

A Bottom-Up Infrastructure Strategy for American Renewal

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Executive Summary

As the United States emerges from the pandemic, it is clear that the nation faces a number of major challenges. Most of these challenges predate the pandemic, but COVID-19 has highlighted their urgency. Succinctly put, these six challenges are:

- 1. Economic Recovery from the Pandemic:** The pandemic has created hardship for tens of millions of Americans, mostly those with modest incomes.
- 2. Racial Inequity and Economic Mobility:** Together, the pandemic and the renewed interest in racial injustice have highlighted how persistent racial concerns are and how difficult upward mobility has become for most Americans.
- 3. Geographic Dispersal of Opportunity:** Even as our cities and metropolitan areas prosper, our rural areas are struggling economically, falling further and further behind.
- 4. Global Competitiveness:** The United States is in danger of losing its premiere economic position in the world.
- 5. Digital Transformation:** New technology has opened the nation to new possibilities. But, as the pandemic showed, in critical areas such as schools and medical care, the growing “digital divide” has made it difficult for many Americans, both urban and rural, to benefit from these advances.
- 6. Climate Change:** Climate is the biggest overarching challenge the world faces today and holds the potential for significant population and economic disruption.

One common thread here is the potential of infrastructure investment as a means to address all of these challenges. As Adie Tomer and others at the Brookings Institution have

pointed out¹, each of these challenges has “an inextricable relationship with our physical infrastructure systems.”

After a long period of neglect, it appears likely that the Biden Administration will place great emphasis on infrastructure. Clearly, an infrastructure package is necessary, both as an economic stimulus and to help the U.S. maintain its global competitiveness. But to be effective, a new infrastructure plan must take a new approach.

Too often U.S. infrastructure policy has taken a top-down approach, with the federal government dictating what will be built based on inside-the-Beltway lobbying. But to be effective — and address the nation’s challenges as listed above — a national infrastructure strategy must be responsive to the real structure of the American economy.

The American economy is, in reality, a network of regional and metropolitan economies. Cities and metropolitan areas are the true engines of American prosperity, producing most of the economic output and most of the jobs. These cities and metropolitan areas are economically connected to small towns and rural areas when they are part of the same large region, such as Greater New York, Southern California, and the Texas Triangle. To meet the challenges listed above, the next American infrastructure strategy must include a market-based, bottom-up component that is responsive to the needs on the ground in cities, metros, and regions.

¹ Tomer, Adie, Joseph W. Kane, and Laura Fishbane, “To Fix Our Infrastructure, Washington Needs to Start From Scratch.” Washington, D.C.: Brookings Institution, December 4, 2019. <https://www.brookings.edu/research/to-fix-our-infrastructure-washington-needs-to-start-from-scratch/>



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The Kinder-Cisneros Survey: Trends in Local and Regional Infrastructure Priorities

In late 2020, the Kinder Institute, in collaboration with Henry G. Cisneros, former Secretary of the U.S. Department of Housing and Urban Development, undertook a major survey of infrastructure priorities in 100 metropolitan areas and 134 cities.² Among other things, we asked for:

1. The top five infrastructure priorities, and
2. Infrastructure projects that rose to the top of the priority list because of the COVID-19 pandemic.

Together with other sources, the survey provided the basis for a database of local and regional infrastructure projects. This database includes 1,807 projects across the country — high-priority projects identified by local and regional officials. (The Kinder Institute will soon publish this database online.) This database is not comprehensive by any means. But it is a sizeable sample of projects and provides a clear indication of what local and regional

² The survey covered the central cities in the 100 largest metropolitan areas as defined by the U.S. Census Bureau and other cities that are in the top 100 in population but are not located in the 100 largest metropolitan areas.

leaders have prioritized. The survey revealed five major infrastructure themes:

1. Transportation (including public transit)

Transportation projects (37% of all projects) continue to be the primary building blocks of a national infrastructure strategy and should be given high priority. But federal transportation policy often focuses on the expansion of highways. In particular, *mass transit projects* (21% of transportation projects) are vital to the transportation of essential workers and can help reduce carbon emissions.

2. Public facilities (including health facilities and parks)

Next to transportation, public facilities (33% of all projects) were identified most frequently as the priority infrastructure projects. Investment in public facilities is necessary in older cities and regions with obsolete facilities and in newer regions with rapid population growth — and such investment was proven to be an effective stimulus during the New Deal. Local and regional governments also require major technology upgrades to enhance the delivery of more effective public services. The pandemic especially highlighted the need for health facilities and parks.

3. Water and wastewater

Investment in water and wastewater infrastructure (15.5% of all projects) can help secure clean water for the nation in the long term — but also address emerging issues associated with climate change, including the increasing problem of extreme weather events, whether they involve too much water (storms and floods) or too little (droughts). A half-century ago, the federal government played a critical role in financing water and wastewater facilities; renewing that commitment today would accelerate progress in localities around the nation.

4. Energy (including renewables)

Energy projects (10% of all projects, mostly at the regional level) create opportunities to invest in rural areas and can help close urban/rural disparities in regional employment and economic development. That's because 70% of those projects are located in rural areas. Renewable energy projects make up 53% of the energy projects identified in this study, signaling that local and regional leaders recognize that renewables are both cost-competitive and critical to reducing greenhouse gas emissions.

5. Communications (including broadband)

Even before the pandemic, communications infrastructure (5% of all projects) — mostly broadband projects — were an important priority for local and regional officials. But the coronavirus revealed major gaps in equitable access to communications systems in both rural areas and underserved urban areas. Massive investment in communications will be necessary for education, public safety, medical care, and remote employment — and can help bridge the urban-rural divide.

These themes *must* be integrated into the new infrastructure plan, as they reflect the priorities of America's cities, metropolitan areas, and regions. Doing so can advance three vital national priorities described below.

Three Big Priorities in American Infrastructure

Based on the Kinder/Cisneros survey, we believe a national infrastructure strategy that is responsive to local and regional needs should focus on three major priorities that will help address *all* of the challenges America faces today. These three priorities are:

- **Essential Infrastructure After the Pandemic:** The pandemic has highlighted the need to reinforce overlooked-but-essential pieces of infrastructure, such as **broadband access, emergency response and health facilities, and public transit,**

which serves essential workers. In our survey, 64% of respondents identified broadband as an infrastructure priority, while 55% identified public facilities (mostly health facilities) as a priority as well. An infrastructure plan that prioritizes this essential infrastructure should focus on short-term, back-to-work efforts and emphasize the needs of disadvantaged communities to ensure that recovery from the pandemic is equitable.

- **Climate Resilience:** More than 500 of the 1,807 projects in our survey deal with climate resilience in some way, suggesting this is a major priority for cities and regions. Investment in **public transit** and **renewable energy**, both of which can reduce emissions, and **clean-water facilities**, which can help mitigate the impact of climate change, can help build the nation's resilience in a time of climate change.
- **Urban-Rural Connections:** Though our survey was primarily of cities and metropolitan areas, more than 300 of the 1,807 projects — almost 20% — involve rural areas. Many of these infrastructure projects — including **broadband, energy, and transportation** — can help harness the prosperity of metropolitan centers to enhance economic opportunities in rural areas. A national program to advance rural broadband could be as transformative as the New Deal's rural electrification efforts.

Introduction

After a long period of neglect, it appears likely that the Biden Administration will place great emphasis on infrastructure. Clearly, an infrastructure package is necessary, both as an economic stimulus and to help the U.S. maintain its global competitiveness. But to be effective, a new infrastructure plan must take a new approach.

Too often U.S. infrastructure policy has taken a top-down approach in which the federal government has dictated what will be built based on inside-the-Beltway lobbying. But to be effective — and address the nation's infrastructure challenges — a national infrastructure strategy must be responsive to the true structure of the American economy.

The American economy is, in reality, a network of regional and metropolitan economies. Cities and metropolitan areas are the true engines of American prosperity, producing most of the economic output and most of the jobs. These cities and metropolitan areas are economically connected to small towns and rural areas when they are part of the same region, such as Greater New York, Southern California, and the Texas Triangle. To meet the challenges listed in the executive summary, the next American infrastructure strategy must include a market-based, bottom-up component that is responsive to the needs on the ground in cities, metros, and regions.

The surest way to forge a true infrastructure agenda for the nation is to directly identify the priorities of leaders in metropolitan areas and regions across the nation and include those priorities in the national infrastructure discussion. This report seeks to identify and highlight those priorities using a representative — though by no means comprehensive — database of 1,807 local, metropolitan, and regional infrastructure projects from across the country.

We do not mean to suggest that all of these local projects should be funded by the federal government as part of a massive infrastructure plan. Traditionally, infrastructure has been funded through a wide variety of mechanisms, including local capital sources, state budgets, private capital, and federal departments, and there is no reason to fundamentally change this funding system.

Rather, including the vast knowledge of priorities at local, state, and regional levels can help unleash the power of infrastructure investment in a way that ensures the most impact and increases that investment's multiplier effect. A truly effective national infrastructure strategy must integrate federal priorities with bottom-up information concerning local and regional priorities to maximize economic mobility, growth, environmental, and quality-of-life objectives.

Critical National Challenges and the Role of Infrastructure

As the United States emerges from the pandemic, it is clear the nation faces a number of major challenges — and that infrastructure will play a key role in addressing them. As Adie Tomer and others at the Brookings Institution have pointed out, each of these challenges has “an inextricable relationship with our physical infrastructure systems.”³ Most of these challenges predate the pandemic, however, COVID-19 has highlighted their urgency. Succinctly put, these six challenges are:

1. Economic Recovery from the Pandemic

The pandemic has created hardship for tens of millions of Americans, mostly those with modest incomes — and our nation has also suffered as a result. During the pandemic, the U.S. learned much about the high degree of interdependence among Americans of all races, income levels, and regions — and, unfortunately, lower-income essential workers were placed at great risk during the pandemic. Any infrastructure package must not only focus on economic recovery, but ensure that essential workers are prioritized.

2. Racial Equity and Economic Mobility

Together, the pandemic and the renewed interest in addressing racial injustice have highlighted ongoing concerns about racism and how difficult upward mobility has become for most Americans, especially African Americans. An infrastructure strategy cannot simply reinforce the systemic racism that is reflected in our current infrastructure patterns, especially in large cities. Future infrastructure efforts must seek to reverse systemic racism and ensure equal opportunity for residents of all communities and neighborhoods.

3. Geographic Dispersal of Opportunity

Even as our cities and metropolitan areas prosper, many are left behind — including rural areas, legacy cities, even disadvantaged neighborhoods in prosperous cities and suburbs. It is critical that we rebuild older and declining areas of the country, renew our legacy cities and communities, and provide modern facilities that will enable the participation of all geographical areas in today’s economy.

4. Global Competitiveness

The United States is in danger of losing its premiere economic position in the world — in large part because we are falling behind other nations in critical infrastructure. Only 2.4% of the U.S. gross domestic product is applied to infrastructure, compared to 5% in Europe and 9% in China. To give just one example, high-speed rail systems exist in every part of the industrialized world except for the United States. A national infrastructure strategy must recognize that infrastructure is a critical component in helping American firms and workers compete with their counterparts around the world.

