



# **U.S. Infrastructure**

## **BUILDING A BETTER FUTURE**

The U.S. Infrastructure sector, on the back of macroeconomic tailwinds, historically low bond yields, and technological advances, is set to undergo drastic change.

With a strong outlook for the second half of 2020, the dynamics between protectionist policy and government stimulus will only determine how much more the sector grows.

## Table of Contents

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### Introduction to Industry

Industry Overview.....	3
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### Development Characteristics

Project Funding	
<i>Private Project Funding</i> .....	3
<i>Public Project Funding</i> .....	4
Project Demand and Volume	
<i>Public Infrastructure Demand</i> .....	4
<i>Private Infrastructure Demand</i> .....	5
<i>Short-Term Demand</i> .....	5

### Trends

Technology.....	5
Regulation and ESG.....	6
<i>Environmental</i> .....	7
<i>Social</i> .....	7
<i>Governance</i> .....	7

### Infrastructure Sub-Sectors and Short-Term Outlook

Oil and Gas.....	8
Renewable Energy.....	8
Transportation.....	9
Waste Management.....	10
Water.....	11
Telecommunications.....	11
Aerospace.....	12
Manufacturing.....	12

### Outlook

Long-Term Outlook.....	13
Global Long-Term Outlook.....	14

### Financials

Infrastructure Valuation.....	15
Fixed Income Funding and Returns.....	16
Equity Funding and Returns.....	17

## Introduction & Development Characteristics

### Industry Overview

The infrastructure industry in the United States has seen steady growth over the past 5 years. Today's low interest rate environment along with the modernization of once rural areas in the US have led to a forecasted 3.9% growth rate over the next two years, with infrastructure projected to make up \$396.0 billion of GDP in 2022. Much of the US economy is dependent on reliable infrastructure, such as roads, electric grids, telecommunication frameworks, and manufacturing. Despite this, American investment in infrastructure is lower on average than neighboring countries. In fact, Canada spent 3.4% of its GDP on infrastructure investments in 2015, whereas the US spent 2.3%.

The main difference between the US and other developed countries is its use of state and municipal funding for infrastructure. Most European countries fund infrastructure federally, but only 25% of US public infrastructure spending is federal. With the decrease in demand for municipal bonds as a result of recent federal tax cuts, there has been a bigger push for private investment in infrastructure.

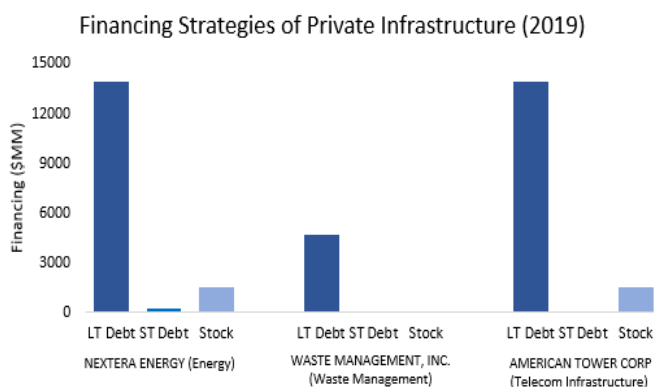
The importance of infrastructure can be largely attributed to its long-term economic returns. Infrastructure investments boast of an estimated \$3 growth in GDP per dollar spent. One of the industry's main contributions to the economy is through job creation, with 11% of the US labor force employed in infrastructure-related jobs. Furthermore, analysts estimate that an increase in spending of 1% of US GDP could add 1.5 million jobs. In a time of record-high unemployment due to COVID-19, there is an even bigger emphasis on job creation.

### Funding Characteristics

Infrastructure development plans are often large-scale projects with intensive upfront financing demands. These projects undertaken by businesses and contracted out by the government are long-term projects and can take many years of operation to recuperate costs. Financing for private and public infrastructure projects often vary.

### Private Project Funding

Due to the high capital demands of infrastructure projects, cash generated from operating revenues is often inadequate in funding projects, making financing necessary. Notable private industries with high infrastructure demands are energy, telecommunications, and waste management. Although each industry has unique operations, all three are funded in similar ways: with heavy use of long-term (LT) debt involving a mixture of notes payable, credit facilities borrowing and issuance of bonds. There is a relatively small reliance on the issuance of short-term (ST) debt and stock to fund operations. The following illustrates funding sources of the three largest American companies in each industry for 2019:



Due to this heavy reliance on debt, all three companies noted concern over the risk of increasing interest rates changes, the creditworthiness of their businesses, and their ability to acquire debt from existing credit facilities.

