January 2020

An Infrastructure Plan for the 21st Century

America's outdated infrastructure is in dire need of a 21st century overhaul – a D+ grade from the American Society of Civil Engineers' (ASCE) says as much. Deteriorating roads, waterways, airports and seaports more than just inconvenience the American people; they are liabilities to the country's economic future, affecting employment, productivity, public health, and the average quality of life. While some progress has been made at the state and local levels, support at the federal level remains muted. But the 2020 presidential election should bring the infrastructure debate into the spotlight. Candidates across the political spectrum are articulating their infrastructure development plans. Presidential hopefuls, policymakers and investors alike should look beyond headline dollar amounts, which will be in the trillions of dollars, and focus on more nuanced details around what tomorrow's infrastructure ought to look like. Infrastructure encompasses a wide range of structures; must cover vast geographic areas in the US; consider changing technology, demographics, and economic realities; and requires responsible financing. In this piece, we aim to avoid the politics and offer pragmatic ideas on what we believe a 21st century infrastructure plan should look like.

MIND THE GAP: US INFRASTRUCTURE INVESTMENT FALLS FAR SHORT OF NEEDS

The US requires $2T of additional investment over the next 10 years to adequately repair and replace existing infrastructure.[1] Funding needs to span myriad segments (see table) from physical infrastructure to the systems that enable commerce, transportation, and a functional society, representing possible investment across many sectors, industries, and end-markets. Without any major funding packages, the gap will only widen, but more concerningly, rising costs extend all the way to the economy's bottom line. Absent the necessary investment, the country risks losing $3.8T in GDP, $7T in business sales, and 2.5 million jobs by 2025. The effects will trickle down to American households, too, as the economic overhang could reduce household disposable income by $3,400 annually.[2]

Infrastructure degrades with use and loses its utility through obsolescence. In a vacuum, such inevitabilities are easy to plan for, but reality introduces unanticipated variables. Secular trends like urbanization and population growth are straining America's infrastructure beyond its intended functionality and capacity. The US population is 80% larger today than it was in 1960, when most of the major highways were built, and could grow another 22% by 2050.[3,4]

The ways the population utilizes infrastructure differs from the past, as well, further exacerbating the issue. For example, there are 1.2 registered vehicles per person on the road today versus 0.4 per person in 1960.[5,6] More people and more cars per person take their toll without proper reinvestment – 20% of the country's highways are in poor condition and more than 2 in 5 miles of urban interstates are congested.[7] And with urbanization trending upward – some project 87.4% of the population will live in cities by 2050 versus 82% today – critical roads will face more concentrated wear and tear and further congestion.[8] Roads are the simplest illustration of this strain, but the complex interconnected systems that make up the US' infrastructure assets face a host of challenges that require politicians at all levels, investors, and engineers to work together in building infrastructure that is fitting of the future.

UNDERFUNDED US INFRASTRUCTURE HAS COSTLY IMPLICATIONS

Sources: ASCE, Nation Safety Council, US DOE, EPA, FAA, American Association of Port Authorities, Amtrak, Bureau of Transportation, City of New York Office of the Comptroller