3 Tomer, Adie, Joseph W. Kane, and Laura Fishbane, “To Fix Our Infrastructure, Washington Needs to Start From Scratch.” Washington, D.C.: Brookings Institution, December 4, 2019. <https://www.brookings.edu/research/to-fix-our-infrastructure-washington-needs-to-start-from-scratch/>



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5. Digital Transformation

New technology has opened the nation to new possibilities. But an infrastructure strategy must embrace technological change to transform our cities and communities, not just expand capacity. For example, instead of simply building additional highway lanes, we should also embed congestion management sensors and communication systems into those roadways. At the same time, as the pandemic showed in critical areas such as schools and medical care, the growing “digital divide” has made it difficult for many Americans, in both urban and rural areas, to benefit from these advances. An infrastructure plan must address these inequities as well.

6. Climate Change

Climate change is the biggest overarching challenge the world faces today and holds the potential for significant population and economic disruption. It has large-scale implications for the American economy and will affect the nation’s regions in different ways — for example, increasing the risk of extreme storms along the Eastern Seaboard while at the same time elevating the danger of wildfires on the West Coast. The reality of climate change poses two broad challenges for the infrastructure sector: to build

the facilities needed to lessen the risk of damage from expected climate change effects and to support the adaptation of existing physical systems that exacerbate climate change-induced risks.

All of these national challenges require urgent action — and they all require infrastructure as part of the response. Infrastructure is integral to the basic workings of many dimensions of our society, and as we seek to adapt, modernize, and improve those basic workings, it’s necessary that we also adapt, modernize, and improve our nation’s infrastructure.

The Need for Bottom-Up Thinking

Infrastucture in the United States is funded through a complex mix of local, state, federal, and private sources. But this financing system is characterized by notable impediments, including the following:

- Funding derives from a wide array of uncoordinated sources and methods of raising revenues.
- Local governments have debt and revenue limitations that prevent complete reliance on municipal bonds to build needed infrastructure.
- State governments face budget pressures that restrict infrastructure funding beyond their traditional commitments to roads and state universities.
- The federal government is confronting unprecedented deficits, in part due to the pandemic, thus limiting its ability to play the leading role in infrastructure finance.
- Federal infrastructure spending is assigned to various agencies across several cabinet departments. There is little coordination between them and, therefore, no overarching coordination at the local level, where projects are executed.
- The vast supply of private capital in the U.S. and global markets has been largely inaccessible for public infrastructure projects. Private investments in public-private partnerships are increasing, but these efforts are hampered by different rules in each state, complicated governmental permitting, lack of predictability in diverse public revenue matches, and the political risk of changing requirements as projects are underway.

A new approach is needed. It begins with aligning infrastructure goals set by federal, state, and local authorities through a consultative process. There is precedent for this approach: The current metropolitan planning organization framework, through which local officials operating at a regional level set transportation infrastructure priorities for local, state, and federal transportation funding.

Admittedly, such collaboration would represent a modest first step toward more integrated investments in infrastructure. It would not in and of itself change the current infrastructure silos; it would not change the lack of capital budgeting due to the multitude of diverse funding sources; and it would not change the volume of capital available.

But a framework that included bottom-up, collaborative goal-setting would make the magnitude of infrastructure need much clearer. It would serve as a guide for a federal administration and congressional decision-makers when dealing with specific projects of regional importance. It would highlight the significance of standardized frameworks across the states to incentivize private investment. It could be an important first step, setting the stage for a golden era of American infrastructure and prosperity.

Regional and Metro Structure of Infrastructure Investment

Although infrastructure decisions are made at local, state, and federal levels, the U.S. economy is, in reality, a network of regional and metropolitan economies. Cities and metropolitan areas are the true engines of American prosperity, producing most of the economic output and most of the jobs. These cities and metropolitan areas are economically connected to small towns and rural areas when they are part of the same region, such as Greater New York, Southern California/Southern Nevada, and the Texas Triangle. To be truly effective — and meet the challenges listed above — the next American infrastructure strategy must include a market-based, bottom-up component that is responsive to the needs on the ground in cities, metros, and regions.

Over time, the power of these cities and metropolitan areas has only grown — and despite the hype during the coronavirus pandemic that “cities are over,” there is every reason to expect their power will only continue to increase. For the first time in human history, more of the world’s population now lives in core cities and urban areas than in rural areas. This process is at work on every continent, including, most recently, Africa, which will have the fastest-growing cities in the world over the next decade. The largest urban areas in the world are now megapolis with tens of millions of people.

These massive global trends deliver the clear message that urban areas are the drivers of the world economy. Many are so dominant within their nations that in practical terms they function as city-states within sovereign nations. But they require huge infrastructure investment to serve this function.

For example: While national trade volumes are calculated in national accounts, the volume of trade between the United States and Japan is conducted in large measure between Los Angeles-Long Beach and Tokyo-Yokohama,

utilizing these cities’ respective seaports to send and receive heavy cargos and their high-frequency airports to move people, investment capital, and high-value products.

But this trade relationship would not be able to function without massive infrastructure investment — docks, cranes, container facilities, dredged waterways, flow management systems, shore-to-ship communications, workforce supports, and capital investments. More specifically, this infrastructure must be integrated into a larger system of rail beds and roadways. Perhaps the most critical component of this system is the Alameda Corridor, a grade-separated rail line that connects the port to the rail yards near downtown Los Angeles and, therefore, to the nation’s rail system. The Alameda Corridor is part of a network based in a single urban area, financed with local public and private capital, and operated by local authorities, but it serves the entire nation. Similar statements could be made for much of America’s urban infrastructure.

To truly understand the nation’s infrastructure needs, it is necessary to understand the infrastructure projects that have been identified by regional, metropolitan, and local

leaders as high priorities. To that end, in late 2020, the Kinder Institute, in collaboration with Henry G. Cisneros, former Secretary of the U.S. Department of Housing and Urban Development, undertook a major survey of infrastructure priorities in 100 metropolitan areas and 134 cities.⁴ We selected the top 100 for illustrative purposes, but their economic power is undeniable: The top 100 metropolitan statistical areas account for 66% of the American population, 75% of the nation's gross domestic product, and 78% of its research and development expenditures.

For analytical purposes, we also divided the nation into 22 regions that revolve around major metropolitan areas, but also cover rural areas and small towns. This allowed us to show how infrastructure priorities differ in different parts of the country, and also gave us the opportunity to identify regional-scale infrastructure projects that are important both to metros and the nation, in addition to

4 The survey covered the central cities in the 100 largest metropolitan areas as defined by the U.S. Census Bureau and other cities that are in the top 100 in population but are not located in the 100 largest metropolitan areas.

more local projects. The 22 regions and the major cities within each region are depicted in Figure 1. These regions are explained in more detail in Appendix B.

In surveying the major cities and metropolitan leaders, we asked for:

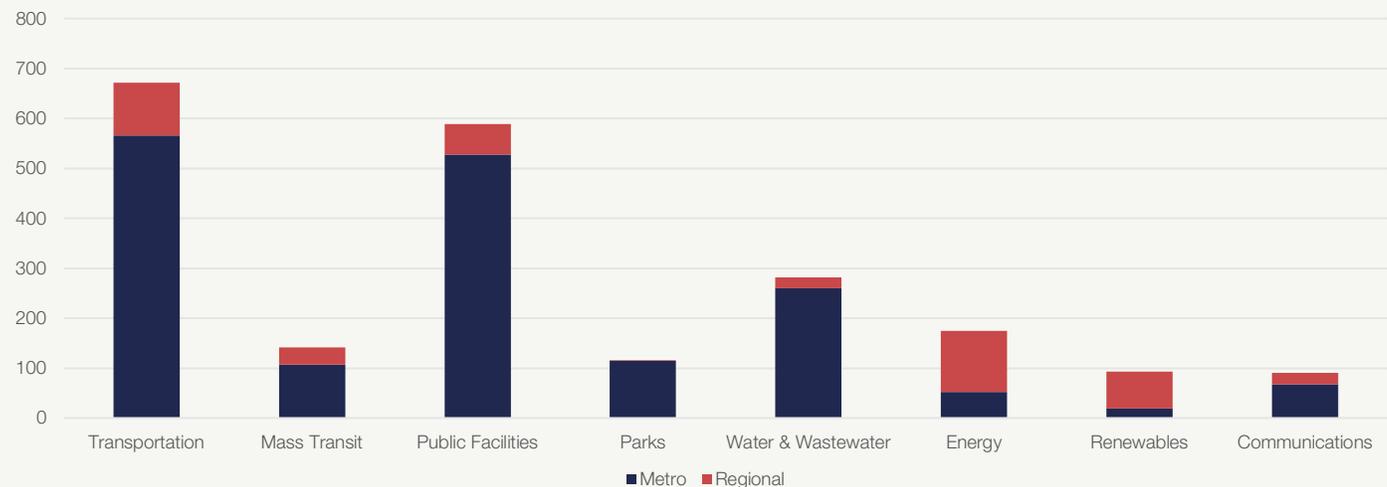
1. The top five infrastructure priorities, and
2. Infrastructure projects that rose to the top of the priority list because of the COVID-19 pandemic.

Together with other sources⁵, the survey provided the basis for a national database of high-priority local and regional infrastructure projects. This database is not comprehensive by any means⁶. But it is a sizeable sample of projects and provides a clear indication of what local and regional leaders have prioritized.

- 5 We also relied on major cities' capital improvement program documents and information on projects from Inframation, as well as other sources. A detailed methodology is included in Appendix A.
- 6 This list was frozen for this analysis on November 25, 2020, but we continue to receive more surveys and will be updating the list in an online format in the future.

FIGURE 1 Map of the 22 Regions



FIGURE 2 Number of Infrastructure Projects by Category

Note: Mass Transit is a subset of Transportation, and Renewables is a subset of Energy.

The resulting database contains 1,807 infrastructure projects, of which 81.5% (1,474) are located inside metropolitan areas and 18.5% (333) serve entire regions. We broke these projects down into six major categories and 36 subcategories.⁷ A summary can be seen in Figure 2. (It should be noted that mass transit, parks, and renewables are each a subset of transportation, public facilities, and energy, respectively.)

The distribution of projects across the regions of the nation is also important. Some regions prioritize infrastructure projects needed to keep pace with rapid growth, such as energy projects in the Texas Triangle and the Rocky Mountain Region. Other regions emphasize projects to modernize existing systems or adapt internal economic transformations, such as projects in New England, the Great Lakes Region, and the National Capital Region. Other regions serve massive populations and prioritize replacement and expansion projects, such as in the New York Global Financial Center Region, the Southern California Region, and the Northern California Region. Distribution of the major project categories by region is shown in Appendix D.

In reviewing these 1,807 projects, we found seven major trends:

- 1. Transportation projects** (37% of all projects) continue to be the primary building blocks of a national infrastructure strategy and should be given high priority.
- 2. Mass transit projects** (21% of transportation projects) are vital to the transportation of essential workers and can help reduce carbon emissions.

- 3. Investment in public facilities** (33% of all projects) is necessary in older cities and regions with obsolete facilities and in newer regions with rapid population growth. Local and regional governments require major technology upgrades. The pandemic especially highlighted the need for health facilities and parks.
- 4. Investment in water and wastewater infrastructure** (15.5% of all projects) can help secure clean water for the nation in the long term — but also address emerging issues associated with climate change, including the increasing problem of extreme weather events, whether they involve too much water (storms and floods) or too little (droughts).
- 5. Energy projects** serving metropolitan areas and regions create opportunities to invest in rural areas and can help close urban/rural disparities in regional employment and economic development.
- 6. Renewable energy projects** make up 53% of energy projects identified in this study, signaling that local and regional leaders recognize that renewables are both cost-competitive and critical to reducing greenhouse gas emissions.
- 7. Massive public investments in communications infrastructure** (5% of all projects) are needed to accelerate competitive economic development — and, in particular, to address the wide equity gaps uncovered during the coronavirus pandemic.