## Introduction & Development Characteristics

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### Public Project Funding

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Unlike private infrastructure, financing for public asset development is fueled by a combination of federal government grants which do not have to be paid back (such as the \$6.3 billion National Highway Performance program) and municipal bond issuances. However, if these are not sufficient, governments may opt to take advantage of public-private partnerships. These partnership arrangements solicit funding from the private sector needed to undertake public projects. Typically, these occur in exchange for partial equity ownership in the asset but can also take the form of debt to be repaid. Institutional entities participating in these partnerships are typically various types of investment funds, such as pension and hedge funds. Private equity groups such as Blackstone and Carlyle Group are also entities that are involved.

### Implication of Current Events

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Due to the lowering of the Federal Reserve interest rate from 1.75% to 0.25% in response to the pandemic, we expect to see higher levels of short-term borrowing in the private infrastructure space in expectation of future demand rising, even if projects are stagnated currently. Additionally, due to the necessity of the aforementioned public infrastructure projects, we expect to see higher private-public partnership style investments as well. This will be driven by many investors' risk averse interest in putting money in a relatively stable asset during volatile times.

### Project Demand

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Demand for infrastructure depends on the capital development needs of public and private industries. Examples of public services are projects on public assets, such as parks and roads and buildings. They can also emerge from the utility needs of the area, such as sewage system requirements. Private demand stems primarily from projects that require CAPEX spending, such as the construction of office buildings and communication towers. Aside from public utility infrastructure which exist on a need-based basis (such as waste management), demand for the infrastructure development relies heavily on government and businesses' willingness to spend on capital investments

### Public Infrastructure

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Many public utilities, such as hydroelectric dams and water treatment plants in the U.S., are funded and run on the state and city level, with varying demands and spending for each area. Transportation, however, is funded federally: the Department of Transportation spent \$22.1 billion in the first two quarters of 2020 on building contracts, of which 66% (\$14.6 billion) was spent on the construction and improvement of highways and bridges. The department's spending for the same two quarters for 2018 and 2017 were only \$15.0 billion and \$16.0 billion respectively, indicating a possible increase in spending interest regarding transportation for the near future. The cost of public infrastructure development projects is usually settled through bidding: development companies compete on price against one another to win contracts. Projects and bidding can take place on federal, city or state levels.

## Introduction & Development Characteristics

### Private Infrastructure

The demand for infrastructure development services on the private side relies upon the existence and continued success of industries which it serves. Purchase, refurbishment, and repair of capital assets such as buildings and machinery depend on the industries' confidence that the demand of their own products and services will increase. For this reason, we are able to get a general forecasting estimate of demand from the private sector by looking at the expected success of industries which require infrastructure investment.

The industrial production index measures manufacturing, mining, electric and gas industries output. Since these are major private industries needing infrastructure, the indicator is a suitable proxy for the health of the infrastructure development sector itself. The index had grown 25.6% in the 11 years since its decline in the last recession. However, due to the pandemic, industrial production declined by 10.9% as of June 2020. Because the success of the infrastructure development relies on growth of output demand, lowered industrial output leads to a decline in private CAPEX spending, due to fewer capital good purchases. It is further lowered by a lack of upgrades and the retirement of capital assets, as fewer amounts of it are needed to sustain the current output demand.



### Short Term Demand Implications

Due to the necessity of creating employment during pandemic times, as well as the declining conditions of many public infrastructure, as outlined by the American Society of Civil Engineers, there is a forecasted increased amount of project volume within the public space. By contrast, due to the stagnation in infrastructure needs of dependent private industries, private infrastructure will not have as many projects in the short term.

### Technological Trends

The rise in demand for infrastructure related to tech has led to increased development of telecommunication infrastructure. Data center deals helped drive a 36% increase in telecom deal value in the latter half of 2019 relative to the first two quarters. Cities across America and across the world are driving investment into potential "smart cities", AI, and enhanced data driven analytics. Investors showed increased interest in the U.S. data center/telecom and transportation/logistics sub-sectors in 2019. The \$1 trillion infrastructure investment plan by the Trump administration sets aside funds for 5G wireless infrastructure and rural broadband, which will be necessary tech infrastructure.

The current low interest rate environment and the large spending plans like the one proposed by President Trump show promise for large expansion in the infrastructure industry.



## Trends

Data center spending and subsequent energy supply will likely continue to grow throughout 2020 and 2021 as cloud computing competitions from the Big 3 of cloud computing (Microsoft Azure, Amazon Web Services and Google Cloud Platform) will drive up both prices and demand for storage, ultra large facilities, and energy.

## Regulation & ESG

The scale, cost and time commitment of infrastructure projects, as well as the consequences involved in the case of failure means that there is a high degree of quality assurance and regulation in infrastructure. Addressing ESG concerns is a critical part of many infrastructure companies, following previous and ongoing controversies with regard to environmental and social issues. While these issues are most present during the construction phase of the project, they can also take place later in the asset's life due to poor maintenance oversight. When investing in infrastructure, governments and investors must be keenly aware of all parts of the development process, from sourcing to eventual divestiture or disposal.

