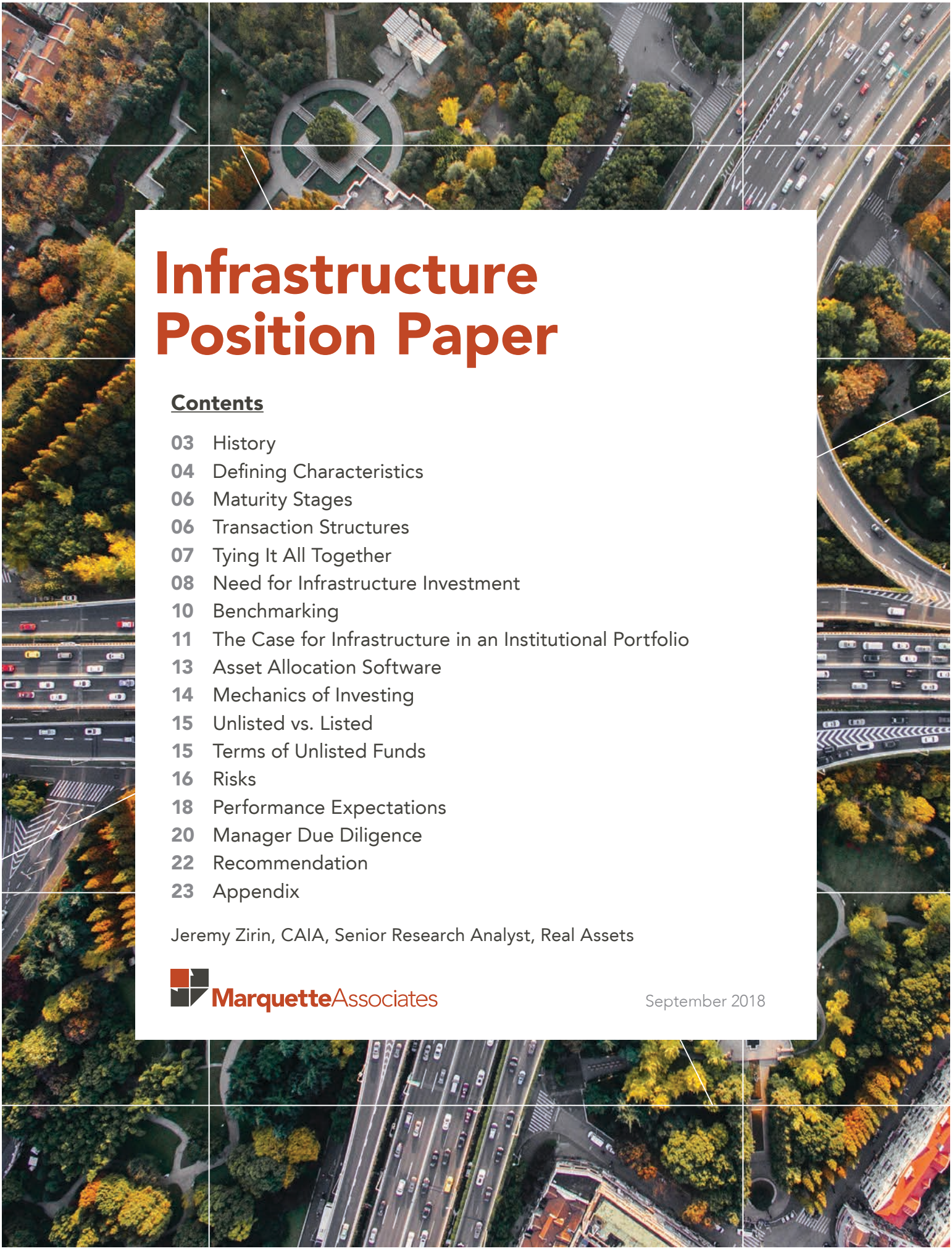
MarquetteAssociates

Infrastructure Position Paper

September 2018



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Jeremy Zirin, CAIA, Senior Research Analyst, Real Assets

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Infrastructure is a relatively new asset class to institutional investors and over the last twelve years has emerged as a sustainable addition to client portfolios. The following paper examines the asset class in great detail, from its early beginnings in the 1980s to its current day role in an institutional portfolio. In particular, the nuances of infrastructure — as well as its unique characteristics — are discussed in an effort to cultivate a thorough understanding of the asset class. Recommendations and guidance towards making an allocation to the asset class are also included.

HISTORY

Infrastructure assets are the physical assets and networks necessary to operate a society. It goes without saying that if a country is to develop and compete on a global scale, rudimentary infrastructure is of paramount importance. Although private sector involvement in the provision of infrastructure can be traced back more than two centuries, it was not until the 1980s when infrastructure privatization emerged as a world-wide trend. The most well-known privatizations occurred under British Prime Minister Margaret Thatcher's administration: when she was first elected prime minister in 1979, the British government still owned the coal, steel, oil, and electricity industries, several auto companies, the telephone system, and a major airline, among other holdings. By the time of her resignation in 1990, all had been privatized by Thatcher.[1]

The full privatizations of state owned enterprises were soon followed by the introduction of public-private partnerships ("PPPs") in the early 1990s. This model was pioneered in the U.K. with the launch of the Private Finance Initiative ("PFI"). Driven by demand to increase expenditures on public social infrastructure, the PFI model was developed to transfer the risks of the design, build, finance, and operate ("DBFO") functions of infrastructure to the private sector.[2] Since its inception, the PFI model has been restructured to incorporate a broader range of public sector projects and PPP is now used as the umbrella term incorporating the wide range of public sector projects. PPPs have since been widely used in Australia, Continental Europe, and Canada, while the U.S. has been slow to embrace the trend of privatization. Historically, U.S. governments have facilitated the development and maintenance of infrastructure assets through general taxes or the municipal bond market.

Naturally, the increased privatization trend has created an abundance of investment opportunities, as large amounts of capital are needed to undertake the private acquisition, financing, and operation of such large-scale assets. Institutional investing in infrastructure dates back to the 1990s when Macquarie Bank in Australia acquired its first infrastructure assets in the wave of Australian state and federal government privatizations. The significant privatization programs — which included airports, roads, telecommunications, and electricity and gas companies — were estimated at AUD$61 billion of assets, the second largest value of privatizations of all countries in the 1990s.[3] Demand for these infrastructure assets was met by the mandatory formation of superannuation funds (pension plans) in 1992 which required workers to earmark funds for retirement savings. Because these infrastructure assets offered long-term assets, they were a natural fit for funds with long-term liabilities and continue to be a natural fit for institutional investors today.

The trend of purchasing assets next moved to Canadian plans in the late 1990s and has since been followed by European and U.S. investors. Public authorities in Europe and much of the developed world have been unwinding infrastructure assets for no less than three decades, with a quickening trend in recent years. Most major European airports, including those in London, Frankfurt, and Paris, are owned and operated by publicly traded corporations. Meanwhile, firms outside of the United States have led the way in devising the business models and financing structures that have made these privatization transactions possible.

DEFINING CHARACTERISTICS

Infrastructure is commonly referred to as the backbone of an economy because it is a prerequisite for sustainable economic, industrial, and social growth and development. Though infrastructure assets can be in various stages of development, there are commonly accepted attributes of infrastructure assets once operational:

- Essential Service to Society: Infrastructure assets provide key services that are critical in everyday life.
- Inflation Protection: Revenue streams are often linked to inflation through concession agreements, long-term purchase agreements or governed by regulatory regimes.
- Long Asset Life: Infrastructure assets are long-lived hard assets with useful lives ranging from ten to ninety-nine years.
- Low Elasticity of Demand: Due to the essential nature of the services provided, demand for infrastructure services can be relatively sheltered from swings in economic activity, depending on the specific asset as well as viable alternatives.
- Monopoly/Quasi-Monopoly: Infrastructure assets are typically large-scale investments with very high initial fixed costs and substantial economies of scale; as a result, they exhibit high barriers to entry.
- Regulatory Oversight: Due to the monopolistic/quasi-monopolistic market position of infrastructure providers and the essential nature of the services they provide, government involvement in infrastructure is high.
- Stable and Predictable Cash Flows: Infrastructure assets often benefit from long-term operating contracts and/or regulated pricing. When combined with the above characteristics, assets tend to generate relatively stable and predictable revenue streams.

Infrastructure assets are commonly defined by their physical characteristics and grouped into two main categories: economic and social infrastructure; however, these two main categories encompass a broad array of sectors, examples of which are illustrated in the table below.