Each of the seven categories will now be discussed in more detail, along with examples derived from the database of 1,807 projects.

⁷ The subcategories are delineated in Appendix B.

1. Transportation

Transportation projects (37% of all projects) continue to be the primary building blocks of a national infrastructure strategy and should be given high priority.

Transportation is a basic element of infrastructure because the movement of people and goods is an essential underpinning of economic commerce and personal quality of life in both urban and rural areas. The sheer volume of projects prioritized by local leaders and by business and trade groups is evidence of a clear need for developed plans, readiness to execute, and expectations of effectiveness. A national infrastructure strategy designed to create jobs in both urban and rural areas must necessarily include transportation projects on a large scale.

Transportation projects include highways, streets and roads, airports, ports, mass transit, bridges and tunnels, and pedestrian walkways. In many metros and regions, the definition of transportation is being more broadly redefined as “mobility” because it increasingly includes alternative modes of movement, such as bicycles, scooters, mobility-on-demand, electric vehicles and autonomous vehicles.

In this study, 84% of transportation projects were identified as priorities in metro areas while 16% were regional in scale. Transportation represented the most projects in 16 of the 22 regions. The Texas Triangle and Southern California had the most projects by far. Among metros within those regions, Houston (31), New York (20), and Los Angeles (20) had the most projects.

Transportation projects represent a very wide range of infrastructure improvements. At the metro level, a few examples include:

- Patriots Crossing Bridge in the Virginia Beach-Norfolk-Newport News metro (\$4.8 billion)
- Redevelopment of Chicago Union Station (\$1 billion)
- Howard Street Tunnel Reconstruction Project in Baltimore (\$466 million)
- Port of Newark Container Terminal improvements (\$500 million)

Examples of regional transportation projects are:

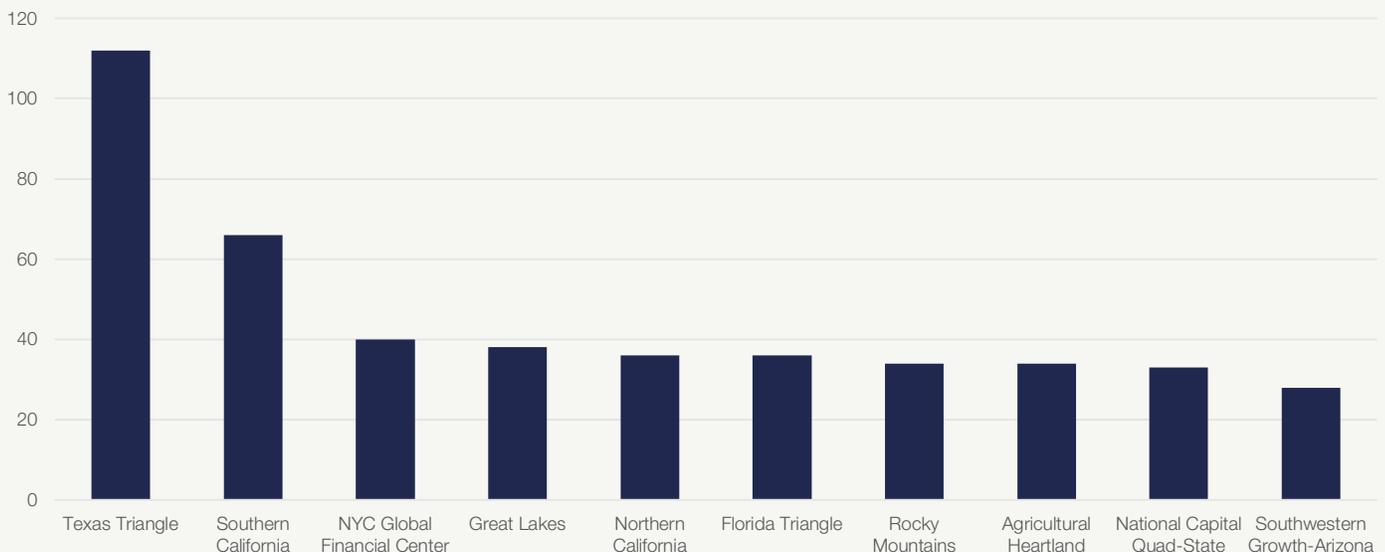
- Central Texas High-Speed Rail project connecting Houston and Dallas (\$30 billion)
- The Columbia River Crossing Project linking Washington State and Oregon (\$2.7 billion)
- The Calcasieu River Bridge Replacement on I-10 near Lake Charles, Louisiana (\$1.2 billion)

2. Mass Transit Projects

Mass transit projects (21% of transportation projects) are vital to the transportation of essential workers and can help reduce carbon emissions.

This study separated out mass transit projects for special review because of their potential for helping to achieve

FIGURE 3 Regions with the Most Transportation Projects



several important goals: reducing traffic congestion, spurring transit-oriented development, lowering air pollution from vehicle emissions, and linking regions together with high-speed systems. The range of mass transit projects identified in this study include bus systems, rail and subway systems, light rail and streetcars, and mobility-on-demand systems.

Our survey identified more than 140 different mass transit projects, mostly at the metropolitan level. Of these, 90 are heavy rail or light rail projects and 19 are major expansions of bus systems, including bus rapid transit routes.

Southern California has by far the most regional mass transit projects underway — twice as many as any other region. This is not surprising considering the major funding measures Los Angeles County residents have put into place for mass transit. A list of the regions with the most mass transit projects is included in Figure 4.

Examples of metro-based mass transit projects include:

- New York’s long-planned Second Avenue Subway Phases 2 and 3 (\$14.2 billion)
- San Antonio’s Advanced Rapid Transit bus corridor project (\$566 million)

Examples of regional mass transportation projects include:

- A high-speed rail project along Colorado’s front range, from Pueblo to Fort Collins (\$6 billion).

3. Public Facilities

Investment in public facilities (33% of all projects) is necessary in older cities and regions with obsolete facilities and in newer regions with rapid population growth. Local and regional governments require major technology upgrades. In particular, the pandemic highlighted the need for health facilities and parks.

Public facilities projects are a mainstay of city, county and state capital programs. In times of economic recession, the construction of public facilities — city halls, hospitals, parks, auditoriums, and libraries — has not only been a source of paying jobs but has enhanced the landscape of American communities with well-used public venues. Every region in the nation has benefited from the legacy of public facilities built during the Great Depression as part of the New Deal’s Works Progress Administration.

This study identified 589 public facilities projects (15% of all projects), spread across every region of the nation. Almost 90% of these public facilities projects were within metropolitan areas, rather than regional in scope. These projects include city halls, courts buildings, performing arts centers, coliseums and auditoriums, government buildings, parks and open space, higher education facilities, public schools, information technology installations, pedestrian amenities, convention centers, athletic facilities, public housing, greenways and riverwalks, health clinics and hospitals, car parks, development projects, public safety operations facilities, and public libraries. Figure 5 shows the metropolitan areas with the most public facilities projects planned.

FIGURE 4 Regions with the Most Mass Transit Projects

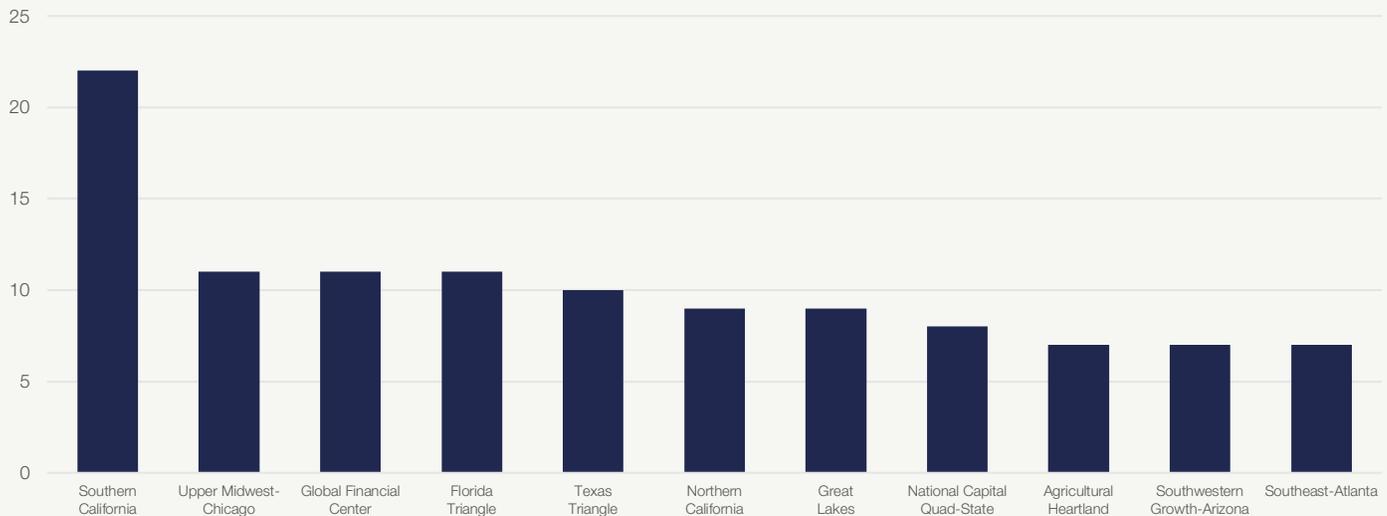
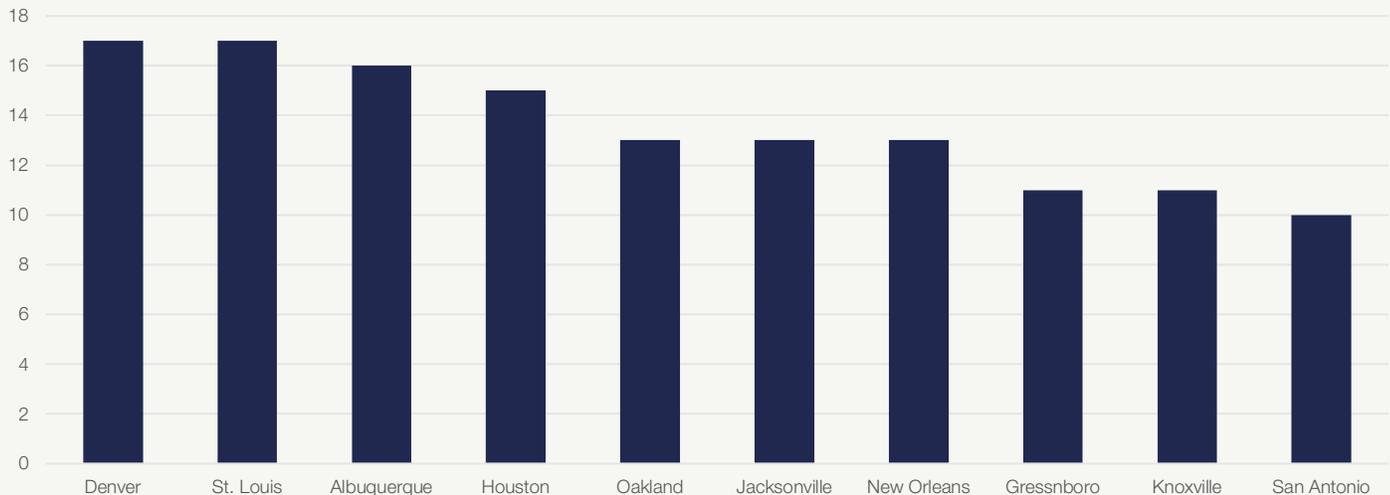


FIGURE 5

Metro Areas with the Most Public Facilities Projects



Many projects reflect the integration of new technology into local government services, such as information technology upgrades, public safety operations centers, transportation control headquarters, central facilities for broadband systems, decentralized health clinics, and modern education buildings for public schools, colleges, and universities. The pandemic also has highlighted the need for more public facilities, especially health facilities.