While the Trump administration is weighing a \$1 trillion dollar proposal to defibrillate the economy, it would reserve most of the money for the much needed traditional infrastructure work of modernizing and introducing more bridges, roads, and pipelines, making no mention thus far of ESG and energy in the plan. However, with the rising importance of community engagement and Indigenous reconciliation, projects with environmental and social opposition may have a more difficult time getting approval.

The growing emphasis on incorporating ESG in infrastructure poses a threat for industry players and investors in non-ESG fields. As the trend towards ESG investing continues, funding and financing at reasonable rates for these projects will become increasingly difficult. The six largest U.S. banks pledged to reduce their funding of carbon-intensive projects and instead finance clean infrastructure projects. Over the next few years, analysts believe it is inevitable that significant value in non-ESG compliant assets will become stranded or lost. At the same time, however, it is clear that the extractive resource industry will live to fight onwards for many more years.

Despite the rise of ESG compliance, the majority of the 10 largest US infrastructure deals of 2019 were extractive resource deals. Promising yet obscure potential technologies such as Direct Air Capture (for directly removing carbon from the air) and Air to Fuel emerging as potential entrants in the clean energy markets leave the future wide open for a further rise in ESG-centred projects, with a myriad of technologies, resources, and companies all competing for their place in the switch to a cleaner US infrastructure.

U.S. Infrastructure Top 10 Deals of 2019	
#1 Buckeye Partners Acquisition	\$10.3B
#2 Calcasieu Pass LNG	\$7.3B
#3 BP Alaska Upstream and Midstream Acquisition	\$5.6B
#4 El Paso Electric Co. Sale	\$4.3B
#5 Ohio Valley and Utica East Ohio Midstream Platform Investment	\$3.8B
#6 Oryx Midstream Acquisition	\$3.6B
#7 Tallgrass Energy Co. Acquisition	\$3.2B
#8 WaterBridge Resources Acquisition (20% Stake)	\$2.8B
#9 Direct ChassisLink Sale (80% Stake)	\$2.5B
#10 Cove Point LNG Sale (25% Stake)	\$2.1B

## Trends

### Environmental

Development of infrastructure without regard to environmental considerations can have devastating effects on the local environment. This issue particularly plagues the energy infrastructure sector, where mistakes could have cascading ecological consequences and reputation damage. A notable incident of such is the Keystone XL (TC Energy) pipeline spill in North Dakota in 2017. Although the root cause was a welding anomaly and may have been caused by a third-party construction error, the environmental and reputation liability ultimately fell on TC Energy, illustrating a need for proper oversight.

The growth of impact investing, a market now estimated to be worth more than \$500 billion, and the similar growth of the Green Bonds markets emphasizes the rising popularity of global sustainable investing. In fact, sustainable investing is estimated to have reached more than \$30.0 trillion in 2018. As such, sustainability now yields a greater power to influence infrastructure planning and decision making in a more ESG-compliant direction. This past September, 87 major companies representing more than \$2.3 trillion in market capitalization committed to support the 1.5 degree goal set at the Paris climate talks.

Additionally, even extractive resource industries are taking clean energy into consideration. Some players in oil production, coal extraction, and mining are soliciting long term clean energy deals to minimize their environmental footprint. Moreover, there has been a push to invest in cleaner revenue streams in a forward-looking plan to become more ESG-compliant. Oftentimes, companies also purchase renewable energy credits (RECs) in an effort to reach carbon emission goals.

### Social

Infrastructure construction projects often require the procurement of large amounts of land. In certain cases, this may infringe upon sensitive lands or the lands of others; investors must take strong prudence regarding these disputes, which can lead to tarnished reputation, lawsuits or project delays. The Dakota Access Pipeline, for instance, had been strongly protested in 2016 for infringing upon sacred Indigenous lands and cultural heritage locations. This caused significant delays in completion and remains a controversial issue.

### Governance

Lack of project oversight is a key issue in infrastructure. Most infrastructure projects require significant amounts of material in construction; while infrastructure companies and governments most likely contract construction companies to oversee building, lack of oversight into development can cause significant financial or reputation loss through project failure.

A report on infrastructure by PwC highlights that when public projects are undertaken by the government alone, they are more prone to cost more and deliver slower. The report suggests public-private partnerships (P3) are a more efficient alternative, as private entities face more risk in not delivering on time or going over budget. However, this introduces the possibility for confusion over project management. Clear and transparent guidelines must be placed in order to ensure P3 success.