Exhibit 1: Infrastructure Sectors

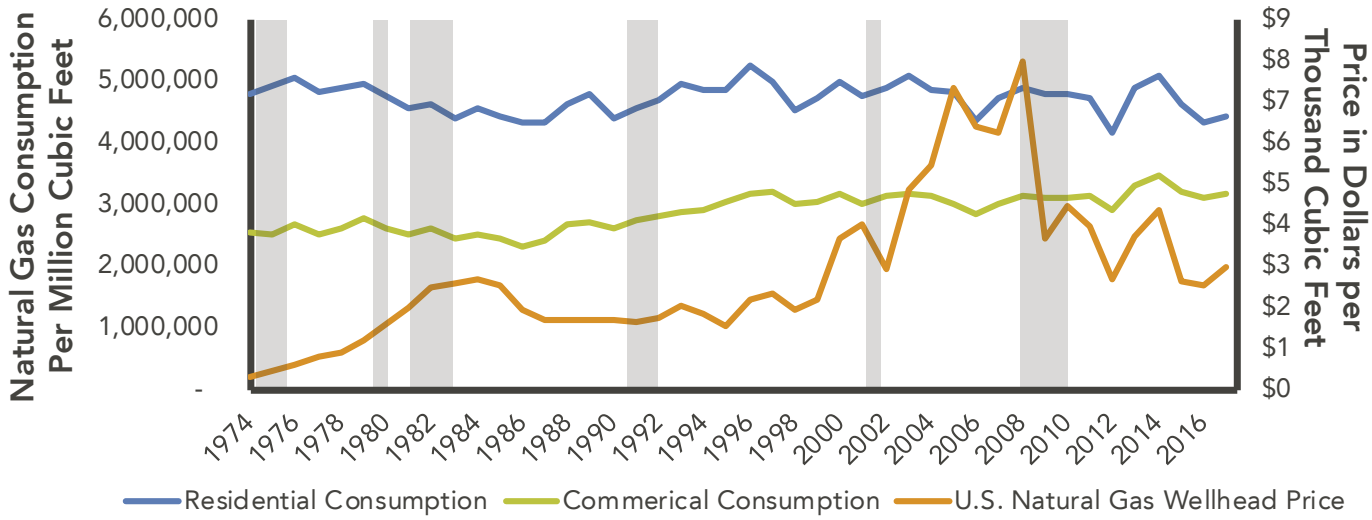
Economic Infrastructure			Social Infrastructure
Transportation	Energy & Utility	Communications	
Airports	Electricity	Broadcast towers	Courthouses
Bridges	Gas	Cable networks	Hospitals
Rail	Oil	Mobile towers	Prisons
Roads	Pipelines	Satellite networks	Schools
Seaports	Water/Waste Water		
Tunnels	Solar/Wind		

Economic infrastructure assets can be further separated by their characteristics, specifically the demand and supply dynamics of each type: throughput, regulated, and contracted. Throughput assets derive income per usage unit and prices are determined by the operator/owner. Regulated assets derive income from users, but prices will be determined by a regulatory body (usually a government), and the asset owner has some degree of protected pricing power. Contracted assets are operated via a contract between the operator and an entity, usually a government or a private body; the contract determines the pricing system and identifiable revenues of the asset. To better understand the differences among the three types, the following examples will assist in explanation.

A transportation asset should be considered a throughput asset, as users pay a fee per usage unit (i.e. a toll on a highway). Though the throughput asset may exhibit high barriers to entry and a long useful life, if users cannot afford the fee or have an (albeit inconvenient) alternate, usage will diminish, and the value of that asset will decrease accordingly. Usage fees can be tied to inflation and therefore provide an inflation hedge, but if usage is down dramatically even an increase in the usage fee may not be enough to offset the decrease in demand. An example of cost pressure on a throughput asset is a toll road: the cost of driving increases due to a rise in gasoline prices, so a driver determines if any alternative modes of transportation are available. If alternatives exist (such as a train), the driver may choose the less expensive option than driving, which in this case would be the train. Thus, traffic on the toll road may decrease due to an external shock: gasoline prices. If traffic on the toll road decreases, the income on the toll road decreases, thereby reducing the current value of the asset (in this example, the toll road).

Energy and utility assets are predominantly regulated assets. As utility usage generally exhibits static demand regardless of economic cycles, the prices of these assets do not fluctuate considerably. Therefore, they are considered inelastic and sheltered from dramatic demand drops even if prices increase. Enhanced value of the asset is thus derived from operational efficiencies, cost cutting, increasing market share, and effective negotiation with the regulatory body setting prices. As an example, the graphic below depicts the inelasticity of natural gas demand. Since 1974, the price of natural gas has steadily increased (except for the 2008 – 2010 drop coinciding with the Great Recession), yet consumer and commercial demand remained steady even during periods of recession (gray bars).

Exhibit 2: Natural Gas Consumption and Prices



Source: U.S. Energy Information Administration. EIA discontinued gathering the Wellhead price in 2012. 2013–2017 prices represent the Henry Hub Natural Gas Spot Price

Communication assets are contracted assets: there is an underlying contract between the owner and the operator determining the provisions of the asset. As these assets exhibit monopolistic characteristics, there is an easily identifiable income stream and consequently, stable asset value. Increasing the asset's value is therefore dependent upon operational efficiencies, cost cutting, and growth into new markets through development and acquisition.

Because the definition of infrastructure is broad and subject to interpretation, some industry participants have included other categories: state lotteries, parking facilities, stadiums, and power generation. As a practical matter, what is considered to be infrastructure depends heavily upon the context in which the term is used. The assets Marquette Associates focuses on are the ones that contribute to the benefit, continuation, sustainability, and growth of society.

MATURITY STAGES

The stage of development at which an investment is made is a critical determinant of the risk/return profile of a project; however, it is not necessarily the defining one. Existing assets currently in operation are generally referred to as "Brownfield" assets, whereas new assets under development are known as "Greenfield" assets:

Greenfield (Primary): Projects that require new construction or development where no previous facilities exist. Investors fund the construction of the project as well as the maintenance after it is designed, built, and operational. Greenfield investments can generate higher returns than Brownfield investments as these investments introduce risks relative to development, in addition to the operational risks applicable to Brownfield assets. Investments are sold or refinanced once the project has been completed and the risk profile has been reduced. Development risk can be offset through concession agreements, contracts, and assignment of construction risk to the contractor(s). Greenfield investments can be characterized by a "j-curve" profile of the cash flow stream.[4] These assets can generate significant capital gains but may offer only limited or no cash yield to investors.

Brownfield (Mature): Existing, well-established, cash flow generating infrastructure assets with stable operating histories. Investors may seek to improve the asset by creating operating efficiencies, increasing revenues, or reducing expenses. Brownfield investments are perceived to be lower risk than new projects because investors can assess the likely success of the project by referencing the historical demand and financial data of the asset. Compared to Greenfield projects, the scope for capital appreciation is more limited; however, Brownfield assets tend to provide regular and stable cash flows.

Rehabilitated Brownfield: Existing assets that require significant capital for maintenance, major retrofitting, or expansion while at the same time generating some current income from operations. These types of investments are effectively a blend of Brownfield and Greenfield risks/returns.

TRANSACTION STRUCTURES

There are three basic structures of private investment in infrastructure: Privatization, Private Transaction, or Public-Private Partnership ("PPP" or "P3"). These methods shift responsibility for (possible) construction, financing, and operation of the asset to the private sector thereby leading to more rigorous economic and financial scrutiny of the asset by the government or regulator.

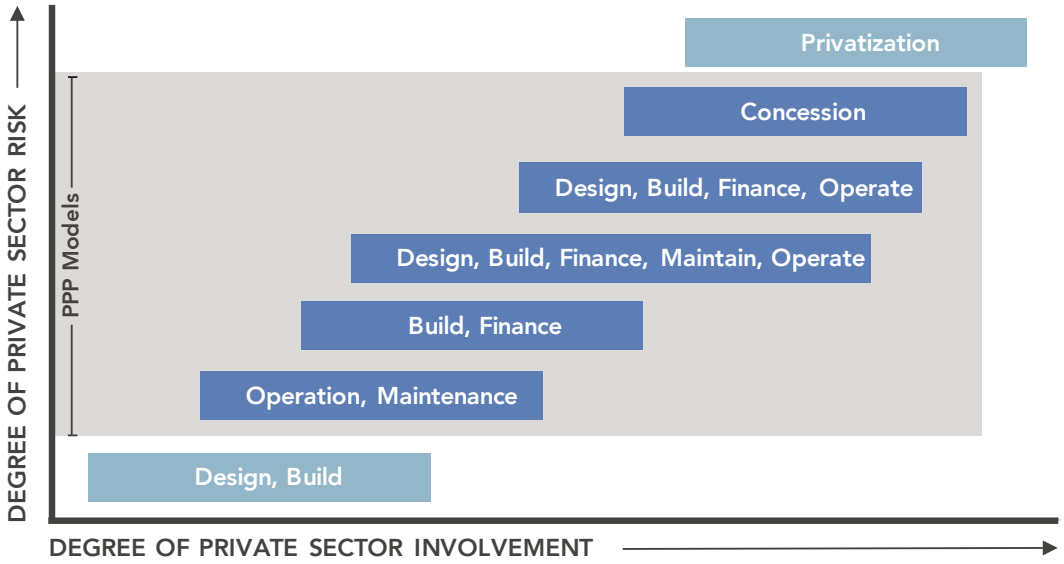
Privatization: The sale or divestment of government owned assets to a private sector company that may bear the costs, benefits, and risk of building, operating, and maintaining the asset. In some cases, the government entity may retain oversight and certain rights over the operations of the asset. The private sector operator of a fully privatized asset must meet contracted service requirements and conform to applicable regulatory standards. Full privatizations are less common in the U.S. compared to the rest of the world due to the limited number of "state-owned enterprises" from which to begin. Privatizations can also be referred to as "denationalization" or "commercialization".