	CURRENT STATE	ECONOMIC/SOCIAL IMPACT	FUNDING GAP (USD BILLIONS)
SURFACE TRANSPORT	• 32% of urban roads are in disrepair • 9.1% of US bridges were structurally unsound in 2016 • States spent $70B on road repair, while federal government spent $2.7B in 2014	• Traffic delays cost $160B in productivity and fuel in 2014 • Traffic fatalities increased 14% since 2014 • Poor road condition cost $112B in vehicle repairs in 2014	$1,101
UTILITIES	• 70% of US transmission lines are at least 25 years old • 5.5% of drinking water systems serve 92% of the US population • 19% of US households are not connected to public sewers • Recycling rates hovered between 34-36% from 2010-2017	• 2018's 'Camp Fire,' was partially caused by faulty power lines, resulting in $16.5B in damages • 6B gallons of drinking water are lost to leaky pipes daily • 8% of drinking water doesn't meet EPA standards • 40% of recyclable waste is disposed of unsustainably	$285
AIRPORTS	• Aviation contributes to $1.5T of annual economic activity in the US • Airports contribute to 11.5M jobs, annually • 24 of 30 top US airports could soon face "Thanksgiving-peak"traffic volume every week	• Flight delays cost airlines, passengers, and businesses $28.2B in 2018 • The cost of flight delays grew by 6.9% annually from 2012-2018	$42
RAIL	• US passengers took 31.7M trips on Amtrak in 2018, 21M of which were in the Northeast Corridor (NEC) • The average age of major NEC backlog projects is 111 years old • 73% of Amtrak trains were on-time in 2018	• Service disruptions on the NEC cost $500M a year in productivity • Inadequate improvement of NEC service will result in $1.2B additional cost on highway and aviation systems by 2025 • New York City subway delays could cost the economy between $170-$389M annually	$29
PORTS AND WATERWAYS	• 99% of the US' overseas cargo by volume, 65% by value, passes through domestic ports • US seaport cargo activity supported 31M jobs in 2018 • Few US ports are deep enough to accommodate the largest ships that can pass through the Panama Canal	Inadequate investment in US ports could result in.. • $4T of lost GDP by 2025 • $575B cost to American businesses and households by 2025 • $14B of added costs to traded products by 2040 due to shallow harbors	$15

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INFRASTRUCTURE SHOULD BE OPTIMIZED, NOT MAXIMIZED

More roads and pipes may have been yesterday's solution to congestion, but today's densely populated urban areas require a more nuanced approach. 21st century infrastructure needs to be robust enough to support the ever-growing requirements of complex local and global economies, but also lean and dynamic enough to evolve with new technologies and changing demographic trends. In the following, we identify key areas where infrastructure can be optimized for the future

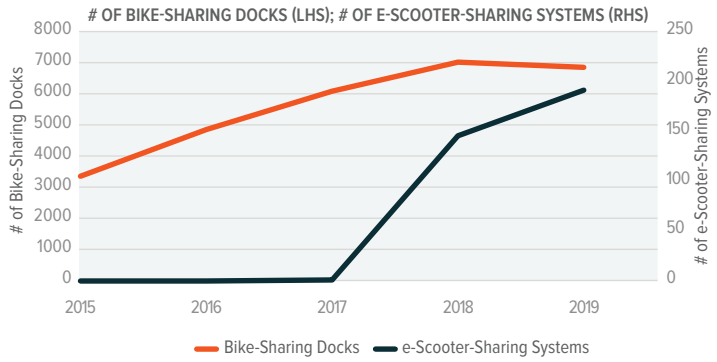
Encourage efficient, clean, last mile transportation

Given the degree of urbanization in the US, we should start with city transportation. Urban environments facilitate the rapid flow of human capital and business activity, but this can only happen with the right infrastructure in place. Building new highways and wider roads is no longer a realistic option for older cities looking to accommodate growth. The average American spends 97 hours in traffic a year, costing a total $87B in lost income.[9] America's next era of infrastructure must facilitate better mobility on congested streets and unnavigable urban sprawls.

Protected bike lanes streamline non-automotive travel and should prove essential in increasing overall transportation volumes. Cities have seen an uptick of bicycle and scooter ridership in recent years, supported by the mass adoption of non-auto vehicle-sharing systems (see below chart). These transportation modes are compact, easily stored, and can get to places that cars can't. But absent the necessary infrastructure, they can increase congestion and traffic accidents.[10] Networks of protected bike lanes provide riders with dedicated, safe travel alternatives and do positively impact existing traffic flows, if implemented correctly. New York City, for example, made room for them by reducing the width of lanes for driving and parking. The results are compelling – bicycle volumes increased by as much as 160%, overall traffic accidents causing injury dropped by 20%, and overall travel speeds either stayed the same or increased.[11] And bike lanes could more than just take single-passenger autos off the road, they make new developments like freight delivery bikes attractive, mobility-enhancing options for businesses and their customers.[12]

BIKE AND e-SCOOTER-SHARING SYSTEMS ON THE RISE

Source: Bureau of Transportation Statistics, Global X ETFs, 2019



Note: e-Scooter-Sharing Systems are the sum of systems per state, ie. the same provider will be counted twice if servicing two states.