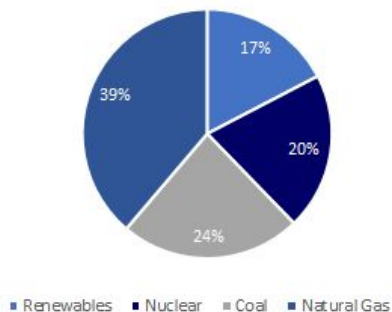
## Infrastructure Sub-Sectors

### Oil and Gas Energy

Energy infrastructure encompasses two categories, energy production and transmission. Firstly, energy production is created by the process of turning a turbine that relies on the burning of petroleum, natural gas or coal. The latter includes systems that focus on the delivery of this energy from the generation plant to the consumer.

Amidst the pandemic, the markets have seen unprecedented oil price territory. However, since then, negative prices have bounced back to \$40. Though the industry has been hurt, infrastructure investment is imperative to sustain normalized energy demand. The ICF and INGAA estimated that the U.S. will need \$417 billion in natural gas infrastructure, oil infrastructure investment of \$321 billion, and NGL infrastructure investment of \$53 billion. Even with rapid progress in the renewable energy sector, energy production from oil and gas is essential to meet daily demand.

#### Sources of U.S. Electricity Generation (2019)

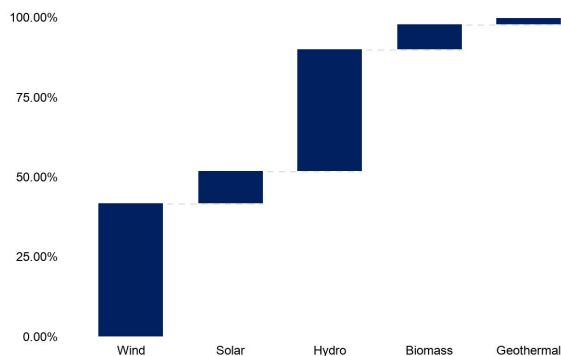


Source: EIA, 2019

### Renewable Energy

Renewable energy continues to grow at a rapid rate and take a larger share of total energy production in the U.S. The most significant energy production sources are generated from solar, wind, geothermal, and hydropower. The increase in renewable energy investments has led to more reliance on renewable energy generation on the electric grid. Changing generation mixes in traditionally fossil fuel driven states (such as Texas and the now large amount of wind in ERCOT's grid) underscore the popularity and affordability of renewables. As of June 2020, wind and solar energy's share in total US generation has continued to rise, averaging 12% compared with 10% in 2019. Despite this, the need for capacity and energy base loads for grid reliability render traditional sources such as natural gas and coal a necessity on most grids.

#### Sources of U.S. Renewable Electricity Generation (2019)



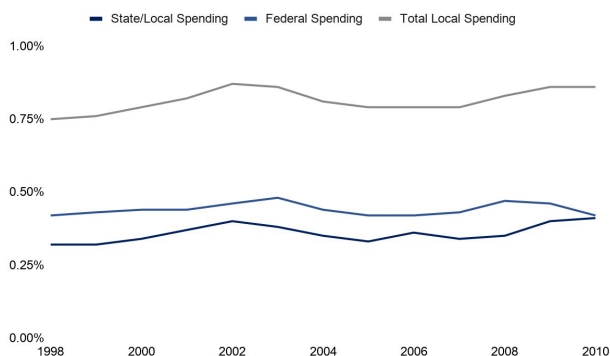
Source: NRCAN, 2019



## Renewable Energy

Renewable energy generation sources' low costs will continue to usher in a new era of resource rivalry. Rapid growth and government support of the renewable sector will help assist in a greener earth and lower energy rates for consumers. The largest obstacles come from energy storage and transmission to meet demand and mitigate the amount of renewable energy lost in the process (~16%). Large-scale deployment of renewable energy generation will require additional transmission to connect renewable resources to consumers. Currently, these systems are widespread across the U.S. but regionally constrained to load centers. This sector remains heavily underutilized in the U.S. even as the cost of electricity generated from wind and solar have decreased sharply over the years. EPA estimates that the US power sector will need a 2.1 trillion investment by 2035 to modernize the electricity grid and prepare for more new renewable energy.

### Transportation Funding as a Share of GDP



Source: Statista, 2010

## Transportation

Transportation infrastructure systems facilitate the efficient movements of goods and services, promote trade commerce, connect supply chains and reduce operating costs across a diverse set of industries. These systems mainly include highways, bridges, railways, airports, transit systems and waterways like canals. In the past The United States' infrastructure represented the top architecture and engineering, in 2002 the U.S. was ranked 5<sup>th</sup> in the World Economic Forum rankings falling as low as 24<sup>th</sup> in 2011. Since they have recovered slightly to 13<sup>th</sup> after Obama's plans to prioritize transportation infrastructure investment.