Private Transaction: These transactions refer to the sale of privatized assets from one private investor to another. In the U.S. for example, many infrastructure assets in the energy and telecommunications sectors are already in private hands and trade from operator to a fund or vice versa. Most private transaction investment opportunities are in electricity transmission and distribution, gas distribution, water and waste-water, port and container terminals, and telecommunications towers.

Public-Private Partnership ("PPP" or "P3"): A government body engages the private sector in the financing and operation of a public asset. While there are many different PPP structures, they generally involve the design, construction, financing, operation, and maintenance of public infrastructure. Although the degree and nature of private participation may vary, in a PPP the public sector retains some exposure to operating and financing risks. The underlying principle of a PPP is that better value is achieved by leveraging the competencies of the private sector and allocating the risks to the party best positioned to manage them. For example, the public sector may

provide financing to the private sector entity responsible for making the asset available for use. Commonly, PPP investment opportunities are in transportation, schools, hospitals, healthcare facilities, and water and waste-water. The graphic below illustrates the varying degrees of private sector involvement and risk in PPP transactions.

Exhibit 3: The Scale of PPPs: Risk Transfer and Private Sector Involvement



Source: The Canadian Council for Public-Private Partnerships

The terms privatization and public-private partnership are commonly used interchangeably. While some industry participants consider privatizations a form of PPPs, for purposes of this paper we separate the two to avoid any confusion. Industry participants frequently refer to toll road transactions, such as the Chicago Skyway, as privatizations. However, a more detailed look into the transaction reveals that in 2004 the City of Chicago awarded a 99-year concession to Cintra/Macquarie, who bid $1.83 billion to assume operations (and subsequent revenues) of the Chicago Skyway. Skyway Concessions Company, LLC (SSC) was selected to act as the operations company, take responsibility for maintenance costs, and retain toll and concession revenues. This agreement between SCC and the City of Chicago was the first long-term lease of an existing toll road in the United States. This was a PPP, not a privatization.

TYING IT ALL TOGETHER

At this point, readers unfamiliar with the asset class may be confused by the plethora of categories by which infrastructure assets can be categorized. As discussed, infrastructure can be sorted by sectors (economic and social), and the economic sector can further be parsed by throughput, regulated, and contracted descriptors. Infrastructure assets can also be sorted by maturity stage (Greenfield or Brownfield) and transaction type (privatization, private transaction, public-private partnership). The different categories are not mutually exclusive but can help to specifically articulate a type of infrastructure asset. For example, the purchase of an existing toll road by an infrastructure fund from a state would be described as a public-private partnership of a Brownfield asset; the asset would be further categorized as a throughput economic asset.

Perhaps the most user-friendly method of labeling infrastructure investments is to separate them into core and non-core buckets. A general partner ("GP") will determine whether it will invest in core or non-core infrastructure assets. In the infrastructure world, core equates to low-risk/low-return assets and non-core equates to higher risk/higher-return. Generally, an open-end fund will have more exposure to core assets as its focus is distributable,

predictable cash flow to investors. A closed-end fund is likely to feature a greater weighting to non-core assets to increase the return potential of the fund at exit. Depending upon the investor's appetite for risk tolerance and return expectation, the balance between core and non-core assets will determine what type of fund he/she will select. The common contents of core and non-core funds are as follows:

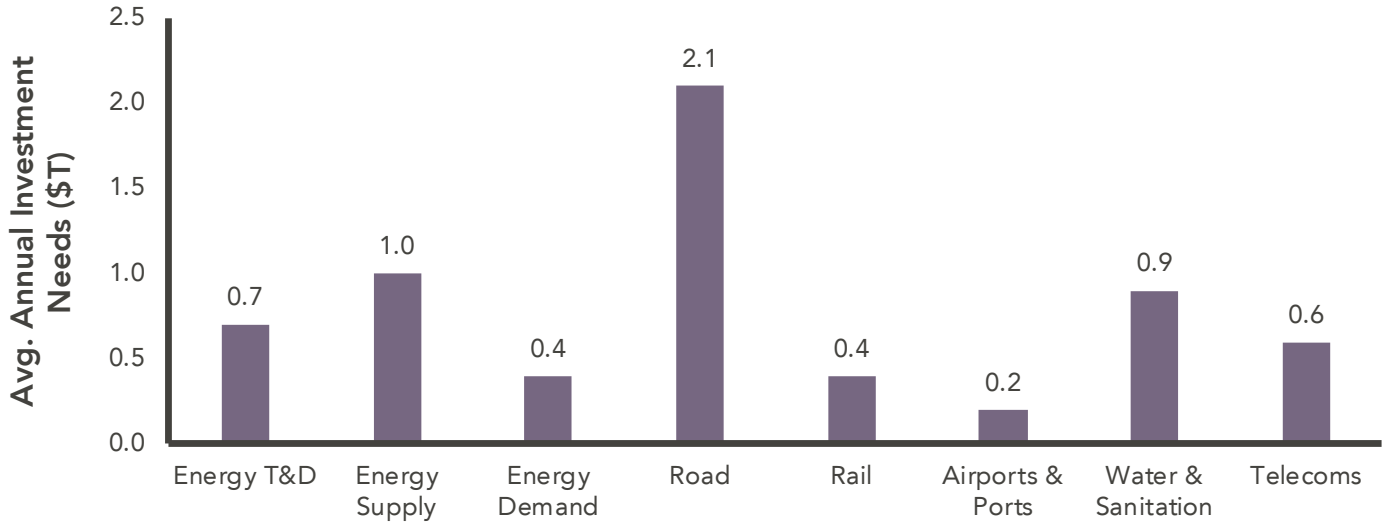
- **Core:** social infrastructure, existing transportation assets (roads, bridges, and tunnels), and mature regulated utilities. Bulk of fund will be in Brownfield assets and minimal Greenfield or development exposure. Cash flow modeling is predictable. Assets structured as privatizations, PPPs, or private transactions.
- **Non-Core:** invest predominantly in economic infrastructure categories, not social infrastructure. Funds feature more risky transportation assets (rail, seaport, and airport), utility generation and expansion, and communication assets. There is an exposure to Brownfield investments, but a higher allocation (relative to core funds) to Greenfield investments (i.e. construct a pipeline) as well as Brownfield Rehabilitation. Assets in the fund are more privatizations or private transactions.

Ultimately, infrastructure funds will encompass different weights of core and non-core assets in their strategies; the most attractive element of the core and non-core discussion is how it simplifies the categorization process of infrastructure assets into two broad categories. These two categories provide transparency into the underlying holdings, strategies, and risk characteristics of funds available for investor use.

NEED FOR INFRASTRUCTURE INVESTMENT

As reported by the Organization for Economic Co-operation and Development ("OECD"),[5] infrastructure is a means to ensure delivery of goods and services that promote prosperity, growth, and contribute to quality of life, including the social well-being, health, and safety of citizens, and the quality of their environments.[6] The world's population is expected to grow on average at 1.0% per annum until 2030.[7] Growth in population begets construction of infrastructure and services, but at a cost: it is projected that 3.8% of the world's GDP[8] is needed for investment in electricity, rail, roads, and water per year. With this growth, the private sector has a tremendous opportunity to participate.

Exhibit 4: Projected per Annum Global Infrastructure Investment Needs by 2030 ($T)



Source: OECD, "Investing in Climate, Investing in Growth", July 2017

An equally rough calculation suggests that for the current period through 2030, total cumulative infrastructure requirements across the above sectors would amount to about $95 trillion.