Public transportation systems should provide commuters with affordable and efficient means of traveling mid to long range distances, but in US cities, they are either overextended or nonexistent. The next generation of infrastructure should make them a viable option for urban and suburban mobility and promote their widespread adoption. Underutilized systems like high-speed water taxis should be built out, with new ports and routes adding to their feasibility. More popular, traditional systems need efficiency-generating redesigns. Limiting bus routes to grids and bus lanes, for instance, would minimize redundancies and associated traffic congestion. Houston, Texas, devised such a system in 2015 and saw ridership jump 6.8% over the following 12 months.[13] Further, the advent of autonomous and battery-electric buses is supportive of expanded bus fleets that have lower operating costs and alleviate urban air pollution.

Subways and light rail, too, could see efficiency improvements without putting as much as a shovel in the ground. By installing open gangways and eliminating space between cars, as is the norm in most of the world, some estimates have subway capacity increasing by as much as 10%.[14] All systems could be further enhanced by connected devices, big data, and artificial intelligence. For example, internet-connected buses could collect and transmit data to a central hub that uses artificial intelligence to optimize bus routes and respond to changing demand.

Transportation infrastructure should be assessed holistically. Optimized point-to-point travel requires interconnected transit systems to enable route efficiency assessment. Mobility as a Service (MaaS) addresses this idea, integrating public and private transportation options and presenting them to the public at a single endpoint – a smartphone. In a MaaS model, users can choose between affordability, speed, and comfort across the multitude of transport modes available. On the other side of this, cities can leverage user data to further optimize transport options or implement demand-responsive pricing, such as adjusting congestion taxes or parking rates.[15] MaaS services are still in their infancy, but early trials of these revolutionary platforms in Sweden and Finland are encouraging. In the Swedish trials, 80% of customers said they wanted to continue using the service, though an assessment stressed that infrastructure improvements were needed for mass adoption.[16]

While more efficient use of roads, public transit systems, and bike lanes can help in the near term, innovation will need to constantly disrupt the way we travel and cities operate. New mediums of transportation may be these disruptors – hyperloop concepts describe transportation pods barreling through series of frictionless tubes at high velocity.[17] Or, the way we think about cities' physical infrastructure may completely change – developers in Arizona are building a community that will solely rely on non-auto transport and in Portland, Oregon, the Tilikum bridge only allows bikes, buses, and pedestrians.[18,19] Regardless, future infrastructure should consider throwing out old norms in favor of testing and optimizing new approaches.

Where the Silicon Hits the Road: Technology and Infrastructure Converge

Infrastructure and technology are more intertwined today than ever before. Changes in the ways Americans connect with each other, travel from A to B, and conduct business require new kinds of infrastructure. And at the brink of a digital age coined 'The Fourth Industrial Revolution,' designers of tomorrow's infrastructure must consider future technological advancement.[20]

The 21st century world is wireless and always connected. Satellites and cellular towers enable instantaneous internet access and communication, transmitting data that runs societies and economies. As new technology requires faster networks with more capacity, infrastructure needs to evolve in lockstep – enter 5G. 5G networks are faster, have greater bandwidth, and its physical imprint is a natural fit for a world that is running out of space. Instead of the fewer, large cellular towers that supported past generations' networks, 5G networks are comprised of many more small towers that have shorter range, but are more powerful. Adequate 5G implementation entails deploying hundreds of thousands of cells across the country and requires significant public and private sector partnership for installation and maintenance.[21] 5G networks provide the bandwidth necessary for millions of internet of things (IoT) devices to simultaneously connect without issue.