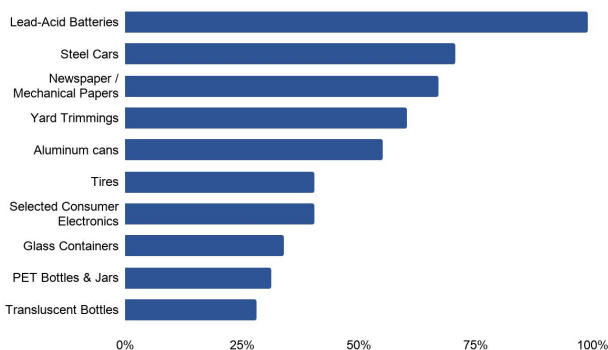
The current state of U.S. transportation infrastructure needs significant support. Estimates report that one in nine bridges are deficient, while costs of fuel and time due to road congestion amount to \$101 billion and airport delays cause a \$22 billion drag on the economy. However, in the pandemic it has caused widespread decreased travel demand resulting in a negative outlook from S&P Global Ratings that will damage this sector for a substantial amount of time. The rising deficit and decreased expectations on returns of transportation investments may deter financing from the much-needed investment that is needed in the U.S. transportation network.

## Waste Management

Waste management infrastructure supports the collection, transportation, processing, and disposal of waste materials produced by human activity. The four main services of waste management include landfills, reduction, composting, and incineration. Landfills are the oldest disposal method and are mostly established in abandoned quarries and mines. In recent years, it has been difficult to justify the use of a landfill because of increasing value of land and alternative uses. Additionally, landfills are known to cause problems like windblown garbage and the production of leachate that pollutes the groundwater. Incineration involves the burning of waste at isolated facilities and can be used as a source of energy. However, it has been proven to be a poor generation source, as most of the energy is lost in the atmosphere. Reduction is either the compacting of existing waste or the process of resource recycling. Resource recycling is also considered secondary resource recovery which involves the reprocessing of materials that would otherwise be considered waste. This method is an excellent method to reduce waste, however, it is rejected by most because secondary materials tend to have higher costs than virgin materials. Composting is used to eliminate pathogens in the process of breaking down waste to produce soil and clean water. Companies typically use aerobic or anaerobic bacteria as breakdown agents. There are three stages of breakdown to create soil and clean water out of waste. First, the initial treatment will inorganic debris, while the second treatment will settle out the solids and allow the breakdown of pathogens in the waste. The final stage renders the waste free of pathogens and leaves soil that can be used productively.

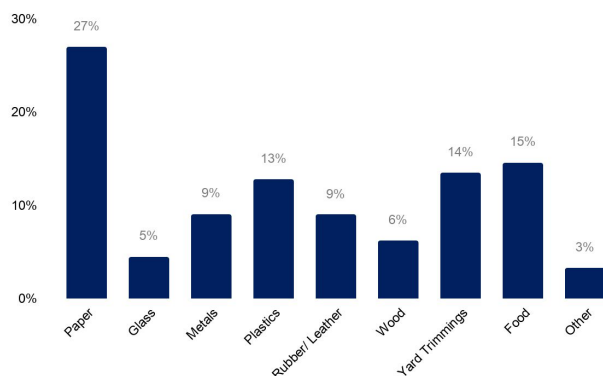
The U.S. is considered one of the largest waste producers relative to their population, generating 248.0 million tonnes of waste annually. In fact, 53% of this waste ends up in landfills while only 34.6% are recycled. Currently, the U.S. can sustain these levels of waste. However, with a growing population and global warming, a focus of investment has been emphasized to be put towards recycling initiatives. Waste management committed \$110.0 million to recycling infrastructure and plans to continue this investment annually. Government subsidies have been encouraged to assist this private sector in accelerating the shift to widespread recycling.

**Recycling Rate of Materials in the U.S.**



Source: EPA, 2019

**Total MSW Generation**



Source: EPA, 2019

## Water

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Water infrastructure is a broad term for systems of water supply, treatment, storage, resource management, flood prevention, and hydropower. The industry breaks down into three main categories: drinking water supply systems, domestic wastewater management systems, and stormwater runoff control systems and management practices. Firstly, drinking water supply systems encompasses infrastructure required for water treatment facilities, treated water storage and the distribution systems needed to deliver water from the storage plants to the user. Typically, pipes and pumps are designed to meet anticipated demand from customers and are controlled through municipal systems to meet that demand adequately. The latter, wastewater management are responsible for collecting, pumping and discharging water to the wastewater, reclamation and reuse facilities. Lastly, stormwater runoff control systems and management practices include pollution prevention and reduction practices embedded in runoff collection and treatment facilities.

Water infrastructure has three main issues challenging it: renewal and replacement of aging water systems, financing for capital improvements, and the long-term water supply availability. The US Environmental Protection Agency shows \$472.6 billion is needed to maintain and improve the nation's water infrastructure over the next 20 years to ensure public health, security and economic wellbeing for cities in the U.S.