Not surprisingly, the glaring need for global infrastructure spending also applies to the United States: the historical under-investment, coupled with the lack of available public-sector funding, has impaired the government's ability to deliver public services at adequate levels. The American Society of Civil Engineers (ASCE) estimated that $4.5 trillion needs to be invested through 2025 to upgrade the nation's infrastructure. In its annual report, the ASCE in 2017 gave an overall "D+" grade for the condition and capacity of infrastructure structures in the U.S., further highlighting the need for additional investment.[9]

Exhibit 5: America's Infrastructure Report Card

Sector	2017 Grade	2009 Grade
Aviation	D	D
Bridges	C+	C
Dams	D	D
Drinking Water	D	D-
Energy	D+	D+
Hazardous Waste	D+	D
Inland Waterways	D	D-
Levees	D	D-
Public Parks & Recreation	D+	C-
Rail	B	C-
Roads	D	D-
Schools	D+	D
Solid Waste	C+	C+
Transit	D-	D
Wastewater	D+	D-
Overall	**D+**	**D**

Source: American Society of Civil Engineers 2017 Report Card

Given the elevated levels of under spending, what are governments doing to address the problem, and how has that created opportunities for investors? Since the 1980s, more than $3.3 trillion[10] of assets have been privatized. The privatizations have mostly occurred in utilities, transportation assets, telecommunications, and oil facilities. Historically, governments have facilitated investment in the development and maintenance of infrastructure assets through general taxes or the municipal bond market. However, governments have been faced with numerous fiscal pressures to cut spending in order to reduce debt and budget deficits. The result is that over the last 35 years, most governments have progressively reduced their expenditures on infrastructure, shifting their focus instead to more politically sensitive expenditures such as education, healthcare, underfunded pensions, and defense. As governments continue to reel because of an inability to secure capital, they are realizing they cannot continue to maintain and expand infrastructure; there is (begrudging) recognition that the private sector can and must assist

Consequently, governments and public agencies have begun looking beyond the traditional funding methods to private investment in infrastructure via privatizations and public-private partnerships ("PPPs"). As a result, ownership and operation of infrastructure assets has been gradually moving from the public to the private sector on a global level. With this trend, the role of government has shifted from the provider of services to that of a regulator. This has provided a stream of investment opportunities and fueled development of a distinct alternative asset class for

institutional investors that complements fixed income, public equities, real estate, and traditional private equity investments.

BENCHMARKING

Investing in private market alternative investments can pose a number of challenges to institutional investors when seeking to gauge the relative performance of their investments. Infrastructure is a less established asset class with a limited performance history.[11] Subsequently, there currently is no industry standard benchmark for private infrastructure investments (also referred to as "unlisted funds" as they are not traded on an exchange). The most common benchmarks currently in use for direct infrastructure portfolios appear to utilize a risk premium/margin over a variable component such as CPI.

However, while there currently is no viable industry standard benchmark for private infrastructure investments, IPD/MSCI developed the MSCI Global Quarterly Infrastructure Asset Index, a valuation-based index based on an appraisal methodology dating back to 2008. As of March 2018, the index comprised of approximately $70 billion in enterprise value with assets across Australia (46%), Europe/UK (42%), North America (9%), and New Zealand (3%) within the following sectors: transportation (31%), power transmission (18%), airports (16%), water (14%), renewable energy (13%), power generation (3%), public facilities (2%), other (2%), and communication (1%).

While the sample size of the MSCI Global Quarterly Infrastructure Asset Index is relatively small and heavily weighted to Australia/Europe and transportation assets, the index provides a close measure for unlisted private infrastructure. Illustrated in the exhibits below, the MSCI Global Quarterly Infrastructure Asset Index has delivered strong risk-adjusted returns (high Sharpe Ratio) since inception through December 2017 with a 13.1% annual return and 4.0% standard deviation. Additionally, the index displays low correlations against other broad asset classes implying attractive diversification within a portfolio.

Investors should be reminded that unlisted infrastructure assets are typically appraised by third-party appraisal firms on an annual basis and adjusted quarterly. Appraised values tend to lag the true market value of the underlying asset which causes the return stream to be smoothed. The smoothing effect artificially lowers the volatility and correlations causing risk-adjusted performance measures to be inflated.

Exhibit 6: Unlisted Infrastructure Risk/Return Correlation Comparison (2008–2017)

	Wilshire 5000	MSCI ACWI ex-U.S.	BarCap Agg	NCREIF	MSCI Global Infra.
Annualized Return	8.6%	2.3%	4.0%	6.1%	13.1%
Annualized Risk (Std Dev.)	16.8%	20.5%	3.3%	5.7%	4.0%
Sharpe Ratio	0.37	-0.01	0.46	0.62	2.66

	Wilshire 5000	MSCI ACWI ex-U.S.	BarCap Agg	NCREIF	MSCI Global Infra.
Wilshire 5000	1.00				
MSCI ACWI ex-U.S.	0.90	1.00			
BarCap Agg	-0.29	-0.11	1.00		
NCREIF	0.25	0.08	-0.21	1.00	
MSCI Global Infra.	0.11	0.10	0.26	0.40	1.00

Sources: Bloomberg, MSCI

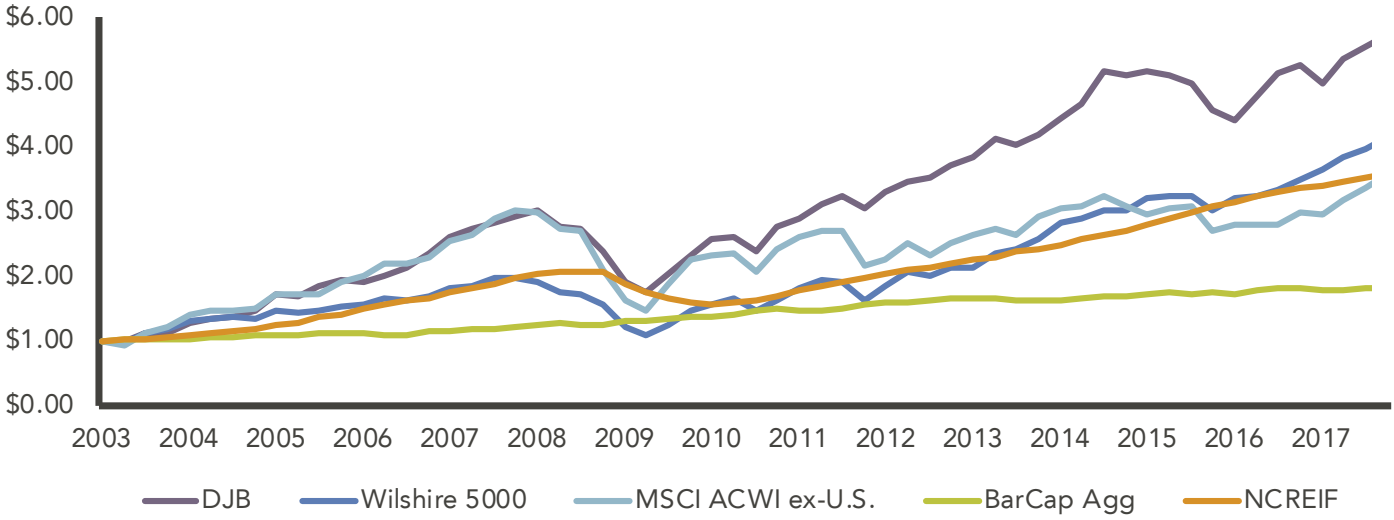
Although unlisted infrastructure is the main area of interest for potential investors, listed infrastructure (traded on a public exchange) can give insight into types of assets and companies that infrastructure investing encapsulates. Infrastructure companies, whether listed or unlisted, generate substantial cash flow, exhibit barriers to entry, and demonstrate pricing power. Within listed infrastructure, the companies are broken down into three distinct categories: pure-play, core, and broad.[12] Performance of listed infrastructure is more transparent than unlisted as it is publicly traded and there are numerous infrastructure benchmarks.

It should be noted that unless one subscribes to the data series, information on these indices is difficult to gather. Of the four main indices available for listed infrastructure (see appendix for details), the Dow Jones Brookfield ("DJB") Infrastructure Index is the most appropriate index for investors seeking a pure-play benchmark as it measures the performance of companies that exhibit pure-play infrastructure characteristics. A focus on long-dated cash flows is required by the index, as constituents are mandated to have more than 70% of cash flows derived from pure-play infrastructure lines of business.[13] For the sake of this paper, we use the DJB index as our data source by which to evaluate infrastructure investments, as it offers the most appropriate measure of the asset class. Construction of infrastructure indices is difficult as there are not any definitive guidelines of what infrastructure is, but the DJB is the best option among the choices.