Examples of public facilities planned across the nation include:

- The Miami-Dade Justice Facility and Courthouse (\$474 million)
- The National Zoological Park Central Parking Facility in Washington, D.C. (\$81 million)
- West Riverwalk connecting downtown to adjacent neighborhoods in Tampa, Florida, (\$30 million)
- Library infrastructure improvements in Madison, Wisconsin (\$11.7 million)



Photo by Sand Crain on Unsplash

Parks

The study identified 116 parks projects, all but one of which were within metropolitan areas rather than regional projects. The parks identified in this study were open spaces, recreation centers, greenways along water features, historic centers, and public amenities such as plazas and city squares. The projects planned include both land acquisition for new parks and redevelopment of existing facilities.

Parks and open spaces add to the attractiveness of urban cores in an era when livability and walkability are prized features of city life. Parks were a major part of the New Deal programs to employ workers in construction and left a permanent legacy of in-city open space, as well as vastly improved national parks. Parks and open spaces gained renewed popularity during the coronavirus crisis and are likely to play a more important role in communities across the country in the future.

Examples of parks projects included in our survey are:

- Repairs to deteriorated public park infrastructure in Chula Vista, California (\$50 million)
- Upgrading of existing recreation centers to serve as education and child care facilities for current and post-coronavirus activities in Henderson, Nevada, (\$20 million).
- Downtown Plaza streetscape redevelopment in Garland, Texas (\$19 million)

Higher Education

This report identified 59 opportunities for partnerships to invest in facilities at institutions of higher education. To keep pace with growth, many higher education institutions have plans to invest in infrastructure facilities, including new cooling plants, parking garages, and student residence halls. Others plan to modernize existing academic facilities to accommodate evolving instructional methods, such as remote learning. The pandemic highlighted special challenges for universities concerning the density of assembly halls, spacing in student housing, adequate health facilities, and online facilities for production of remote classes. With tight budgets as a result of the pandemic's recessionary economic effects, many universities will require new sources of investment capital for these projects, including public-private partnerships.

Most of the higher education facilities identified in this report are located within metropolitan areas, but investments also are being made in the infrastructure of higher education campuses in rural areas across the nation. These investments serve to strengthen the economic opportunities in those areas, as well as benefit entire regions with the career education opportunities extended to regional residents.

Examples of higher education infrastructure projects include:

- The University of Southern California Bioscience Infrastructure Project in Los Angeles
- The University of California–Riverside Medical Building public-private partnership
- The Texas A&M Medical Building and Student Housing public-private partnership in Houston
- The Georgetown University Renewable Energy Project in Washington, D.C.

Public Safety Facilities

An important subcategory of public facilities is public safety facilities. Many cities and metro areas are planning new public safety facilities, while most local governments regularly modernize or add fire stations and police substations as well.

This study identified 77 public safety projects — principally in the communications and public facilities categories. Public safety facilities generally are financed from city or county budgets or through bond issuances for capital improvement programs. But with public safety concerns receiving more attention — especially given police reform proposals — redesigned facilities and effective communications technologies will certainly be part of an overall national strategy.

Examples of public safety facilities projects include:

Police Facilities

- The Chicago Public Safety Training Facility public-private partnership (\$95 million)
- Public safety infrastructure projects in Henderson, Nevada (\$70 million)
- Police infrastructure projects in Arlington, Texas (\$4.5 million)
- Police facility improvements in Syracuse, New York (\$2.1 million)

Fire Facilities

- Fire and emergency medical services department projects in Washington, D.C. (\$161 million)
- Replacement of fire and rescue building systems in Portland, Oregon (\$1.8 million)
- Fire Department Facilities and Information Technology Center project in North Port, Florida, near Sarasota (\$1.7 million)

4. Water and Wastewater

Investment in water and wastewater infrastructure (15.5% of all projects) can help secure clean water for the nation in the long term — but also address emerging issues associated with climate change, including the increasing problem of extreme weather events, whether they involve too much water (storms and floods) or too little (droughts).

Water-related projects are elements of the nation’s most basic infrastructure — fundamental to every community and every business.

In legacy cities such as Flint, Michigan, and Newark, New Jersey, old water lines have been a huge problem, contributing to toxins in the drinking water. In newer metro areas in the South and West, finding additional water

supplies is a challenge, especially where climate change is increasing drought conditions.

Regarding wastewater, cities find themselves under environmental sanctions for mismanaging overburdened treatment facilities or for discharging polluted effluent into streams and oceans. Massive improvements to wastewater systems burden both residential and business ratepayers with high water bills.

This study includes 149 clean-water projects and 132 wastewater projects, the overwhelming majority of which were contained within metropolitan areas and were not regional in their impact. The metros with the largest number of clean-water projects are depicted in Figure 6. Figure 7 shows the same information for wastewater projects.

FIGURE 6 Metros with the Largest Number of Water Projects

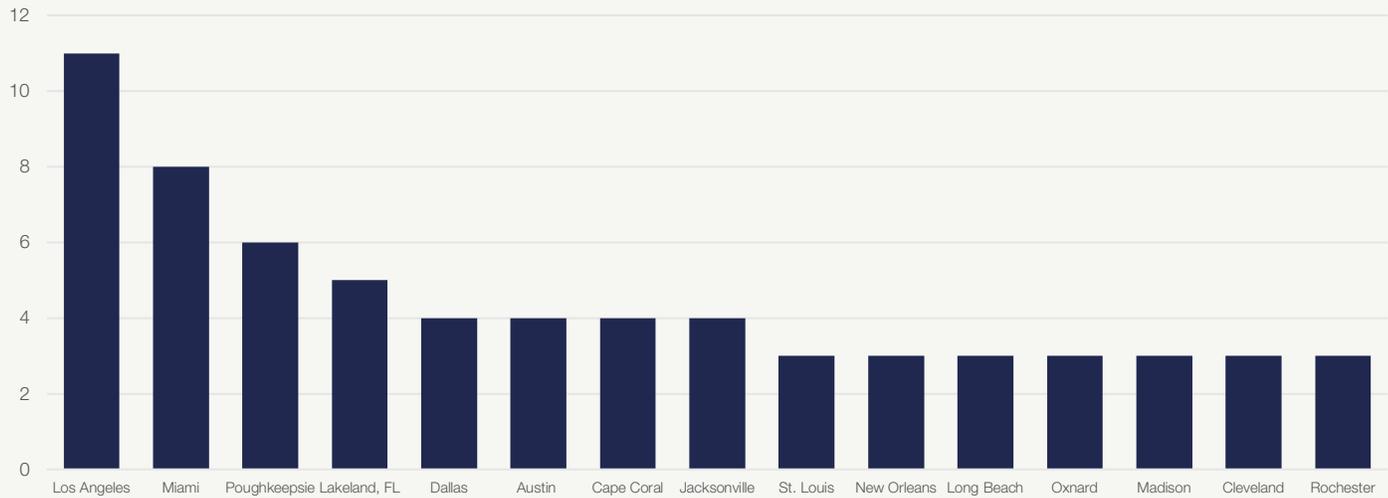
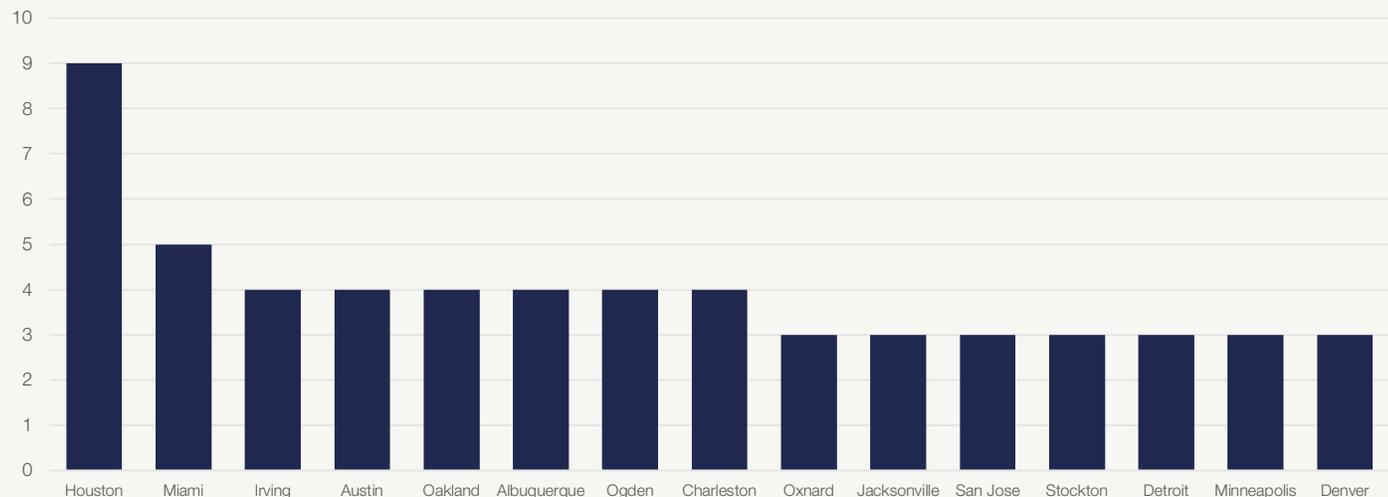


FIGURE 7 Metros with the Largest Number of Wastewater Projects



Clean-water projects in our database are evenly divided between modernization and replacement in old cities, and new projects in high-growth cities. Examples include:

- Lead service replacements in Rochester, New York (\$150 million)
- Water pipe network improvements in Austin, Texas (\$40 million)
- A recycled water storage expansion in Oxnard, California (\$6 million)

Examples of wastewater projects identified in this study include:

- Massive drainage construction in Houston (\$665 million) — only one aspect of drainage improvements in Houston following Hurricane Harvey
- A package of sewage infrastructure improvements in Albuquerque, New Mexico (\$176 million)
- Sanitary sewer system upgrades in San Jose, California (\$140 million)