## Telecommunications

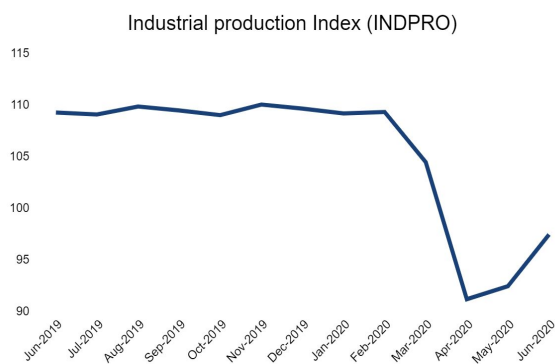
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Telecommunication infrastructure is the physical medium through which internet flows. These systems are primarily funded in the private sector and include telephone wires, cables, satellites, and mobile technology. In 2019, the top four telecom companies were responsible for \$54.0 billion in capital expenditures to enhance communication for the everyday user.

The COVID-19 pandemic induced an increase in demand for broadband internet as work-from-home (WFH) and social distancing measures pushed people towards more online activity. The U.S. has fared well compared to countries like Europe, where their telecommunication infrastructure could not withstand the surge in streaming activity and WFH users. Fortunately, The U.S. has had heavy telecom investment through 2010 to sustain the surge in broadband usage. Investment in telecommunication infrastructure in the next decade will be driven by 5G integration and the lasting effects of the work from home movement.

## Manufacturing

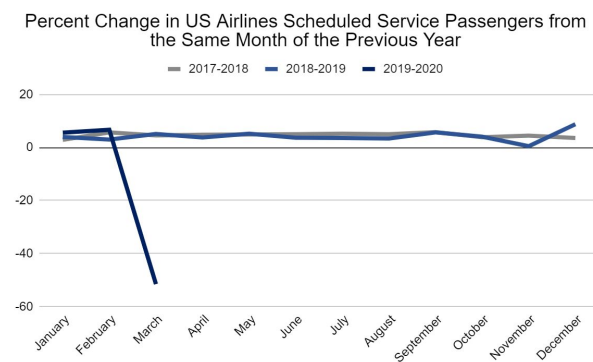
The US manufacturing purchasing managers index (PMI) moved into expansion in early 2020; however, US industrial production registered a month-over-month decline in March and April at 4.5% and 11.2% respectively, courtesy of the COVID-19 pandemic.



This downward trend, based on the Oxford Economic Model (OEM), is expected to cause US manufacturing GDP to decline by 14% in 2020 and wiping 10 years of manufacturing job gains. For example, automotive factories have become a breeding ground for the novel coronavirus. In particular, many plants were forced to shut down all together as it became a severe safety concern. In the short-term, manufacturing companies have adopted crew scheduling and balancing programs as an effort to promote social distancing and prevent the spread of COVID-19. The main focus for these companies is to rebuild their disrupted supply chain, revamping their sourcing of raw materials to movement of goods. Multi-sourcing strategies will play a huge role in the new and improved manufacturers, helping companies increase flexibility and resilience by reducing dependency on individual suppliers and improving transparency.

## Aerospace

Aerospace is one of the industries most affected by the COVID-19 pandemic. Prior to the pandemic, although deliveries struggled due to production issues, global passenger traffic has increased steadily for more than 15 years and was on route for a record year in 2020. The exponential growth in COVID-19 cases shattered demand within a matter of weeks with no hope for a V-shaped recovery. Analysts project that it would take as long as three years for global passenger traffic to return to pre-COVID-19 levels. For the aerospace sector, the prolonged decline in travel demand will directly translate to a lasting decline in aircraft deliveries. Having experienced production and safety-related issues in certain aircraft models in 2019, global aircraft delivery projections for 2020 are down more than 50% from 2018 (the peak year for deliveries), sitting at just under 700 aircrafts (compared to nearly 1,500 in 2019 and 1,400 in 2018). Starting the first week of April, several airlines have announced cancellations on their newly order aircrafts as a desperate attempt to scramble for cash.



## Outlook

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### Long-Term Outlook

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The industrial sector is expected to begin recovery within the second half of 2020. As companies launch their post-COVID-19 initiatives and strategies, investors believe that initial growth projections can still be met while adapting to the new normal. From a long-term perspective, companies across the sector will continue to struggle with decreased demand as governments face significant decline in GDP and employment rates.

As mentioned earlier, the Trump administration has proposed a \$1 trillion infrastructure bill with hopes to revive the US economy. The president hopes to take advantage of record-low interest rates as a result of the novel coronavirus to capitalize on infrastructure development. These funds will primarily be reserved for traditional infrastructure focused on transportation but will also be made available for 5G and broadband development. The Trump administration believes that the boost in funding, along with appropriate payroll tax cuts, will directly address the needs of small businesses and result in a “Big Economic Bounceback”. However, economists warn that it is critical to assess the feasibility and focus of these proposals. Some argue that while transportation development may be a beneficial solution, the current focus needs to be on telecommunication infrastructure considering the long-term thematic of workplace productivity.