THE CASE FOR INFRASTRUCTURE IN AN INSTITUTIONAL PORTFOLIO

As mentioned previously, there is no viable dataset to evaluate private ("unlisted") infrastructure investments, so our best option is to use the DJB index for analysis of the asset class. Using the DJB index as a proxy for infrastructure investments, it is quickly apparent that infrastructure can add considerable value to an institutional portfolio. The chart below illustrates the growth of a dollar from 2003 through December 2017 (time period chosen because 2003 is when the DJB index was launched). Apparent is that infrastructure has featured the highest absolute return over that time period, when compared to traditional institutional portfolio constituents U.S. and non-U.S. equities (as approximated by the Wilshire 5000 and MSCI ACWI ex-U.S. indices, respectively), bonds (BarCap Agg), and real estate (NCREIF Property Index).

Exhibit 7: Growth of a Dollar, 2003–2017



Source: Bloomberg

Of course, looking at absolute return independent of risk is not especially insightful, because ultimately investors want to maximize return per unit of risk. Thus, using the Sharpe Ratio is usually more helpful when making portfolio allocation decisions. In the case of infrastructure, the risk adjusted return, or Sharpe Ratio, is not the highest of the asset classes in the graph below, but compares favorably, in contrast to bonds, U.S. and non-U.S. equities.

Exhibit 8: Risk & Return Analysis (common period March 2003 – December 2017)

	DJB	Wilshire 5000	MSCI ACWI ex-U.S.	BarCap Agg	NCREIF
Annualized Return	12.4%	10.4%	9.2%	4.1%	9.0%
Annualized Risk (Std Dev.)	14.5%	14.9%	18.9%	3.3%	5.2%
Sharpe Ratio	0.68	0.53	0.36	0.50	1.25

Source: Bloomberg

Equally important is how infrastructure can help diversify a portfolio. Using correlation analysis, we can examine how an allocation to infrastructure can enhance the diversity of an institutional book of assets. From the table below, it is apparent that listed infrastructure has a relatively low correlation to bonds and real estate. The low correlation to real estate is especially notable because infrastructure and real estate are often classified as similar asset classes due to their characteristics (income producing, "real asset" category). It should also be noted that the correlations between infrastructure and equities (both U.S. and non-U.S.) appear quite high, but that is partially explained by the fact that we are using a listed index as a proxy for infrastructure. The DJB is subject to many of the same market forces that drive equity markets; in reality, an investment in an unlisted product can be expected to have lower correlation to equities than as suggested by the information below.

Exhibit 9: Correlation Matrix (common period March 2003 – December 2017)

	DJB	Wilshire 5000	MSCI ACWI ex-U.S.	BarCap Agg	NCREIF
DJB	1.00				
Wilshire 5000	0.81	1.00			
MSCI ACWI ex-U.S.	0.84	0.89	1.00		
BarCap Agg	0.14	-0.22	-0.10	1.00	
NCREIF	0.25	0.23	0.16	-0.15	1

Source: Bloomberg

Moving beyond the quantitative measures of the asset class, there are credible — though more qualitative — arguments to include infrastructure in institutional portfolios. These reasons include:

- Growing opportunity set: The glaring need for additional infrastructure investment (as covered earlier), both in the U.S. and abroad, should create opportunities for attractive investment returns. Compared to other traditional markets (such as equities and bonds), there figures to be more opportunity for managers to locate and execute on attractive investment concepts.
- Infrastructure is a long-term investment and therefore well matched for a long-term liability such as a pension fund. As cash flows of infrastructure assets tend to be more static, the pricing and value of the assets are relatively more stable than other private market assets.
- Diversification within the asset class: Within an infrastructure portfolio it is possible for assets to be further diversified from each other by revenue generation, sector, geography, and currency.

- Hedge against inflation: Revenue streams can be linked to inflation through concession agreements, long-term purchase agreements, or governed by regulatory regimes. Thus, as price levels rise, the revenues associated with infrastructure assets will also rise, therefore preserving the real value of the investment.
- Stable and predictable cash flow: Infrastructure assets often benefit from long-term operating contracts and/or regulated pricing. When combined with the above characteristics, assets tend to generate relatively stable and predictable revenue streams.
- Monopoly/quasi-monopoly nature of assets: Infrastructure assets are typically large-scale investments with very high initial fixed costs and substantial economies of scale; as a result, they exhibit high barriers to entry and provide pricing power (as allowed by regulators) to providers which can allow for a sustainable level of profitability.
- Low elasticity of demand: Due to the essential nature of the services provided, demand for infrastructure services can be relatively sheltered from swings in economic activity. Subsequently, cash flows can be stable and predictable.
- Long asset life: Infrastructure assets are long-lived hard assets with useful lives ranging from ten to ninety- nine years. This is another reason why the cash flows are steady and predictable.

ASSET ALLOCATION SOFTWARE

In addition to rigorously analyzing historical data, it is useful to consider the input of our proprietary asset allocation software, and how adding infrastructure to a portfolio can change the expected risk and return metrics. Exhibit 11 illustrates two portfolios: portfolio A has a basic 60/40 allocation between stocks (S&P 500 Index) and bonds (BarCap Aggregate) while portfolio B has a 10% allocation to infrastructure (dynamically simulated), taking 5% from both fixed income and equity.

Exhibit 10: Proposed Portfolio for Marquette Asset Allocation

	A (%)	B(%)
Broad Fixed Income	40	35
Broad U.S. Equity	60	55
Infrastructure	0	10
Total	100	100

Exhibit 11: Marquette Asset Allocation Results

	A (%)	B (%)
Avg. Annualized 10 Yr. Return	6.12	6.34
Avg. Annualized 10 Yr. Volatility	10.84	10.53
Downside Probability Return (Return < 7.5%)	57.90	56.60
Downside Risk (Return <7.5%)	3.30	3.10

Source: Marquette Associates Proprietary Asset Allocation Model

The results indicate that the inclusion of a 10% allocation to infrastructure, portfolio B, increases the risk-adjusted return from 0.56 to 0.60; the return is slightly higher, and the volatility is reduced by more than 2%. In addition, the downside risk is also reduced by 6%. The data suggests that by including an infrastructure allocation in a multi-asset portfolio, one can increase the risk-adjusted performance of the overall portfolio.

At this point, the reasons to include infrastructure in institutional portfolios are clear: attractive risk and return measures, as well as favorable asset class characteristics which should provide strong performance in the future. The question now becomes one of access: which types of vehicles offer access to infrastructure?

MECHANICS OF INVESTING

Institutional investors can access infrastructure through a variety of investment options, including private open-end funds, private closed-end funds, private co-investments/direct investments, private fund-of-funds, public open-end vehicles, or listed closed-end funds. The following provides a brief overview of each structure.

PRIVATE VEHICLES ("UNLISTED FUNDS"):

Open-End Funds: A pooled investment vehicle with a perpetual term. Proponents of the open-end structure allude to the fact that the buy and hold investment strategy is well suited for the long-term nature of the infrastructure asset class; this long-life mentality may attract sellers of assets who want to see their assets perform, grow, and exist infinitum. Open-end funds have an investment strategy that seeks to maximize cash flow over the long-term rather than capital gains over the short/medium term. The perpetual nature of open-end funds also allows the funds to reinvest and continually grow. Consequently, these funds have the ability to grow to a significant size thus becoming extremely well diversified. Investors can normally receive the immediate benefit of buying into an established, well diversified portfolio with transparency.

A commonly cited advantage of open-ended funds, in any asset class, is that they allow investors to enter and exit the fund at a pre-specified frequency, at the fund's previous net asset value (NAV). However, it is important to stress that infrastructure assets are highly illiquid in nature. Unconditional liquidity should not be a primary consideration when selecting private open-end funds although an open-end fund has one more tool to create liquidity than a closed-end fund: new investors entering the fund.

Currently, there are a limited number of open-end commingled funds. These open-end funds have an initial lock-up period of anywhere from zero to four years and fee schedules vary by the product (see Exhibit 13 for details).

Closed-End Fund (Limited Partnership): Infrastructure closed-end funds are normally in the form of a limited partnership vehicle. Funds have a fixed term which is usually ten to fifteen years, subject to negotiated term extensions. As is the case with private equity or closed-end real estate investing, the fund is managed by a general partner ("GP"), which in most cases is the infrastructure investment firm ("sponsor"). The investors in the fund are known as limited partners (“LPs”).

Investors in a limited partnership make capital commitments which represent their obligation to provide a certain amount of capital to the GP for fund investments. This capital commitment is then drawn down or called by the GP periodically over the investment period as assets are acquired. The investment period lasts two to three years and is then followed by a holding period where active management is pursued to create value. Once the investment strategy has been implemented the investment manager will then seek to harvest the gains through asset sales. There is the possibility of fund extension if the GP is not able to sell the assets to a strategic buyer, another private fund, or a direct buyer (i.e. a pension fund or sovereign wealth fund).