5. Energy Projects

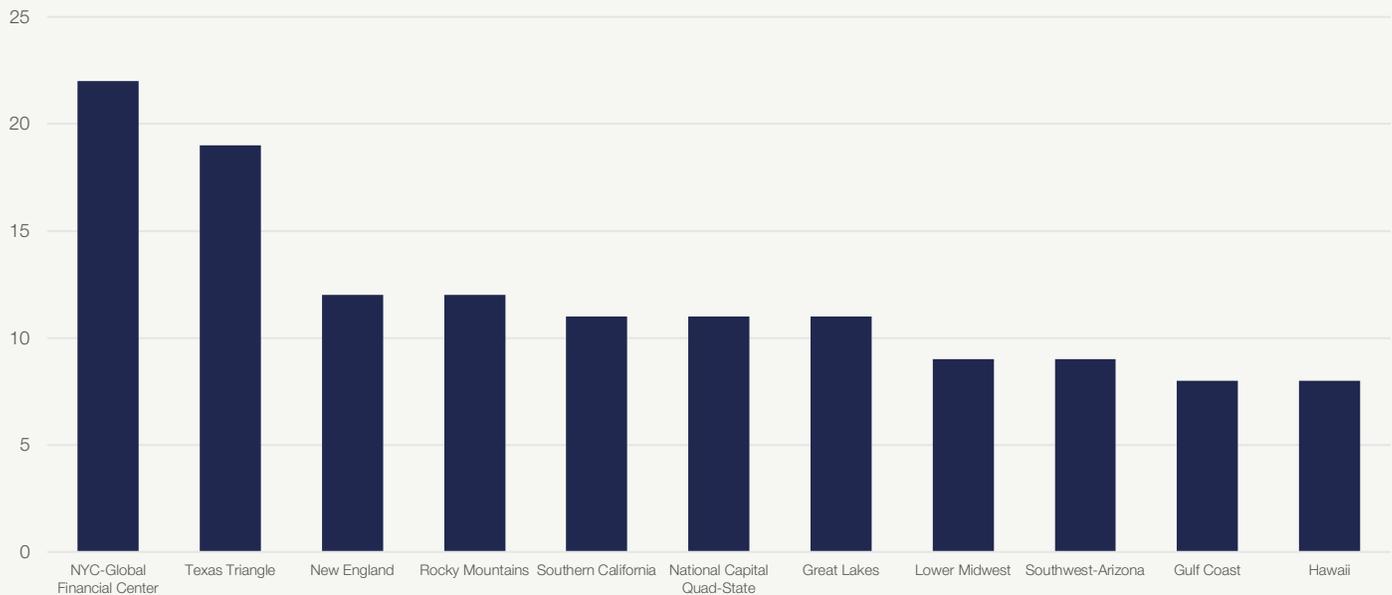
Energy projects serving metropolitan areas and regions create opportunities to invest in rural areas and can help close urban/rural disparities in regional employment and economic development.

Energy projects are among the most important elements of the national infrastructure because we are highly dependent on electricity. This study identified 175 energy projects located in the nation's 22 regions. These included energy generation projects (fossil fuel projects, photovoltaics, onshore and offshore wind projects, and biomass conversion projects), transmission projects (transmission lines and energy storage projects), and distribution projects (electrical grid upgrades).

Unlike other forms of infrastructure, most of the energy projects identified (70%) are located in regional settings outside of metropolitan areas, where the energy is generated. For that reason, energy projects are an excellent way to spur job creation and economic development in rural areas and should be part of a national strategy to spread the benefits of economic prosperity to the areas left behind.

Every region of the nation has multiple energy projects planned — though, as noted above, most are in rural areas. The regions with the most projects tend to be the areas of highest energy demand, which means either the fastest-growing or those with high energy needs because of their business and industrial composition. As Figure 8 shows, the regions with the most energy projects planned are metropolitan New York and the Texas Triangle.

FIGURE 8 Regions with the Most Energy Projects



Examples of energy projects serving entire regions are:

- The Port of Brownsville, Texas, liquified natural gas phase 1 project (\$1.3 billion)
- The Mountain Valley gas pipeline in Virginia (\$4.6 billion)
- The Escondido 6.5-megawatt (MW) energy storage project in Northern California (\$8 million)

Examples of energy projects in major metropolitan areas are:

- San Diego’s 500MW energy storage project (\$1.5 billion).
- The Pittsburgh International Airport Microgrid public-private partnership (\$30 million).
- The retrofit Chicago energy conservation project (an estimated \$28 million)

in general, most renewable projects (79%) are concentrated in primarily rural areas.

Renewable energy projects are planned in 19 of the 22 regions of the nation. The regions with the most renewable energy projects planned are regions with heavy power demand and within transmission distance of proven renewable sources. While the New York region again led the pack, Figure 9 shows that regions rich with sun and wind are close behind, including Arizona, the Rockies, and the Texas Triangle.

Examples of non-MSA-based regional renewable energy projects are:

- The Chokecherry and Sierra Madre 3-gigawatt (GW) wind energy project in Wyoming (\$5 billion)
- The 690MW Gemini Solar Project serving Northern California and Nevada (\$1 billion)
- A 60MW offshore wind project in North Carolina (\$500 million)

Examples of MSA-based renewable energy projects are:

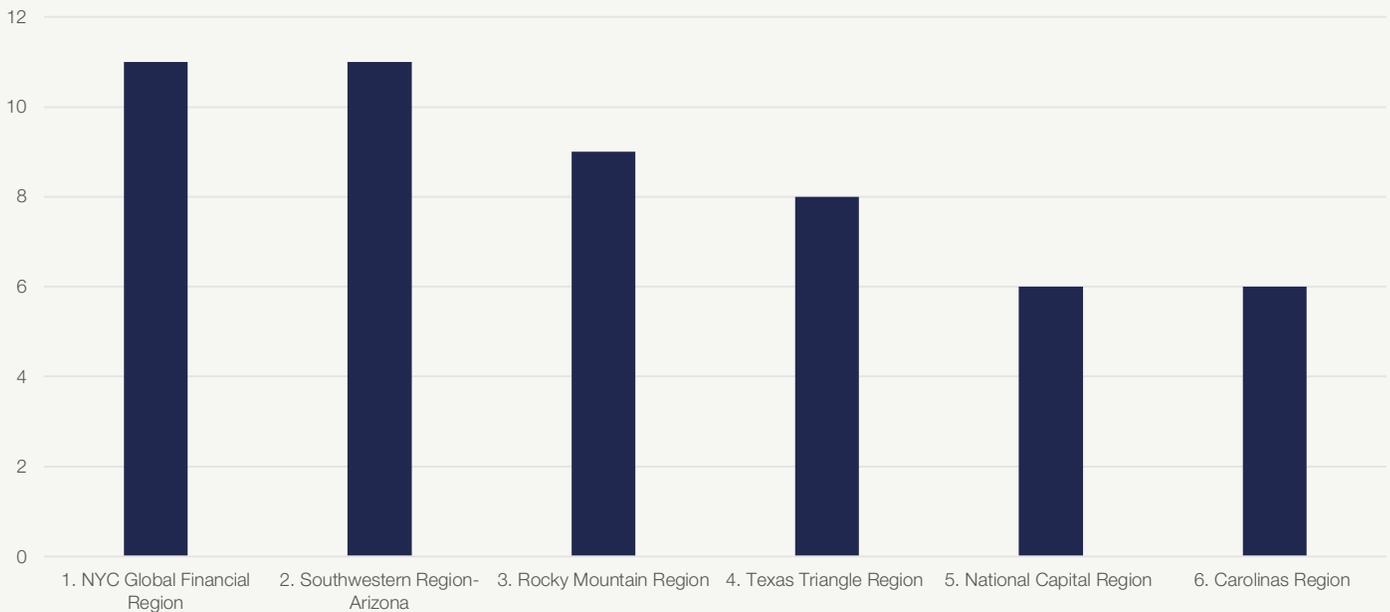
- San Diego’s system for landfill-gas collection and power generation
- The geothermal infrastructure system in Boise, Idaho (\$15 million)

6. Renewable Energy Projects

Renewable energy projects make up 53% of energy projects identified in this study, signaling that local and regional leaders recognize renewables are both cost-competitive and critical to reducing greenhouse gas emissions.

Of the 93 renewable energy projects identified, 33 are solar projects and 36 are wind projects. Like energy projects

FIGURE 9 Regions with the Most Renewable Energy Projects



7. Communications

Massive public investments in communications infrastructure (5% of all projects) are needed to accelerate competitive economic development — and, in particular, to address the wide equity gaps uncovered during the coronavirus pandemic.

For more than a decade, the “digital divide” has been recognized as a serious national problem, but the coronavirus pandemic catapulted the issue to the level of a true national emergency. Individuals and families without effective online capabilities have been shut out of school, work, and medical care. In some cases, school districts found it necessary to equip school buses with Wi-Fi hot spots and station them in large parking lots so that students without online access could get classroom assignments and instruction. In other cases, overburdened medical personnel could not use available telemedicine devices because of the lack of internet access.

When asked in our survey how infrastructure priorities were altered by the pandemic, local leaders responded most frequently that the extension of broadband became a critical infrastructure priority.

The study identified 90 communication projects, the majority of which involved broadband extension. Of those projects, 68 (75.5%) are in MSAs and 22 (24.5%) are regional projects. Beyond broadband extension, other communication projects identified involved the restructuring of city government information technology systems and the modernization of public safety communications.

Figure 10 depicts the regions with the most communications projects.

Examples of broadband communications projects planned within a metropolitan area include:

- A project in Raleigh, North Carolina, to build a broadband system specifically to support online education. The project is directly related to disparities uncovered during the pandemic (\$10 million).

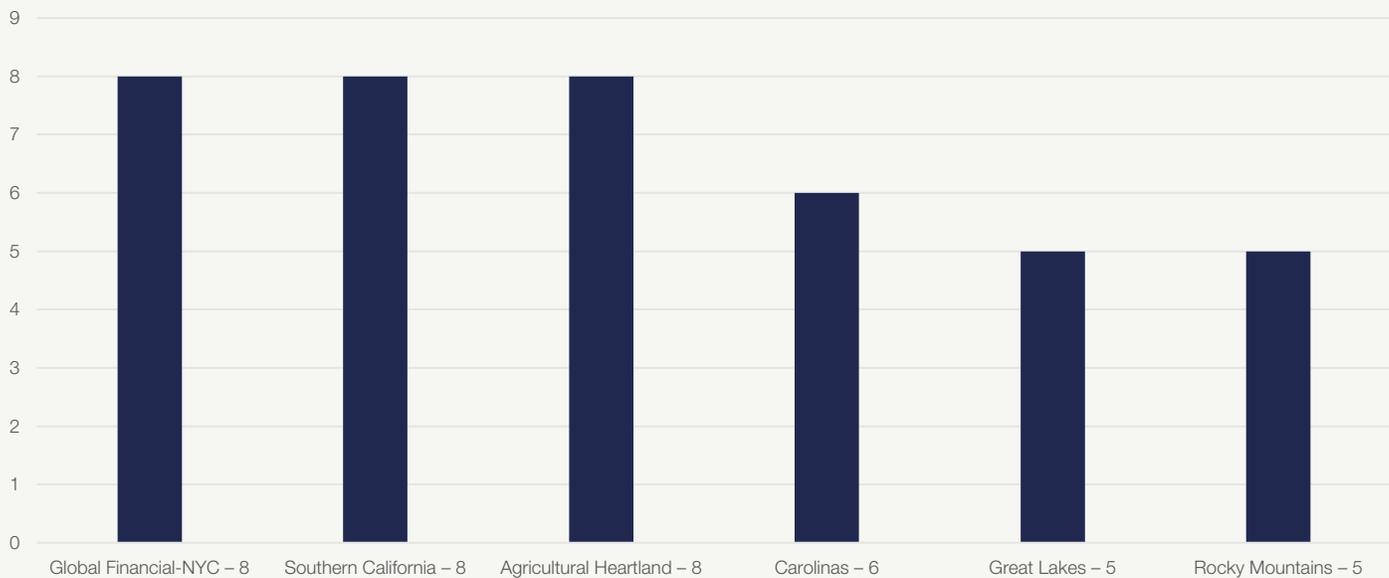
Examples of broadband communication projects with regional dimensions include:

- The Pennsylvania fiber-optic broadband network public-private partnership (\$200 million)

Examples of communication projects that do not involve broadband are:

- An upgrade of internal communications and IT equipment in New Haven, Connecticut (\$200 million)
- A 5G technology accelerator in Buffalo, New York (\$40 million)
- A new investment in a five-station dispatch alert system in Oakland, California (\$2 million)

FIGURE 10 Regions with the Most Communications Projects



Three Big Priorities in American Infrastructure: A Bottom-Up Approach

The seven trends identified in this report represent the priorities of America's cities, metropolitan areas, and regions. They *must* be integrated into any new national infrastructure plan. However, they should not be included in the plan in an uncoordinated way. Rather, a national infrastructure strategy that is responsive to local and regional needs should focus on three major priorities that will help address *all* of the infrastructure challenges America faces today. These three priorities are:

- **Essential Infrastructure After the Pandemic**, such as **broadband access**, **emergency response and health facilities**, and **public transit** that serves essential workers.
- **Climate Resilience Infrastructure**, such as **public transit** and **renewable energy**, which can reduce emissions, and **clean-water facilities**, which can help mitigate the impact of climate change.
- **Infrastructure Focused on Urban-Rural Connections**, such as **broadband**, **energy**, and **transportation**, which can help harness the prosperity of metropolitan centers to enhance economic opportunities in rural areas.