In our daily lives, IoT devices are our smartphones, wearables, and virtual assistants that, for the most part, make us more productive. Increasingly, they are also data-collecting sensors embedded throughout cities. Imagine traffic lights that precisely time traffic flows, vehicles that communicate with each other and infrastructure, and engineers knowing exactly when physical infrastructure needs repair. This revolution is already taking place in Nanjing, China, where sensor-equipped taxis, buses, and private vehicles transmit data to a central hub that sends smartphone notifications to commuters.[22]

IoT infrastructure will also be crucial in mainstreaming autonomous vehicles which rely on low latency data transmission to make split second driving decisions. Utilities services, too, will benefit as smart meters monitor water and electricity usage, efficiently distributing resources across entire cities. Cities like Singapore, Tokyo and New York City pledged to spend more than $1B on smart city planning in 2019 and such efforts will need to continue and expand across the continental US.[23]

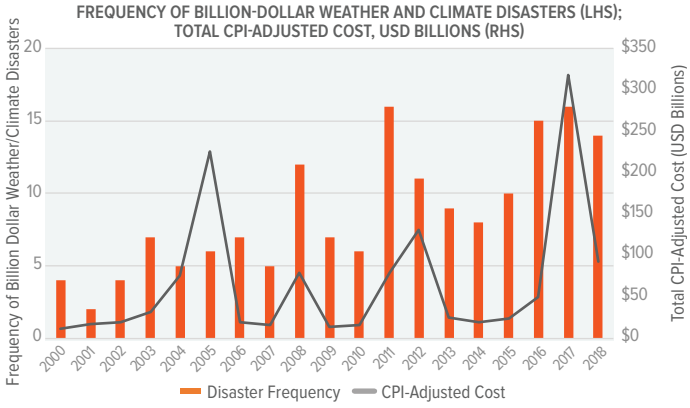
Commerce-facilitating infrastructure also needs an upgrade. This could include standardizing a national electronic payment system, an effort that global infrastructure leaders see as vital. Singapore, which many rank as having the world's best infrastructure, named e-payments as a core tenet of its Smart Nation Initiative, and already launched government-backed B2B and P2P platforms.[24] The World Bank identifies 7 infrastructure categories needed for such systems, including interbank gross settlement systems, communications technology infrastructure, and reliable electric grids.[25] On a greater scale, infrastructure supporting commercial aviation, maritime shipping and trucking needs technological enhancement. Aviation contributes to $1.5T of economic activity in the US, and while stretched airport capacity necessitates additional physical infrastructure, airline efficiency technology like the FAA's NextGen can limit congestion and should roll out nationally.[26,27] Similar optimization should be brought to the shipping industry, where port authorities name automation, big data and analytics, IoT, and AI as key investment areas.[28]

Weathering the Storm: Building Resilient Infrastructure for an Unpredictable World

Mother nature is harsher than ever, with disaster events occurring at unprecedented rates (see below chart), destroying infrastructure along the way.[29] With the opportunity to build trillions of dollars' worth of new infrastructure, it is equally important to protect that investment against climate events.

BILLION-DOLLAR WEATHER AND CLIMATE DISASTER FREQUENCY IS ON THE RISE, COSTING TENS OF BILLIONS

Sources: National Centers for Environmental Information, Global X ETFs, 2019.



Natural disasters cost the US $92B in 2018, an astonishing 20% of the federal funding afforded to disaster assistance over the past 14 years.[30] More resilient infrastructure could vastly reduce these costs. For physical infrastructure, this means focusing on architecture, engineering, and planning. Traditional enhancements like raised roadbeds, proper drainage systems, and strengthened levies and sea walls, can all help protect infrastructure and property during extreme weather events. Some of these efforts are already underway: a recent survey of the 50 largest US cities found that 240 infrastructure resilience projects are in the pipeline, totaling $47B and 60% of which are for managing flood risk.[31]

Innovative engineering goes further and can make resilience a key design consideration in construction. Cognizant of Malaysia's regular flooding during monsoon season, engineers in Kuala Lumpur built the city's Expressway 38 tunnel to serve as stormwater drainage tunnel during flash floods, thus far having mitigated 45% of total flood risk since its 2007 opening.[32] Innovation also makes retrofitting an option for protecting existing infrastructure. Years after the Great East Japan Earthquake of 2009, Japanese construction companies announced plans to install earthquake dampening pendulums atop the Shinjuku Mitsui building in downtown Tokyo.[33] And finally, disruptive technology like disaster-detecting IoT sensors, camera-equipped unmanned drones, and artificial intelligence, can be used alongside more traditional technologies like geographic information systems and satellite imaging to better predict and plan for natural disasters before they occur.[34]