Investors in limited partnerships are often introduced to the J-Curve effect. The J-curve effect describes the tendency of limited partnership funds to deliver negative returns in the initial years and investment gains in the later years as value is harvested through asset sales. Investment returns are often negative in the initial years due to the payment of management fees, which are paid on the entire committed capital, and under-performing assets which are identified early and written down.

Co-Investment/Direct Investment: Due to the large capital requirements and substantial resource commitment that direct asset investing requires, separate accounts are only suitable for larger institutional investors with substantial resources that desire greater control over their infrastructure portfolios. Rather than paying management fees to a GP, the investor would need to have a team in place to operate the asset or dedicate personnel to source deals with joint venture partners or private/public auctions.

Fund-of-Funds: A fund-of-funds aggregates capital from a number of investors and instead of investing in direct investments, invests in other infrastructure private funds. A fund-of-funds can provide investors with limited capital

access to a highly diversified fund by strategy, market, asset type, manager, and vintage year. The majority of fund-of-funds focus on higher risk/return strategies where there is significant dispersion of returns. Therefore, a fund-of-funds can be utilized as a satellite approach to further diversify an existing mature infrastructure allocation with higher risk/returning strategies in a well-diversified manner.

PUBLICLY TRADED VEHICLES ("LISTED FUNDS"):

Open-end funds: Mutual funds, separate accounts, and ETFs that invest in publicly traded stocks of companies directly related to infrastructure assets.

Listed closed-end funds: Invest in underlying infrastructure assets. These funds conduct periodic valuations to determine the net asset value of the fund, but the net asset value will deviate from the fund's share price which fluctuates daily.

UNLISTED VS. LISTED

With all the discussion on listed and unlisted infrastructure investments, an overview on the advantages and disadvantages is helpful.

Unlisted Infrastructure Advantages:

- Greater opportunity set
- Direct infrastructure investing
- Control of asset more likely

Listed Infrastructure Advantages:

- Traded on an exchange
- Transparent
- Liquid

Unlisted Infrastructure Disadvantages:

- Limited liquidity
- Potential lack of diversification
- High regulatory parameters of assets
- High capital requirements
- Significant leverage

Listed Infrastructure Disadvantages:

- Limited opportunity set
- Indirect infrastructure investing
- Concentration in a single company via another stock manager
- High regulatory parameters of assets
- Market volatility

TERMS OF UNLISTED FUNDS

Regardless if a private vehicle is open- or closed-end, there should be an alignment of interest between the investors/LPs and the manager/GP and the terms should be fair to both (see tables on following page). Investors will pay a management fee charged on called capital, committed capital, or fund net-asset-value balance. Investors may also pay a performance fee known as carried interest. This payment entitles the GP to receive a percentage of the profits from the fund's investments normally exceeding a hurdle rate. The carried interest can be subject to a claw back provision whereby if the fund experiences losses in the later years, the fee paid to the GP is returned to the fund for distribution to the LPs. Other fees associated with infrastructure funds may include placement agent fees, financial advisory fees, and investment banking fees.

As the structure of closed-end infrastructure funds is extremely similar to private equity investments, the key factors for private equity investing also apply to infrastructure investing. While open-end funds have a perpetual life structure, they still exhibit some private equity-like characteristics. In reviewing closed-end vehicles,[14] the results on the following page are the average terms of funds:

Exhibit 12: Closed-End Fund Term Averages

Management Fee (during investment period)	1.55%
Investment Period	4.47 years
Management Fee (post investment period)	1.46%
Carried Interest	17.36%
Preferred Return	7.74%
GP Commitment to Fund	3.18%

Source: Preqin data on 138 closed-end funds

The fee structures of open-end funds are not as uniform as closed end funds; the table below shows the two most common fee arrangements, as proxied by two of the larger open-end funds in the market available for investment:

Exhibit 13: Examples of Open-End Fund Terms

Term Category	Fund 1	Fund 2
Management Fee	0.77% on the First $300M	1.00% on the First $100M
Performance Fee	10%	15%
Preferred Return/Hurdle	8% (33.3% GP catch-up)	7% hard hurdle (no catch-up)
Withdrawal Term	Quarterly (no lock)	Semi-annual (4-year lock)
Other fees (investment activities, operations, administration of funds, etc.)	Borne by partnership	Borne by partnership

Sourced from manager reported information

RISKS

There are a variety of risks that may adversely affect infrastructure investments, and institutional investors must properly evaluate the inherent risks before investing in the asset class. The major risks of investing in infrastructure are highlighted below:

- Concentration risk: A new open-end or closed-end fund that is beginning to deploy cash for the purpose of purchasing assets could have concentration in one or two assets for a sustained period. If the asset does not perform as expected, there is major risk of losing the capital invested. On the other hand, if an asset performs exceptionally well and becomes a large part of the portfolio, there is now the risk of overexposure to one asset.
- Construction risk: Generally, only relevant for Greenfield investments or to a lesser extent rehabilitated Brownfield. Major risks include cost overruns and construction delays. The construction contractor bears most of this risk under the terms of the construction contract. If investors are taking on construction risk, they should be compensated with a higher rate of return.
- Currency risk: Relates to the foreign exchange risk associated with translating cash flow received from non-U.S. assets into the U.S. dollar as well as cash flows paid out to investors in U.S. dollars if the investor is not U.S.-based. If currency rates are unfavorable in either case, the investor will suffer.
- Demand/patronage risk: Actual demand and usage falling below the original projections. An asset's return and even debt servicing ability could be adversely affected.

- Disaster risk: Assets could be affected by "Mother Nature" occurrences: volcanic ash reducing air traffic and airport usage, snow storms that shut down toll roads, or man-made disasters that damage or destroy assets such as bridges or pipelines.
- Environmental risk: Greenfield/construction assets could be subject to environmental, development, and regulatory usage and impact.
- Financial risk: Investment in infrastructure is highly capital intensive and relies heavily on the capital markets. The level of interest rates and the ability to obtain debt financing on attractive terms may present financial risk. While cash flows from a project may be linked to inflation, depending upon the terms of the debt, some benefits of the inflation link could be lost.
- Inflation risk: While infrastructure may hedge against unanticipated inflation over the long term, this does not hold true in all environments. Poor returns can be experienced in cases when nominal rates rise more than inflation. If cash flows of an asset are tied to an inflation measure and the debt servicing on the asset is a nominal rate, the cash flows coming in may not be enough to service the cost of debt on the asset.
- Interest Rate risk: As with any investment in a business, an increase in real interest rates is likely to have two effects. The first is that the business will experience higher financing costs and the resulting increase in interest payments may reduce the amount of cash available for distribution to investors. However, most infrastructure businesses have some proportion of long-term debt at hedged or fixed interest rates, so this effect is only likely to be felt significantly if real interest rates move higher over the long term.

  Secondly, higher financing costs will increase the cost of equity which will theoretically lower the value of the business. While all financial investments face these risks, the gearing and hedging decisions that are made at the business level coupled with price elasticity determine how significant any impacts will be. The level of interest rates and the ability to obtain debt refinancing on attractive terms may also present financial risk and, because infrastructure investments often employ a high degree of leverage, these financial risks can be exacerbated.
- Liquidity risk: Refers to the ability to exit an infrastructure asset in a timely manner and/or on favorable terms. Infrastructure assets are very large in scale and capital thereby increasing the typical time it takes to dispose of an asset. In addition, the GP of a fund, open- or closed-end, will subject LPs to a certain time frame of capital being "locked up". The GP relies upon investor capital to buy investments regardless of the fund structure.

  For both open- and closed-end funds, immediate liquidity for unlisted funds is not an option. It is not possible for the GP to instantly liquidate or reduce exposure to an asset at a moment's notice. Institutional investors with substantial cash flow requirements must be aware of this. For an open-end fund, liquidity may come from investors entering the fund, the refinancing of an asset, or the cash flows of an asset as opposed to the forced sale or reduction of an asset. The GP of any type of fund will be weary to sell an asset at a loss to pay out a queue and hurt the remaining investors in the fund.
- Obsolescence risk: Though this is a lesser extent risk, new technology may arise that could make current technology antiquated.
- Political risk: Arises from any significant changes in legislation, deregulation, nationalization, seizure, changes in tax rates, and breach of concessions or contracts by government bodies. These risks are particularly relevant in emerging countries.
- Public perception risk: PPPs, specifically in the form of long-term concession contracts that mirror privatizations, face the possibility of vocal opposition from the public at large. Institutional investors should be aware of the potential "headline" risk from investing in sometimes controversial assets.