Essential Infrastructure After the Pandemic

The pandemic has highlighted the need to reinforce overlooked-but-essential pieces of infrastructure, including **broadband access**, **emergency response and health facilities**, and **public transit** that serves essential workers. In our survey, 64% of respondents identified broadband as an infrastructure priority, while 55% identified public facilities (mostly health facilities) as a priority as well. An infrastructure plan that prioritizes this essential infrastructure should focus on short-term, back-to-work

efforts and emphasize the needs of disadvantaged communities to ensure that pandemic recovery is equitable.

The coronavirus pandemic has altered the patterns of American life as profoundly as any event since the Great Depression or World War II. These changes in daily activities have required immediate adjustments in the provision of public services and in the physical infrastructure that supports the delivery of those services. The pandemic has changed the very definition of essential infrastructure, as broadband became essential to learning and telemedicine; hospitals had to quickly expand their intensive care units; and transit agencies had to adopt new protocols for cleaning vehicles, reconfiguring stations and buses for social distancing, and redesigning routes and stops.

Many of these adjustments have been made specifically to deal with the pandemic in the short-term, but they underscore the need for modifications in services and facilities.

The pandemic uncovered glaring disparities when hospitals in densely populated, underserved neighborhoods were pushed beyond capacity, when transit arrangements for essential workers left them unnecessarily exposed, and when children in neighborhoods without internet access could not avail themselves of online classes.

In our survey of local leaders, we asked how infrastructure priorities had changed as a result of the pandemic. Leaders in 33 metro areas described specific plans for infrastructure upgrades because of the pandemic, including improvements like stronger fiber-optic, Wi-Fi, and broadband networks; emergency operations centers, health facilities, and testing sites; transportation upgrades; open space and recreation facilities; and housing and homeless facilities.

Communications

Communications projects were cited most frequently as being a higher priority because of COVID-19. In addition to the Raleigh project highlighted above, examples of communications projects directly related to the pandemic include:

- Citywide broadband modernization and expansion to underserved areas in St. Louis (\$300 million)
- Expansion of the city's public Wi-Fi network to reach all residents in Madison, Wisconsin (\$2 million)
- Fiber connectivity and digital inclusion projects in Long Beach, California, (\$17 million)
- Expansion of Wi-Fi/broadband connectivity in lower-income neighborhoods in Fort Worth, Texas (\$20 million)

Public Facilities

Projects to renovate, replace or build new public facilities were identified as the second-most needed during the pandemic. They include emergency operations centers, storage facilities for emergency supplies, food distribution sites, health facilities and testing sites, and renovations of public buildings to improve air quality. Examples are:

- Construction of permanent health diagnostic and testing facilities in Oklahoma City (\$50 million)
- Expansion of the health department building in Lubbock, Texas (\$15 million)
- Facilities for equitable access to food delivery in Salt Lake City (\$5 million)

Transportation

The third category of COVID-19 projects most-often prioritized in MSAs are transportation projects. They include the extension of mass transit routes into marginalized neighborhoods, improvements of service to employment centers, and upgrading transit rolling stock to make it safer. Examples include:

- Buildout of the bus rapid transit system to improve access to underserved neighborhoods in Akron, Ohio (\$250 million)
- Support for socially distanced commuting projects in Riverside, California (\$15 million)
- Improvements in mobility technology projects for workforce access in Boise, Idaho (\$1.5 million)

Climate Resilience

More than 500 of the 1,807 projects in our survey deal with climate resilience in some way, suggesting this is a major priority for cities and regions. Investment in **public transit** and **renewable energy**, which can reduce emissions, and **clean-water facilities**, which can help mitigate the impact of climate change, can help build the nation's resilience in a time of climate change.

The evidence of climate change is overwhelming and the trends point to a range of catastrophic effects. The Risky Business Project, a national task force that studied the economic risks of climate change, concluded that by the mid-21st century, the number of 95-degree days the typical American experiences will double or triple. Climate change could result in significant threats to human health, economic growth, and national security. The threats include rising sea levels, increasingly violent storms, destruction of crops due to higher temperatures, water shortages caused by less snowfall and drought, more extensive forest fires, productivity losses in industries such as construction, and negative effects on human health. We could see property losses, labor productivity declines, human health and safety risks, food supply interruptions, and energy costs. Climate change will also engender international conflicts over uncontrollable migration due to crop failures, severe water shortages, and financial system disruptions.

Therefore, there is a pressing need to curtail activities that contribute to the rapidity of climate change — by reducing emissions — and an urgent need to mitigate the damage from climate change effects that are now irreversible — by protecting people and places from damage. The priorities

of the metropolitan areas and regions in this study reflect the understanding of ways to reduce risks and vulnerabilities in MSAs and regions.

Emissions Reduction Projects

Renewable Energy Projects

The massive amounts of electrical generation required by population growth must include generation from renewable sources priced to replace older coal and gas-fired power plants. Two categories of projects identified — renewable energy projects and mass transit projects — contribute to reduced carbon emissions.

Examples of renewable projects identified in this study are:

- Wind Catcher Energy Connection 2GW wind farm in Oklahoma (\$4.5 billion)
- Principle Power 100MW offshore wind farm in North Carolina (\$500 million)
- New Jersey wind projects (\$436 million)
- Lambert 35MW and Franklin 79MW biomass energy generation facilities in North Carolina (\$285 million)
- 100MW solar project in Minnesota (\$40 million)

Mass Transit Projects

The transportation sector today generates 29% of U.S. greenhouse gases, the largest percentage of any industrial sector in the nation. Reducing emissions of vehicles on the roads in part by providing mobility via more efficient, safe, and reliable mass transit is an important step forward.

Examples of mass transit projects identified in this study are:

- Brooklyn-Queens light rail connector in New York (\$2.6 billion)
- Chicago Red Line extension and renovation (\$2 billion)
- Miami-Dade Broward light rail public-private partnership (\$2 billion)
- Public-private partnership for transit-connector rail in Inglewood, California (\$1.3 billion)

Climate Change Mitigation/Resilience

Water Supply Projects

Water supply projects include reservoirs and other new sources of water to prevent water shortages in drought-prone regions such as the Texas Triangle and Southern California. Metro areas with aggressive water supply projects are Los Angeles and Miami. Supportive projects in these areas involve water treatment and water distribution.

Examples of water supply projects identified in this study are:

- Huntington Beach, California's desalination plant (\$500 million)
- Water supply pipeline extension from new sources in San Antonio (\$470 million)
- Water infrastructure needs in Glendale, Arizona (\$278 million)
- Water reclamation projects in Fort Worth (\$156 million)

Wastewater and Flood Control Projects

Wastewater and flood control projects are important to channel water from massive storms and are priorities in the Texas Triangle and the Florida Triangle — especially in Houston and Miami, which are among the most vulnerable metros in the nation.

Examples of wastewater projects identified in this study are:

- Stormwater infrastructure improvements and upgrades in Miami (\$800 million)
- Improvements to the stormwater drainage system in Houston (\$665 million)
- Levees and flood control projects in New Orleans (\$400 million)



Photo by Matthew T. Reader on Unsplash

Urban-Rural Connections

Although our survey was primarily of cities and metropolitan areas, more than 300 of the 1,800 projects — almost 20% — involve rural areas. Many of these infrastructure projects — including **broadband, energy, and transportation** — can help harness the prosperity of metropolitan centers to enhance economic opportunities in rural areas. A national program to advance rural broadband could be as transformative as the successes of the New Deal’s rural electrification efforts.

Today, many rural areas continue to decline. As small towns grow smaller, rural populations are, on average, older than those in urban areas, and job opportunities are few. These realities create a sense among rural Americans of being left behind and forgotten, which contributes to deep divisions and intense contention in American public life. It is clear that the momentum of the global, bi-coastal, and metropolitan economies need to be linked to the rural areas of the nation.

This report identified 333 projects in rural areas in every region of the nation. Of these, more than 120 are energy projects — most of them involving renewable resources. A national strategy of utilizing infrastructure to stimulate economic activity in rural areas should invest heavily in energy projects and especially in renewable power projects that help serve metropolitan areas.

Energy Projects

Examples of such projects are below:

- Niles 1GW gas-fired power generation project in Michigan (\$1 billion)
- The Oregon 955MW energy production center (\$865 million)
- The New York State 260MW renewable energy development project (\$360 million)
- The Tenaska Clear Creek 236MW wind project in Missouri (\$250 million)

Transportation Projects

The second-largest number of rural-area projects were transportation projects — 106 in total (32% of regional projects), of which 71 are projects for roads, highways, freight rail, bridges and tunnels. Tying rural economies to national and metropolitan commercial, manufacturing, and trade transactions requires modern, dependable, and safe road and rail connections. Examples of these projects include:

- I-35 Trade Corridor highway expansion from Texas to Minnesota (\$15.6 billion)
- I-69 highway extension project in Kentucky and Indiana (estimated at \$10.5 billion)
- The Colorado Mountain Corridor highway project (\$3.8 billion)
- The Wisconsin passenger rail line (\$337 million)
- Scudder Falls bridge public-private partnership in Pennsylvania (\$322 million)

Public Facilities Projects

Other regional infrastructure projects identified in this study are investments in various forms of public facilities, 61 of which were identified in the study. They range from higher education campus expansions and government buildings, to public safety centers and health care facilities. Many of them are public-private partnerships. Examples include:

- Oregon Courthouse public-private partnership (\$220 million)
- Vermont correctional and mental health facilities public-private partnership (\$153 million)
- Illinois State University student housing public-private partnership (\$100 million)

Of the 90 regional-level communications projects, only 22 are identified in rural areas.

Given the importance of communications for such important activities such as online education, telemedicine, and business transactions, this is a major shortfall in the nation's infrastructure planning. Examples are:

- The Maryland Eastern Shore 10G fiber-optic project
- The Georgia statewide broadband project
- The Pennsylvania fiber-optic broadband network public-private partnership

America is facing an undeniable urban-rural divide. Its effects can be seen in economic, educational, and health indices and it is a source of serious division in the nation's politics. The strategy of linking rural areas to the new American and global economies has many components, but certainly one of them must be to use infrastructure — particularly transportation, energy, communications, and facilities infrastructure — to generate economic growth in rural areas and to integrate those rural areas into the nation's broader prosperity.