Sustainability considerations are also important in building resilient infrastructure. Mismanaged stormwater runoff, for example, can eventually end up in drinking water and in the ground below physical infrastructure. Sustainable infrastructure like the before-mentioned example in Kuala Lumpur, can mitigate these risks. Ironically, unsustainable infrastructure can accelerate weakening of structures and negatively impact public health. Infrastructure associated with pollutive emissions like coal-fired power plants and combustion engine public transportation contribute to rain acidification which can degrade physical infrastructure like buildings roads and parks. Investment in renewable energy sources like wind, solar, hydro, among others, could mitigate some of these risks. This might make economic sense too. The levelized cost of energy for onshore wind and thin-film solar is cheaper than that of coal – this means that utility providers can charge less for renewably-generated electricity for a project to breakeven over its lifetime.[35] Electric vehicle infrastructure would also help to this end. More expansive charging station networks, especially in cities, might incentivize further EV adoption. The global stock of EVs is currently 5.1 million vehicles, but is expected to reach 130 million by 2030, representing a 34% CAGR.[36]

Resilience also means withstanding forces like obsolescence and population growth. While we have focused on keeping infrastructure lean, increased capacity is necessary in some cases. US ports, for example, are not deep enough to accommodate the growing size of containerships. Other maritime commerce hubs have kept pace: the Panama Canal, where $260B worth of cargo passes through annually, underwent recent expansion in anticipation of increased depth requirements.[37] Considering that 99% of the US' overseas cargo by volume passes through ports, creating $4.6T of economic activity, it would be incumbent for the US to modernize its ports to remain a competitive power in the global economy.[38] The US' utility infrastructure faces similar capacity constraints and obsolescence. 5.5% of the country's drinking water systems serves more than 92% of the population, and while urbanization definitely strains infrastructure in concentrated areas, capacity must increase according to current and expected population distribution.[39] Further, existing water systems need an immediate overhaul: 240,000 water main breaks occur each year, and even more concerningly, 2,000 water systems across all 50 states contain excessive amounts of led, 350 of those supplying water to schools or day cares.[40] Natural gas infrastructure faces similar pressure. While oil-producing states make natural gas abundant and cheap on the whole, transportation pipelines are lacking in certain regions like the Northeast.[41] This strains existing pipelines, inflates prices beyond what supply would suggest, and often results in oil producers burning surplus gas – also known as flaring – to affordably dispose of it.[42]

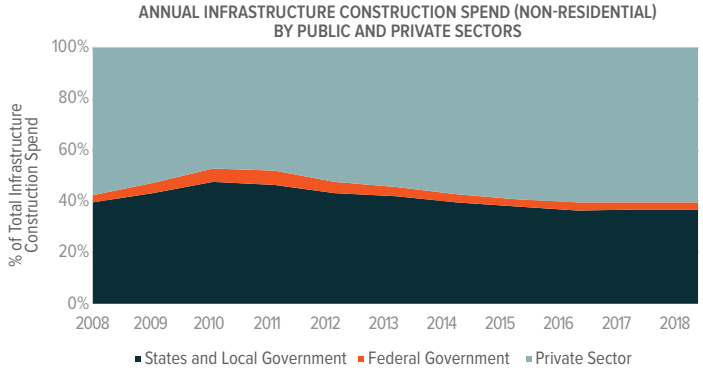
GETTING IT BUILT: SMART USE OF FUNDING WITH REDUCED RED TAPE

Infrastructure may be a top of mind issue on the national stage, but in reality, the federal government only owns 5% of the country's non-defense fixed asset stock, often used as a measure of infrastructure, and contributed to just 6% of infrastructure construction spending in 2018 (see chart).[43] State and local governments and the private sector, on the other hand, own the remaining 95% of those assets (30% and 65%, respectively) and are responsible for 94% of the spending.[44,45] States fund infrastructure by issuing municipal debt, general taxation, fees, and by establishing public-private partnerships (P3s) where the private sector takes on some or all of building or maintenance costs in exchange for fees or other revenue. Today's current economic backdrop is supportive of infrastructure spending – borrowing is

cheap, with interest payments' percent of municipal spending reaching the lowest in recorded history. Yet, infrastructure spending has decreased relative to the size of the US' economy.[46]

MUNICIPALITIES AND PRIVATE SECTOR LEAD THE WAY WHEN IT COMES TO INFRASTRUCTURE CONSTRUCTION

Source: US Census Bureau, Global X ETFS, 2019.