Regardless of potential government intervention, companies will need to make significant modifications to the workforce and workplace to reposition for growth. Times of crisis reveals opportunities for growth, and there is no better time to leverage digital technologies to enhance productivity and move forward on the recovery timeline. As companies regain traction, they can use this opportunity to accelerate and adopt advanced technology to help increase efficiency and reduce manpower. Companies and manufacturers will look to incorporate augmented and virtual reality into their design process and diversify their original supply chain and sourcing ecosystems.

Once again, the second half of 2020 is where the industrials sector are expected to transition from navigating the pandemic to thriving and emerging stronger for the new normal. The new and improved industrial sector will heavily rely on digital transformation and aftermarket services. By examining current service structures and supply networks, companies can effectively leverage their technological breakthroughs from the pandemic.

The current inflationary environment and all time low interest rates force will push investors farther along the risk spectrum. Assets such as municipal bonds and other bond-like investments with stable cash flows will certainly be far less attractive as their rates of return are closely correlated with the U.S. 10-Year Treasury. On the other hand, the record-low interest rates has made credit easily accessible to companies. As the industrial sector is mainly financed with debt rather than equity, this proves to be an incredible opportunity for firms to increase research and development into advanced technologies.



## Outlook

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### Global Outlook

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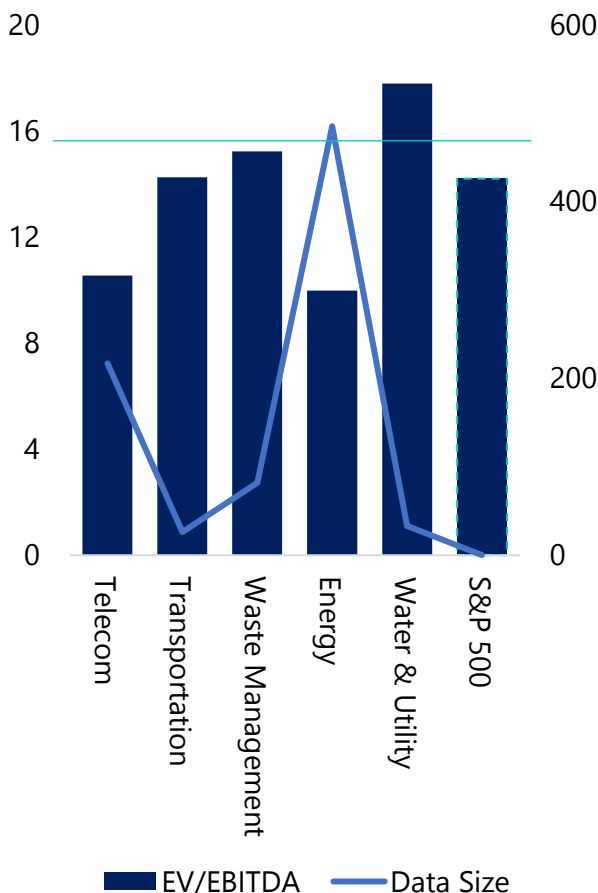
On the global scale, China continues to be a world leader in 5G and solar technology, having essentially cornered those markets. China's large construction boom provides them with the modern expertise in construction and technological innovations to outbid and outperform American firms on large construction projects. The One Belt One Road initiative, a federal Chinese global infrastructure development strategy which aims to invest in over 70 countries and international organizations, poses a threat to American firms, increasing competition both abroad and potentially domestically. However, potential protectionist policies regarding technology infrastructure and fear of Chinese dependence and espionage seems to be a saving grace for American telecom companies. Many governments' decisions to move away from Huawei as a 5G provider and the Meng Wanzhou political dispute seem may be a silver lining for American Huawei competitors. While America turns inwards, China turns outwards in terms of infrastructure in general, with the aforementioned OBOR initiative costing an estimated US\$4–8 trillion.

## Infrastructure Valuation

### Multiples

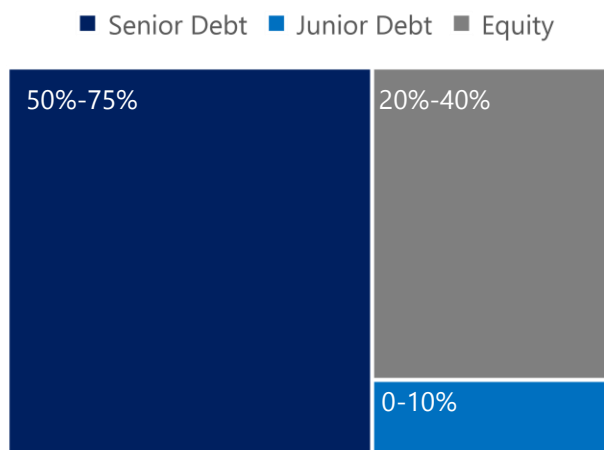
As of January 2020, most infrastructure sectors had EV/EBITDA multiples lower than the average multiple in the S&P500.

