing program rules could better ensure an efficient but equitable infrastructure that brings regional economies together.

I close by reflecting on recent debates regarding the social and economic effects of physical public works, infrastructure, and other built systems. For example, there have been claims that the Infrastructure Investment and Jobs Act—that is, the “bipartisan infrastructure act”—inscribe a “social agenda” into the wires, concrete, and pipes of our infrastructure. These claims deny the reality of our historical infrastructure’s impact and contradict infrastructure’s essential purpose as a social and economic enabler. Infrastructure *is* social.

Along with my professional training as an architect and civil engineering, I am proud to note my academic background in the history and sociology of technology. To quote technological historian Melvin Kranzberg, “technology is neither good nor bad — nor is it neutral.” Our nation’s infrastructure is no different. By its very definition, physical infrastructure is a public good. In its historical implementation, though, that good can and has been used to benefit only a segment of the public while disproportionately burdening another. Our government at all levels needs to ensure that the rules for building and maintaining our infrastructure are clear and fair for everyone. Federal guidance is needed to set a transparent foundation for all states for future growth, not to keep up a pretense that it was fair in the past.