- Regulatory risk: Infrastructure assets are often subject to some form of regulation given their monopolistic/quasi-monopolistic characteristics. Any unforeseen shifts in policy or regulation can have a dramatic impact on the cash flows of the asset. An unexpected negative outcome from an existing regulatory regime or a previously unregulated asset that becomes subject to some form of regulation are examples of regulatory risk.
- Systematic risk: Macroeconomic factors such as GDP growth and demographic trends are fundamental drivers of the revenue streams of most types of infrastructure assets. Specific infrastructure assets show more sensitivity to changes in macroeconomic factors than others.
- Valuation risk: Infrastructure assets are appraised by third-party appraisal firms on an annual basis and adjusted on a quarterly basis. Appraisals are inherently subjective and appraised values may not accurately reflect the actual market value of the underlying asset.

PERFORMANCE EXPECTATIONS

It is easier to gauge the performance of listed (publicly traded) infrastructure assets because they are publicly traded and hence the data is readily available. While the returns of listed funds (in this case, the DJB index) can be expected to serve as a reasonable proxy for unlisted infrastructure funds, they are not a perfect match. They do not capture the actual performance of the asset in isolation. It is similar to private real estate and its relationship to the REIT sector. Listed infrastructure is just as volatile as a stock as it is traded on an exchange every day.

For unlisted infrastructure or private vehicles, performance comparison has to be divided between open-end funds (NAV is struck quarterly, perpetual life) and closed-end funds (NAV struck quarterly, but term limit to fund). For open-end funds, after the initial lock-up, investors are able to exit out of funds thereby locking in a gain or loss since the initial capital outlay. The main benefit of an open-end fund versus a closed-end fund is the underlying inherent nature of the assets. The assets are long-term, investors are long-term. Assets only have to be sold by a fund at a time when the fund can gain, while a closed-end fund has less flexibility in regard to when it can divest of its holdings.

For closed-end investments, an internal rate of return over the life of the fund is affected by investment timing, carry rates, claw back provisions, and other expenses. One cannot calculate true experience of the fund until it ceases and all assets are liquidated: a realization event must occur in order to exit the asset and end the fund. With the global financial crisis, many of the exit opportunities had dwindled. Many funds planned to "IPO" an asset or sell it to another closed-end fund, but the IPO market was not receptive to infrastructure assets post global financial crises and fundraising for closed-end funds declined from the heyday period of 2005 – 2007.

As mentioned earlier, there is a lack of transparency related to unlisted vehicles and therefore it is difficult to assess what performance and experience have actually been unless one invests in a fund. Further complicating matters, return data across different funds can be very inconsistent: return history is limited, reliability is unclear, reporting standards are uneven, the underlying investments are not uniform, and benchmarks vary for each fund. In the interest of examining the best proxy for unlisted funds, we utilize Preqin data. Preqin data, perhaps the best source of return data for closed-end funds, is contributed by limited partners ("LPs") in funds, and has the following data through August 2018 (next page):

Exhibit 14: Weighted Closed-End Fund Analysis

Vintage	No. Funds	Called (%)	Dist (%) DPI	Value (%) RVPI	Multiple	IRR (%)	Max IRR (%)	Min IRR (%)
2017	18	31.5	0.01	97.6	1.00	n/m	n/m	n/m
2016	31	31.5	2.24	99.0	1.03	n/m	n/m	n/m
2015	28	65.9	7.62	95.0	1.14	12.6	50.23	-0.83
2014	24	68.9	9.50	103.1	1.20	15.5	64.59	-12.62
2013	27	80.7	18.23	102.0	1.24	10.8	19.1	-6.4
2012	26	88.7	20.00	94.2	1.26	7.8	22	-0.51
2011	19	95.0	37.56	72.4	1.20	9.3	25.81	-10.76
2010	20	92.9	63.99	71.0	1.40	11.6	37.89	-18.0
2009	12	99.7	61.21	76.4	1.45	11.9	448	-12.3
2008	19	98.7	46.16	80.4	1.42	7.2	16.87	-14.3

Source: Preqin

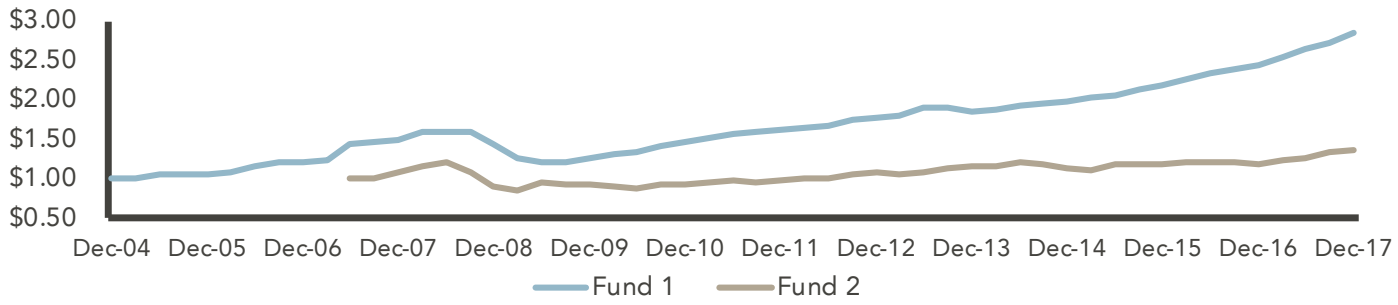
Analyzing the details in the above table, we can see how varied an investor's experience has been. Much of the performance has been dependent on the vintage year. Generally speaking, the longer-dated vintage years have seen a larger percentage of capital put to work ("called"), and the multiples are higher. This is not surprising, as the longer period of time after initial investment allows for emergence from J-curve effects and more time to realize profits of underlying investments. If anything, the previous table should reinforce the notion that when investing in an illiquid asset class, continued commitment to the asset class is important so as to take advantage of vintage year opportunities and diversification. As infrastructure is a young asset class with limited return data, it is not fair to make definitive conclusions about the asset class as whole, other than to use the information as a guide for future return expectations.

With unlisted open-end funds, data and options are even more limited. We use two funds as proxies for this space, one launched in March 2005 and the other in September 2007. The global financial crisis had an impact on both funds and the damage and ensuing recovery are apparent in the results. As of December 2017, for Fund 1, $1.00 invested at inception would be worth $2.84; for Fund 2, $1.00 invested at inception would be worth $1.37. As stated above, the longer vintage year exposure contributes to positive performance over the time period examined, as the 2005 fund has returned over 7%/year, while the shorter dated fund has returned only 3% per year.

Exhibit 15: Risk & Return Analysis

Fund	Since Inception	Annual Return (%)	Annual Std. Dev. (%)
Fund 1	March 2005	7.2	8.0
Fund 2	September 2007	3.0	9.2

Exhibit 16: Growth of a Dollar, Since Inception of Each Fund

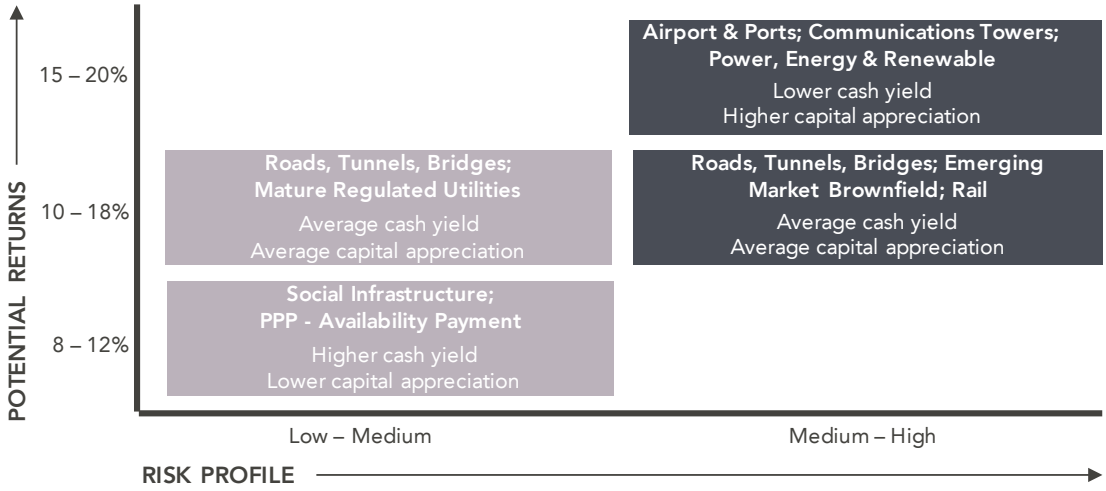


Source: Manager data

Thus, return experiences for infrastructure to date have varied, depending on fund type (closed or open), as well as by vintage year. Since infrastructure is a relatively immature asset class, it is important to recognize that returns over the short term will continue to feature considerable dispersion across fund type and vintage year.