Historically, while infrastructure as a whole has had positive beta values that correlated with the overall index, the entire sector is treated as a risk-off investment. This is due to revenues mostly being uncorrelated with overall economic health: electricity, waste management, and water treatment facilities all need to be maintained at a constant service level regardless of macroeconomic conditions.



### Typical Capital Stack

Typically, equity only takes up a limited portion of a projects total costs. Hence to consider and gauge the condition of the infrastructure market, not only equity investments, but also fixed-income investments should be taken into account.



### COVID-19 Developments

When the virus hit, interest rates across North America virtually dropped to 0 overnight.

For massive infrastructure projects that are based on a floating rate and have not had their interest rates fixed, this is a heaven-sent gift that will dramatically lower debt servicing costs, improve DSCR ratios, and increase IRRs.

The lower interest rates will also serve as a tailwind for future infrastructure projects going forward.

On the equity side, investor appetite has shifted towards safer investments as well, with infrastructure stocks higher and infrastructure bonds yields lower.

## Fixed Income Funding & Returns

### Private and Public Infrastructure Bonds

Corporate bonds can be senior secured, unsecured, or subordinated. Oftentimes, senior infrastructure debt offers a more stable and less risky investment than unsecured but also lower yield.

The maturity of bonds are usually much longer than typical debt, as infrastructure projects can stretch on for several years before reaching completion, and then several more years for cashflows generated from revenue to flow back into the hands of debt investors, equity investors, and then finally the project owners themselves (if private).

Despite the skewed risk and reward timeframe for these projects, the long-dated cash flows are highly prized by pensions and life insurance companies as they offer higher yield than typical U.S. treasuries or municipal bonds.

The main risks for an infrastructure bond is as follows. Depending on if the bond was public or private, risk profiles may change. For example, private bonds usually hold much higher liquidity risk than public

Liquidity Risk

Technology Risk

Varies based on Greenfield vs Brownfield Projects

Revenue Risk

Management Risk

Development & Construction Risk

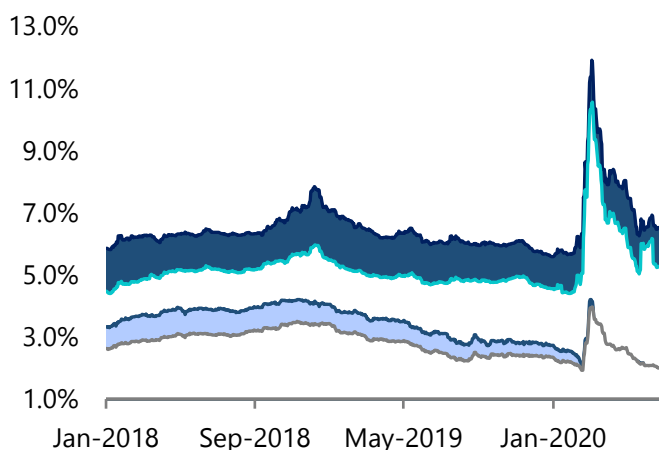
### Corporate Bonds: Lower Yields Across the Board

Comparing yields from infrastructure bonds with yields of corporate bonds of similar credit rating shows that in the past two years, infrastructure bonds have consistently produced lower yields than regular corporate bonds of the same credit rating.

This can be attributed to two possible reasons. One, infrastructure projects pose much less risk relative to other uses of corporate bond proceeds.

Another possibility is that infrastructure attracts much more foreign investment from countries with low interest rates, and thus they are more receptive to low yielding fixed income instruments than domestic investors who are less attracted to infrastructure.

- S&P HY Corporate Bond Index
- Brookfield Infrastructure Corporate HY Index
- S&P IG Corporate Bond Index
- Brookfield Infrastructure Corporate IG Index



## Equity Funding & Returns

### Equity Investments: A Divergence

Equity investments in the infrastructure sector can be measured through indexes, commodity prices, and ETFs.

Since 2018, there has been a clear divergence in the amount of equity investments going into the various infrastructure sectors, with oil and transportation lagging beneath the S&P while Renewables and Water Resources have outperformed.

The Communications sector has more closely tracked the S&P than in previous years partially due to large cap companies like FB and Alphabet being added. In 2018, the Telecommunication sector was renamed the Communication Service sector to include companies that offer communication services through various media sources. This allowed companies in the Media industry like Disney to join the Communications sector as well.

### Infrastructure ETF Performance by Sector

— Crude WTI      — Transportation ETF (XTN)      — Communication ETF (XLC)  
 — Water Resources ETF (PHO)      — Clean Energy ETF (ICLN)      ..... S&P 500