It makes sense that the majority of infrastructure is owned by local or state governments or the private sector. In theory, a decentralized model allows market forces to dictate the building and funding of local infrastructure. This can be especially valuable for a large, geographically diverse country like the US. Federally built infrastructure tends to be one-size-fits-all and politically driven, potentially resulting in sub-optimal decisions or additional layers of regulation. Still, federal funding is necessary for projects of national interest and, in many cases, is needed to complement funding from other sources. A new infrastructure plan should focus on removing the barriers that inhibit spending, fixing where federal programs went wrong in the past, and directing federal funding to best-suited areas.

Infrastructure investment only comes to fruition when capital is available and deployed for its intended use. In the US, infrastructure funds face issues on both fronts. The Federal Highway Trust Fund, for example, will be insolvent after 2021, according to the Congressional Budget Office.[47] The trust relies on income from the federal gas tax, which is not indexed to inflation and hasn't been raised since 1993. While increasing the gas tax would help recapitalize the fund, we believe the federal government should think of novel ways to raise capital that are in-line with how our country uses infrastructure today. In an age where combustion-engine vehicles are on the outs, this could mean installing sensors on vehicles and physical infrastructure that track usage, charging those who use it most, rather than charging at the pump. Such an approach introduces new revenue streams, giving the federal government more ability to fund infrastructure where its needed. However, funds need to be marked for particular use. Funds within the Harbor Maintenance Trust, which is the primary means of federal investment in port infrastructure, frequently flow into unrelated areas for federal budgeting purposes.[48] The federal government must prohibit misallocation of funds in cases like this.

Municipalities issue debt to pay for expensive upfront expenditures, while enjoying the flexibility of paying back the debt over time. And most importantly, municipal debt is not taxed at the federal level, meaning that the federal government forgoes revenue, passing savings down to municipalities. However, some studies show that in practice, the amount of foregone revenue can exceed the reduced costs municipalities see from preferential tax treatment, with the remainder going to individual bondholders with high marginal tax rates.[49] Other approaches, such as tax-credit bonds, can mitigate this inefficiency by issuing tax credits directly to borrowers.[50] The federal government can adjust the level of tax credit provided, allowing for customized subsidies to the public utility depending on its needs. Similarly, direct-pay tax credit bonds pass savings on to the borrower, with the federal government directly paying issuers a percentage of taxable yields offered to bondholders. Both options require that bonds are issued with yields that are competitive with taxable options.

The Build America Bond program, included as a part of the American Recovery and Reinvestment Act of 2009, shows how these vehicles can stimulate infrastructure investment. Allowing municipalities to issue either tax-credit or direct-pay bonds, the program resulted in 2,275 bond issuances across all 50 states, financing $182B in new infrastructure investment until its expiration in 2010.[51] Such bonds helped federal funding efficiently reach specific local infrastructure projects. A new infrastructure plan should consider re-authorizing Build America Bonds.

An extensive review and streamlining of regulations could further incentivize infrastructure spending and accelerate the building process. Regulations are important for protecting American citizens, the environment, and the economy, but they accumulate over time, creating redundancies and unnecessary oversight that the government doesn't have capacity for. Transportation projects, for example, must conform to almost 70 environmental regulations today, compared with 26 in 1970.[52] Further, projects that receive any amount of federal funding must be reviewed under the National Environmental Policy Act, a process which today takes 6.6 years versus 2.2 years in the 1970s.[53] Repealing these regulations could result in harmful externalities, but thoughtful review and consolidation should ensure that regulations are appropriate for future projects. Additionally, federal funding directed to the government agencies that review prospective infrastructure projects could accelerate the regulatory process and increase capacity for necessary oversight.