Conclusion: A Different Kind of American Infrastructure Strategy

Infrastructure is a critical dimension of national economic progress. This assertion has always been true in the nation's rural development and it is as valid as ever today. There is a broad bipartisan consensus that a major, federally led infrastructure strategy is necessary if we hope to overcome the challenges facing the country.

But the traditional top-down approach won't be enough to meet the nation's needs. In devising a new infrastructure strategy, the U.S. must *balance* that top-down approach with a bottom-up consultation process that involves regional and local leaders and focuses on the three priorities laid out in this report: essential infrastructure after the pandemic, addressing climate change, and bridging the urban-rural divide. Only then will a national infrastructure strategy be truly responsive to the needs of America's cities and regions — and maximize infrastructure's value to the nation.

Appendix A: Methodology

The database of 1,807 projects was derived from several primary sources.

The first was a survey of 134 large cities in 121 metropolitan statistical areas. The cities included in the survey were:

- The largest city in each of the 100 most populous metropolitan statistical areas in the nation (for example, Los Angeles in the Los Angeles-Long Beach-Anaheim MSA).
- Any other city named as part of the MSA (for example, Long Beach and Anaheim in the Los Angeles-Long Beach-Anaheim MSA).
- Any other city in the 100 most populous cities in the nation that are not located within one of the 100 most populous MSAs (for example, Corpus Christi, which ranks 59th nationally in population but is located in an MSA that ranks 127th).

The survey covered many topics and will be posted online, along with the survey results. But, for this report, the two survey questions that were the most critical asked respondents to identify:

1. The top five infrastructure priorities, and
2. Infrastructure projects that rose to the top of the priority list because of the COVID-19 pandemic.

Of the 134 cities invited to participate in the survey, 65 responded.

The second source was the capital improvement programs (CIPs) for the cities surveyed.

The third was the list of 333 regional projects, some of which came from Inframation, which maintains a database of large infrastructure projects, and some from other regional plans.

In addition, the research team compiled a list of projects gathered from other sources, such as news outlets, and then verified the details of those projects.

Once this list was compiled, our research team culled it to eliminate projects valued at less than \$10 million and single-year projects (for example, the purchase of police and fire vehicles) that technically are not capital infrastructure projects.

Of the 1,807 infrastructure projects, 337 were the result of survey responses, 822 were the result of examining CIPs, 229 came from Inframation and other regional sources, and 419 came from news reports and other sources.

As a result, the priority lists of MSAs are not strictly uniform, even though priorities were secured for every one of the 121 MSAs.

All projects were assigned by our team to one of six categories and one of 36 subcategories. These categories and subcategories are detailed in Appendix B.

In some cases, estimated costs for projects were available, but in other cases, no capital budgets for projects were available.

This is a report of a snapshot in time. The survey work was completed on Nov. 25, 2020. Some projects will be funded, move to completion, and, therefore, deleted from future updates of this list of pending projects. New priorities will be added to the list as they are proposed and identified.

Appendix B: Categories and Subcategories

All 1,807 projects were divided into categories and subcategories as follows

1. **Transportation (672):** Airports, Bridges and Tunnels, Mass Transit, Ports, Car Parks, Streets and Roads, Highways, Pedestrian and Bicycle Projects
2. **Public Facilities (589):** Transportation Terminals, Pedestrian Facilities, Housing Development, Environmental Improvements, Public Buildings, Health Facilities, Technology Upgrades, Higher Education Facilities, Public Safety Facilities, Car Parks, Parks
3. **Water (149):** Supply, Distribution, Treatment, Water Control
4. **Wastewater (132):** Drainage, Sewage, Flood Control
5. **Energy (175):** Generation, Renewable Generation, Transmission, Distribution, and Energy Storage
6. **Communication (90):** Broadband, IT Systems, Fixed Line, Technology, Public Safety

Appendix C: Regions and Metropolitan Areas



For purposes of analysis, we grouped metropolitan areas into 22 larger regions that are economically interconnected. These regions usually include several metropolitan statistical areas and sometimes cross state lines, as depicted on the map above. These regions are listed below, ranked by the overall population size of the core MSA (which are included in parentheses). Cities in the Top 100 not included in the MSA's name are also listed.

1. The Global Financial Center Region

Core Metro: New York-Newark-Jersey City, NY-NJ-PA (1)

Other Top 100 MSAs Within the Region:

Bridgeport-Stamford-Norwalk, CT (59); Albany-Schenectady-Troy, NY (63); New Haven-Milford, CT (67); Poughkeepsie-Newburgh-Middletown, NY (86); Syracuse, NY (90)

States or Portions of States: Southern/Central New York; Western Connecticut; Northern New Jersey

2. The Southern California Region

Core Metro: Los Angeles/Long Beach/Anaheim, CA (2), also including Santa Ana and Irvine

Other Top 100 MSAs Within the Region:

Riverside-San Bernardino-Ontario, CA (13); San Diego-Chula Vista-Carlsbad, CA (17); Las Vegas-Henderson-Paradise, NV (28), including the city of North Las Vegas; Bakersfield, CA (62); Oxnard-Thousand Oaks-Ventura, CA (68).

States or Portions of States: Southern California, Arizona, Southern Nevada.

3. The Chicagoland–Upper Midwest Region

Core Metro: Chicago Naperville-Elgin, IL-IN-WI (3)

Other Top 100 MSAs Within the Region:

Milwaukee-Waukesha, WI (39); Madison, WI (89)

States or Portions of States: Northern Illinois; Northeastern Indiana; Southern Wisconsin; Western Michigan; Eastern Iowa

4. The Texas Triangle Region

Core Metros: Dallas-Fort Worth-Arlington, TX, (4) including the cities of Plano, Garland, and Irving; Houston-The Woodlands-Sugar Land, TX (5); San Antonio-New Braunfels, TX (24); and Austin-Round Rock-Georgetown, TX (29).

Other Top 100 MSAs Within the Region:

Oklahoma City, OK (41); Tulsa, OK (55); McAllen-Edinburg-Mission, TX (65); El Paso, TX (69)

States or Portions of States: Texas; Louisiana; Oklahoma; Eastern New Mexico

5. National Capital Region

Core Metro: Washington-Arlington-Alexandria, DC-VA-MD-WV (6)

Other top 100 MSAs Within the Region:

Baltimore-Columbia-Towson, MD (21); Virginia Beach-Norfolk-Newport News, VA (37), including the city of Chesapeake; Richmond, VA (44)

States or Portions of States: District of Columbia, Maryland, Virginia, Southern Delaware, Eastern West Virginia

6. The Florida Triangle Region

Core Metros: Miami-Fort Lauderdale-Pompano Beach, FL (7), including the city of Hialeah; Tampa-St. Petersburg-Clearwater, FL (18); Orlando-Kissimmee-Sanford, FL (23)

Other Top 100 MSAs Within the Region:

North Port-Sarasota-Bradenton, FL (72); Cape Coral-Fort Myers, FL (76); Lakeland-Winter Haven, FL (81);

Deltona-Daytona Beach-Ormond Beach, FL (88); Palm Bay-Melbourne-Titusville, FL (96)

States or Portions of States: Central/ Southern Florida

7. The Mid-Atlantic Region

Core Metro: Philadelphia-Camden-Wilmington, PA/NJ/DE/MD (8)

Other Top 100 MSAs Within the Region:

Allentown-Bethlehem-Easton, PA-NJ (70); Harrisburg-Carlisle, PA (98)

States or Portions of States: Eastern Pennsylvania, Western/Southern New Jersey, Northern Delaware

8. The Atlanta/Southeastern Region

Core Metro: Atlanta-Sandy Springs-Alpharetta, GA (9)

Other Top 100 MSAs Within the Region:

Jacksonville, FL (40); Birmingham-Hoover, AL (50); Augusta-Richmond County, GA-SC (95)

States or Portions of States: Georgia; Alabama; Eastern Mississippi; Northeastern Florida

9. The Southwestern Growth Region

Core Metro: Phoenix-Mesa-Chandler, AZ (10), including the cities of Scottsdale, Gilbert, and Glendale

Other Top 100 MSAs Within the Region: Tucson, AZ (53)

States or Portions of States: Arizona

10. The New England Region

Core Metro: Boston-Cambridge-Newton, MA-NH (11)

Other Top 100 MSAs Within the Region:

Providence-Warwick, RI-MA (38); Hartford-East Hartford-Middletown, CT (48); Worcester, MA (58); Springfield, MA (84)

States or Portions of States: Massachusetts, Rhode Island, New Hampshire, Maine, Eastern Vermont, Eastern Connecticut

11. The Northern California New Economy Region

Core Metro: San Francisco-Oakland-Berkeley, CA (12)

Other Top 100 MSAs Within the Region:

Sacramento-Roseville-Folsom, CA (26); San Jose-

Sunnyvale-Santa Clara, CA (35), including the city of Fremont; Fresno, CA (54); Stockton, CA (77)

States or Portions of States: Northern California, Northern Nevada

12. The Great Lakes Industrial Region

Core Metro: Detroit-Warren-Dearborn, MI (14)

Other Top 100 MSAs Within the Region:

Pittsburgh, PA (27); Cleveland-Elyria, OH (34); Buffalo-Cheektowaga, NY (49); Grand Rapids-Kentwood, MI (51); Rochester, NY (52); Akron, OH (82); Toledo, OH (93)

States or Portions of States: Western New York, Central/Western Pennsylvania, Northern Ohio, Eastern Michigan, Central West Virginia

13. The Pacific Northwestern Region

Core Metro: Seattle-Tacoma-Bellevue, WA (15)

Other Top 100 MSAs Within the Region:

Portland-Vancouver-Hillsboro, OR-WA (25); Boise City, ID (78); Spokane-Spokane Valley, WA (99)

States or Portions of States: Washington; Oregon; Western Idaho

14. The Minneapolis/Northern Plains Region

Core Metro: Minneapolis-St. Paul-Bloomington, MN-WI (16)

Other Top 100 MSAs Within the Region:

Des Moines-West Des Moines, IA (83)

State or Portions of States: Minnesota, Northern Wisconsin, North Dakota, South Dakota, North/Central Iowa, Northeastern Nebraska

15. The Rocky Mountain Region

Core Metro: Denver-Aurora-Lakewood, CO (19)

Other Top 100 MSAs Within the Region:

Salt Lake City, UT (47); Albuquerque, NM (61); Colorado Springs, CO (79); Ogden-Clearfield, UT (85); Provo-Orem, UT (91)

States or Portions of States: Colorado, New Mexico, Utah, Wyoming, Montana, Western Kansas, Western Nebraska

16. The Agricultural Heartland Region

Core Metros: St. Louis, MO-IL (20); Kansas City, MO-KS (31)

Other Top 100 MSAs Within the Region:

Omaha-Council Bluffs, NE-IA (57); Wichita, KS (94)

States or Portions of States: Missouri, Northern Arkansas, South Central Iowa, Western Nebraska, Kansas

17. The Carolinas Region

Core Metro: Charlotte-Concord-Gastonia, NC-SC (22)

Other Top 100 MSAs Within the Region:

Raleigh-Cary, NC (42); Greenville-Anderson, SC (60); Columbia, SC (71); Charleston-North Charleston, SC (74); Greensboro-High Point, NC (75); Winston-Salem, NC (87); Durham-Chapel Hill, NC (92)

States or Portions of States: North Carolina, South Carolina

18. The Lower Midwest Innovation Region

Core Metros: Cincinnati, OH-IN-KY (30); Columbus, OH (32); Indianapolis-Carmel-Anderson, IN (33)

Other Top 100 MSAs Within the Region:

Louisville/Jefferson County, KY-IN (46); Dayton-Kettering, OH (73)

States or Portions of States: Southern Ohio; Western/Central Indiana; Kentucky; Southern Illinois

19. The Mid-South Region

Core Metro: Nashville-Davidson-Murfreesboro-Franklin, TN (36)

Other Top 100 MSAs Within the Region:

Memphis, TN-MS-AR (43); Knoxville, TN (64); Little Rock-North Little Rock-Conway, AR (80); Chattanooga, TN (100)

States or Portions of States: Tennessee, Eastern Arkansas, Northern Mississippi

20. The Mississippi Valley/Gulf Coast Region

Core Metro: New Orleans-Metairie, LA (45)

Other Top 100 MSAs Within the Region:

Baton Rouge, LA (66); Jackson, MS (97)

States or Portions of States: Louisiana, Mississippi

21. Hawaii Region

Core Metro: Honolulu, HI (56)

22. Alaska Region

Core Metro: Anchorage, AK (137)

Appendix D: Breakdown of Projects by Region and Category

	Region	Transportation	Facilities	Energy	Wastewater	Water	Communication	Total
1	Global Financial Center	40	38	22	9	1	9	119
2	Southern California	66	48	11	22	12	8	167
3	Upper Midwest	19	10	7	0	0	0	36
4	Texas Triangle	112	62	19	24	27	4	248
5	National Capital	33	33	11	4	2	5	88
6	Florida Triangle	36	29	3	20	15	3	106
7	Mid Atlantic	21	22	4	3	3	1	54
8	Southeastern	27	20	2	6	5	3	63
9	Southwest	28	15	9	9	6	4	71
10	New England	23	21	12	2	1	3	62
11	Northern California	36	35	5	5	11	3	95
12	Great Lakes	38	25	11	10	5	8	97
13	Pacific Northwest	17	12	5	5	3	4	46
14	Northern Plains	15	15	4	1	7	3	45
15	Rocky Mountain	34	49	12	10	13	8	126
16	Agricultural Heartland	34	31	3	7	6	9	90
17	Carolinas & Charlotte	25	43	7	2	6	7	90
18	Lower Midwest	25	27	9	2	4	4	71
19	MidSouth	16	28	2	1	3	3	53
20	Gulf Coast	19	16	8	6	1	1	51
21	Hawaii	4	6	8	1	1	0	20
22	Alaska	4	4	1	0	0	0	9
	Totals	672	589	175	149	132	90	1807

Appendix E: Breakdown of Projects by MSA and City

MSA	Transportation	Facilities	Energy	Wastewater	Water	Communication	Totals
Global Financial							
New York	20	8	4			2	34
Newark	6	1					7
Jersey City	3	6	3		1	2	15
Bridgeport		5					5
Albany	1	5				1	7
New Haven	1	4				3	8
Poughkeepsie	4	3	1		6		14
Syracuse	3	6		1	2		12
Total	38	38	8	1	9	8	102
Southern California							
Los Angeles	19	9			11	1	40
Long Beach	5	7			3	1	16
Anaheim	2	2	1	1	1		7
Santa Ana	2						2
Irvine	4	2				2	8
Riverside	9	2	1	2	1		15
San Diego	5	4	2	2	1		14
Chula Vista	4	5				2	11
Las Vegas	2	5	2		1		10
Henderson	4	6			1	1	12
North Las Vegas	1	3		2		1	7
Bakersfield	2	1		2			5
Oxnard	2	1		3	3		9
Total	61	47	6	12	22	8	156

MSA	Transportation	Facilities	Energy	Wastewater	Water	Communication	Totals
Upper Midwest							
Chicago	10	4	4				18
Milwaukee	6	1					7
Madison	1	3					4
Total	17	8	4	0	0	0	29
Texas Triangle							
Dallas	13	4	1	1	4	1	24
Ft. Worth	7	3		3	3	2	18
Arlington	1	4		2			7
Plano	4	1			1		6
Garland	2	2		1	1		6
Irving	6	2		4	2		14
Houston	31	15		9	2		57
San Antonio	11	10	3				24
Austin	8	6	1	4	4		23
Oklahoma City	5	2			1	1	9
McAllen	1	2		1	1		5
El Paso	9	1	3	1	1		15
Laredo	3	1		1	1		6
Lubbock	2	4			1		7
Total	103	57	8	27	22	4	221

MSA	Transportation	Facilities	Energy	Wastewater	Water	Communication	Totals
National Capital							
Washington	5	8	4			1	18
Baltimore	5	9		2	2	1	19
Virginia Beach	7	1	1		1	1	11
Chesapeake	2	1	1		1		5
Norfolk		5					5
Richmond	1	2					3
Total	20	26	6	2	4	3	61
Florida Triangle							
Miami	12	9		5	8	1	35
Hialeah	3	1					4
Tampa	3	1		1	1		6
St. Petersburg	2	2		1			5
Orlando	2	9		2			13
North Port	1	2		2	1		6
Cape Coral	2	1		1	4		8
Lakeland	3	1	1		5		10
Deltona	5		1	2			8
Palm Bay					1		1
Total	33	26	2	14	20	1	96
Mid Atlantic							
Philadelphia	8	9			1	1	19
Camden	1	4		1	1		7
Wilmington	1	5					6
Allentown				2			2
Harrisburg	9				1		10
Total	19	18	0	3	3	1	44
Southeastern							
Atlanta	7			2		1	10
Jacksonville	9	13		3	4		29
Birmingham	2	3			1		6
Augusta	3	1					4
Total	21	17	0	5	5	1	49

MSA	Transportation	Facilities	Energy	Wastewater	Water	Communication	Totals
Southwest							
Phoenix	12	1	2		2	1	18
Mesa	1	4	1	2	1		9
Chandler	2	3		1		1	7
Scottsdale	1			1	1		3
Gilbert	4	3		1	2	1	11
Glendale	2	2		1	1		6
Tucson	2	2	1		1		6
Total	24	15	4	6	8	3	60
New England							
Boston	3	3	2				8
Providence	6	6					12
Hartford	3	4					7
Worcester		1		1	1		3
Springfield	1	2					3
Total	13	16	2	1	1	0	33
Northern California							
San Francisco	5	3				1	9
Oakland	5	13		4		1	23
Sacramento		7					7
San Jose	4	2		3	1		10
Freemont	10	5				1	16
Fresno	2				1		3
Stockton	2			3			5
Reno	5			1			6
Total	33	30	0	11	2	3	79
Great Lakes							
Detroit	8	1	2	3	2	1	17
Pittsburgh	3	1	1				5
Cleveland	1	3	2		3	1	10
Buffalo	1	6				1	8
Grand Rapids		3		1		1	5
Rochester	6	2			3		11
Akron	3	4		1		1	9
Toledo	6						6
Total	28	20	5	5	8	5	71

MSA	Transportation	Facilities	Energy	Wastewater	Water	Communication	Totals
Pacific Northwest							
Seattle	4		1			1	6
Tacoma	3	1					4
Portland		6			1	1	8
Boise City	3	2	1	1		1	8
Spokane	2			1	2		5
Total	12	9	2	2	3	3	31
Northern Plains							
Minneapolis	5	6		3	1	1	16
St. Paul	4	1		1			6
Des Moines	1	4		2		2	9
Total	10	11	0	6	1	3	31
Rocky Mountain							
Denver	4	17		3	2		26
Aurora		3				1	4
Salt Lake City	5	5		2	1	1	14
Albuquerque	7	16		4	1	2	30
Colorado Springs	3	3				1	7
Ogden	5						5
Provo	3	4		4	2		13
Total	27	48	0	13	6	5	99
Agricultural Heartland							
St. Louis	16	17		2	3	6	44
Kansas City	4	4		1	2		11
Omaha	7	4		2		1	14
Wichita		1			1		2
Lincoln	2	4	1	1	1	1	10
Total	29	30	1	6	7	8	81

MSA	Transportation	Facilities	Energy	Wastewater	Water	Communication	Totals
Carolinas							
Charlotte	1	6					7
Raleigh	5	4				2	11
Greenville		3		2			5
Colombia	10	2					12
Charleston	1	3		4			8
Greensboro	2	11			2	3	18
Winston-Salem		5					5
Durham	4	5					9
Total	23	39	0	6	2	5	75
Lower Midwest							
Cincinnati	4	4					8
Colombus	2	5	1	2	1	2	13
Indianapolis	3	4		1			8
Louisville	2	5					7
Dayton	7		1			1	9
Lexington	2	2		1	1		6
Fort Wayne	3	3					6
Total	23	23	2	4	2	3	57
MidSouth							
Nashville	3	1		2		1	7
Memphis	3	5		1			9
Knoxville	2	11				1	14
Little Rock	4	7					11
Chatanooga	2	3			1	1	7
Total	14	27	0	3	1	3	48
Gulf Coast							
New Orleans	3	13			3	1	20
Baton Rouge	5	1		1	1	1	9
Jackson	5						5
Total	13	14	0	1	4	2	34

MSA	Transportation	Facilities	Energy	Wastewater	Water	Communication	Totals
Hawaii							
Honolulu	2	5	1	1	1		10
Total	2	5	1	1	1	0	10
Alaska							
Anchorage	2	4					6
Total	2	4	0	0	0	0	6

Appendix F: Breakdown of Regional Projects

	Region	Transportation	Facilities	Energy	Wastewater	Water	Communication	Total
1	Global Financial Center	2	0	14	0	0	1	17
2	Southern California	5	1	5	0	0	0	11
3	Upper Midwest	2	2	3	0	0	0	7
4	Texas Triangle	9	5	11	0	2	0	27
5	National Capital	13	7	5	0	0	2	27
6	Florida Triangle	3	3	1	1	0	2	10
7	Mid Atlantic	2	4	4	0	0	0	10
8	Southeastern	6	3	2	0	1	2	14
9	Southwest	4	0	5	0	1	1	11
10	New England	10	5	10	0	1	3	29
11	Northern California	3	5	5	0	3	0	16
12	Great Lakes	10	5	6	1	2	3	27
13	Pacific Northwest	5	3	3	1	2	1	15
14	Northern Plains	5	4	4	0	0	0	13
15	Rocky Mountain	7	1	12	0	4	3	27
16	Agricultural Heartland	5	1	2	0	0	1	9
17	Carolinas & Charlotte	2	4	7	0	0	2	15
18	Lower Midwest	2	4	7	0	0	1	14
19	MidSouth	2	1	2	0	0	0	5
20	Gulf Coast	6	2	7	0	2	0	17
21	Hawaii	1	1	7	0	0	0	9
22	Alaska	2	0	1	0	0	0	3
	Totals	106	61	123	3	18	22	333

The Kinder Institute and the Authors

The **Kinder Institute for Urban Research** is a multidisciplinary think-and-do tank focusing on urban issues in Houston, the American Sun Belt and around the world. The institute is housed at Rice University in central Houston.

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Mission

The Kinder Institute for Urban Research builds better cities and improves people's lives by bringing together data, research, engagement and action.



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