Activating the private sector could also bring an influx of capital to infrastructure and result in more efficient spending. In 2016, North American infrastructure funds had an estimated $75B of dry powder, indicating that while there is strong investor demand for infrastructure, there are scarce opportunities to invest in US' public infrastructure projects.[54] Privatizing certain infrastructure by transferring ownership of existing assets to the private sector or contracting private companies for projects could free up some of this capital. Private entities respond to their shareholders and focus on the overall bottom line, spending efficiently and generating returns. The public sector has less flexibility in this regard and can be forced to spend inefficiently. Amtrak, the federal government's passenger rail service, demonstrates these limitations, losing over a billion dollars a year to an inefficient system.[55] Elsewhere in the world, privatized rail services see far greater success. Japan, which is often touted as having the world's best rail systems, privatized the Japanese National Railways in 1987. Today, Japanese rails are profitable, efficient, and rely on almost no government subsidies.[56]

Public-private partnerships can yield similar benefit without fully transferring infrastructure ownership to the private sector. By transferring certain responsibilities to the private sector, projects are completed faster and for lower cost.[57] Australia's Road Traffic Authority employed a P3 structure for its 1996 Pacific Highway Upgrade, relying on multiple private sector organizations for design, contracting, and geotechnical services. Working together as a team with public sector oversight, the project closed out seven months early and for $100M less than anticipated.[58] Federal governments can direct spending to these types of arrangements. P3 supportive programs like the 2015 Build America Bureau, the Fixing America's Surface Transportation Act and the Water Infrastructure Finance and Innovation Act, are examples of federally funded programs that either streamline or enable P3 activity.[59] Further, federal support for tax-exempt private activity bonds can make it easier for private companies to raise capital for projects that serve the public. [60]

INFRASTRUCTURE'S IMPACT ON INDUSTRY

Associated spending for an infrastructure overhaul we describe would be in the many trillions, across the public and private sectors, and spanning countless industries. New and retrofitted physical infrastructure will require extensive raw materials including aluminum, for construction infrastructure and transportation; copper, for electrical transmission; cement, a key ingredient for making concrete; and steel. Further down the infrastructure value chain, companies exposed to the building process should benefit from increased spending, including those involved in construction and engineering for major structures, as well as those involved in the production

of heavy equipment. IoT, 5G, and the other technological aspects of future infrastructure should also benefit these component manufacturers, as well as those involved in the development and production of integrated products and solutions, applications serving smart grids, smart homes, connected cars, and the industrial internet.

CONCLUSION

Rebuilding the US' infrastructure lays an important foundational pillar for the country's future economic health - if done thoughtfully. The builders of tomorrow's infrastructure should ask the question: what does a 21st century America look like? America is urbanized, tech-driven, and faces natural and economic forces never before reckoned with. Infrastructure should be built accordingly, but it also doesn't build itself. Policymakers should consider novel and proven means of funding, attracting investment from municipalities and the private sector, while working to streamline the regulatory process to fast-track these critical investments.

RELATED ETFs

PAVE: The Global X U.S. Infrastructure Development ETF seeks to invest in companies that stand to benefit from a potential increase in infrastructure activity in the United States, including those involved in the production of raw materials, heavy equipment, engineering, and construction.

SNSR: The Global X Internet of Things ETF seeks to invest in companies that stand to potentially benefit from the broader adoption of the Internet of Things (IoT), as enabled by technologies such as WiFi, 5G telecommunications infrastructure, and fiber optics. This includes the development and manufacturing of semiconductors and sensors, integrated products and solutions, and applications serving smart grids, smart homes, connected cars, and the industrial internet.

DRIV: The Global X Autonomous & Electric Vehicles ETF seeks to invest in companies involved in the development of autonomous vehicle technology, electric vehicles ("EVs"), and EV components and materials. This includes companies involved in the development of autonomous vehicle software and hardware, as well as companies that produce EVs, EV components such as lithium batteries, and critical EV materials such as lithium and cobalt.

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