Understandably, potential investors may be frustrated by the lack of long-term data on which to evaluate the viability of infrastructure for their portfolios. A possible remedy for the lack of return data is to evaluate the potential cash flows of each infrastructure asset. Although one cannot predict with absolute certainty the future return of an asset with such analysis, it is another "tool in the toolbox" by which to evaluate the asset class, as the cash flow characteristics of an asset can help provide a range of scenarios. Collectively, it is possible to use the cashflows of asset types, coupled with the various data sources referenced earlier, to assemble projected risk and return values for the spectrum of infrastructure assets. Although there are many factors to consider, in general, the returns from infrastructure assets lie along a continuum with lower risk/lower return (Brownfield, PPP availability payment) at one end and higher risk/higher return (Greenfield, assets subject to great demand risk) at the other. The chart below illustrates this relationship.

Exhibit 17: Illustrative Unlisted Infrastructure Returns Profile



Note: Regarding roads, tunnels, and bridges, risk profile differs based upon factors including concession agreements, demographics, traffic patterns, and overall GDP growth.
Source: RBC Global Asset Management, "The Global Infrastructure Investment Opportunity"

MANAGER DUE DILIGENCE

With more than 584 firms and 1,388 funds currently in the marketplace,[15] manager selection is also critical in maximizing consistent infrastructure returns. Due diligence by the LPs and their advisors is paramount before making commitments. As infrastructure is a relatively new investment area for U.S. institutional investment — but a considerably expanding one at that — potential LPs must wade through many first-time fund offerings. The key factors to consider in manager selection include:

- Proper alignment of interest: All GPs should commit at least 1% of capital to the fund. A cash commitment, versus deferred management fees, is preferable. A commitment of greater than 1% is also preferable. For groups within a larger financial institution it is the commitment of the portfolio managers that is most important, not the commitment of the financial parent. It is preferable that the firm is owned by the managers. There should also be limits on raising additional funds in the current strategy until a substantial amount of capital from the current fund has been invested.
- Strong deal flow: One of the reasons that the best infrastructure funds can consistently outperform their peers is because private market transactions tend to be less transparent than public market transactions. As a result, some firms see more potential deals, and better potential deals, than other firms. Firms that see

a large number of potential deals and see deals that other firms do not (i.e. proprietary deals) tend to generate better returns. Investors should focus on firms that have sourced more than half of their investments though proprietary deal flow or limited auction sales.

- Consistent process: Investors should focus on funds with a consistent, repeatable process that has not varied over time. Firms that shift sector focus, have substantial increases in fund size or target asset size, or change investment strategy (i.e. switch from a Brownfield focus to a Greenfield focus) tend to have poor returns relative to firms that maintain their focus over time.
- Consistent returns: Because of the long-term nature of infrastructure investments, judging performance simply by looking at IRR and multiples before a fund has fully matured can be misleading. In addition to traditional performance metrics, investors should look for groups that have a low loss ratio (number of deals that return less than their investment), and consistent performance across multiple funds.
- Investment process: For infrastructure, control of the asset is crucial as the majority owner will be able to facilitate and implement procedures to grow the asset, increase its efficiency, and continue its sustainability and viability for the long term. With this "control" mindset at the forefront, how is the GP purchasing the asset? With a larger equity/cash investment, the overall return potential may be lower than an investment featuring a greater debt investment; however, the asset will not be burdened with cumbersome debt costs and covenants. This balance of financing in past deals must be evaluated.
- Long track record: Unlike traditional asset classes where managers that have outperformed tend to revert to the mean, in infrastructure there is a strong argument to be made that top tier firms have a greater chance of repeating their performance in the future as long as their fund size and investment strategy are unchanged. Largely due to the benefits of better deal flow, top tier firms have been able to repeat top tier performance more consistently in infrastructure. Thus, investors should focus on groups with a long track record, and solid performance.
- Team consistency and experience: Infrastructure is a highly complex, operational business, and therefore continuity of the investment team is crucial. This is important when making assumptions about firms with top tier performance. If the key professionals that helped to amass the top tier track record have left the firm it is unreasonable to assume that the firm will generate similar returns in the future. Having a team that has been around and worked together for a long period of time is often a crucial determinant of success. It is also important that since the funds are buying a business, the experience of the team should be sector specific in either experience or operations. An investment banker will not know the best way to aggregate user information and rate cases across a network of water companies, but a person who has worked for a water company will have experience with best practices. Practical experience is crucial.
- Strategy: The fund should be diversified by revenue streams, asset type, geography, and investment structure. Investors should look for funds that are either already diversified/established (open-end or listed) or for a manager who has a proven record of diversification in past funds.
- Managing Risk: Before purchasing the asset, the GP should understand and articulate the full menu of upsides and downsides of the asset. For example: What will happen if traffic declines; what will happen to revenues if costs cannot be cut in some way? What will happen when prices to consumers increase, will the customer base decrease? What natural disasters could affect the asset and what would that do to its cash flows? The investment case for an asset should be presented to LPs. For past funds, these investment cases should be provided to give potential investors comfort that the GP is investing with full knowledge.

Firms that reach these standards are more likely to generate strong returns for their limited partners and meet the expectations that investors have when making an allocation to the infrastructure asset class.

Recommendation

In summary, infrastructure is an attractive asset class for the following reasons:

- Infrastructure provides diversification relative to other asset classes;
- Cash flows are not highly correlated to those of equities (dividends) or real estate (income distribution);
- Within an infrastructure portfolio it is possible for assets to be further diversified from each other by revenue generation, sector, geography, and currency; and
- Given the need for huge infrastructure investments (both globally and in the U.S.), the opportunity set is large and growing, which cannot be said for most other asset classes.

Infrastructure is a long-term investment and therefore well matched for a long-term liability such as a pension fund. As cash flows of the assets tend to be more static, the pricing and value of the asset is relatively more stable than other private market assets. Infrastructure should be included in a portfolio that can tolerate illiquidity.

For new allocations to infrastructure, an existing, unlisted open-end fund is the best way to access the asset class. With an open-end fund, the transparency trumps the lack of options in the space. There is transparency into:

- the underlying holdings;
- its diversification by investor, investment, currency, geography, revenue stream;
- pricing methodologies;
- leverage levels;
- distributable cash flow;
- deal flow;
- how the assets were acquired (auction vs. private);
- evidence of discipline or lack thereof in constructing the fund; and
- no forced asset exits at fund life end.

Although the closed-end, private equity model is the predominant structure for infrastructure investing, it does not necessarily make it the best. Under the closed-end vehicle model, an investor must trust the GP to always make the correct decision on his or her behalf. With the acknowledgement that there are talented managers running closed-end funds, there is no way to gauge future fund performance, when capital will be deployed, diversification (or lack thereof), or other factors which may influence performance. The investor must trust the GP to do all these things to construct a well-diversified, low risk, cash-yielding portfolio. One can only evaluate the past performance of funds to estimate what possible construction and experience will be. As with all investments, past performance can never be a guarantee of future results. Due to these challenges of closed-end funds, Marquette recommends that when making new allocations to infrastructure, open-end funds receive first consideration.

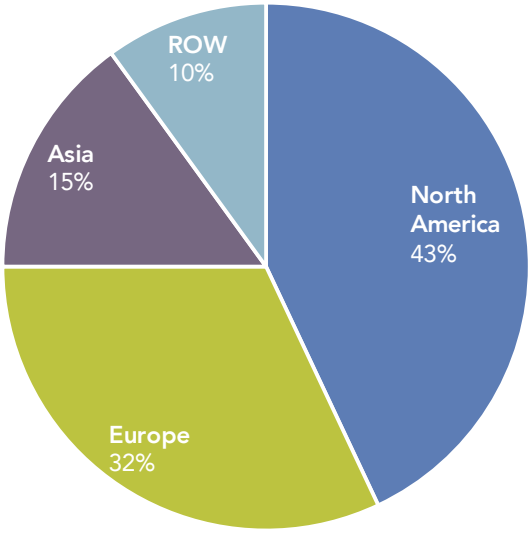
As always, clients are encouraged to analyze the factors unique to their portfolios before making an allocation to infrastructure. In particular, return goals, risk tolerance, and liquidity needs should be closely scrutinized before a commitment to the asset class is made. While an investment in infrastructure has many positive attributes, clients must be confident it is a good it for their specific portfolios.

APPENDIX

SIZE OF THE GLOBAL INFRASTRUCTURE MARKET

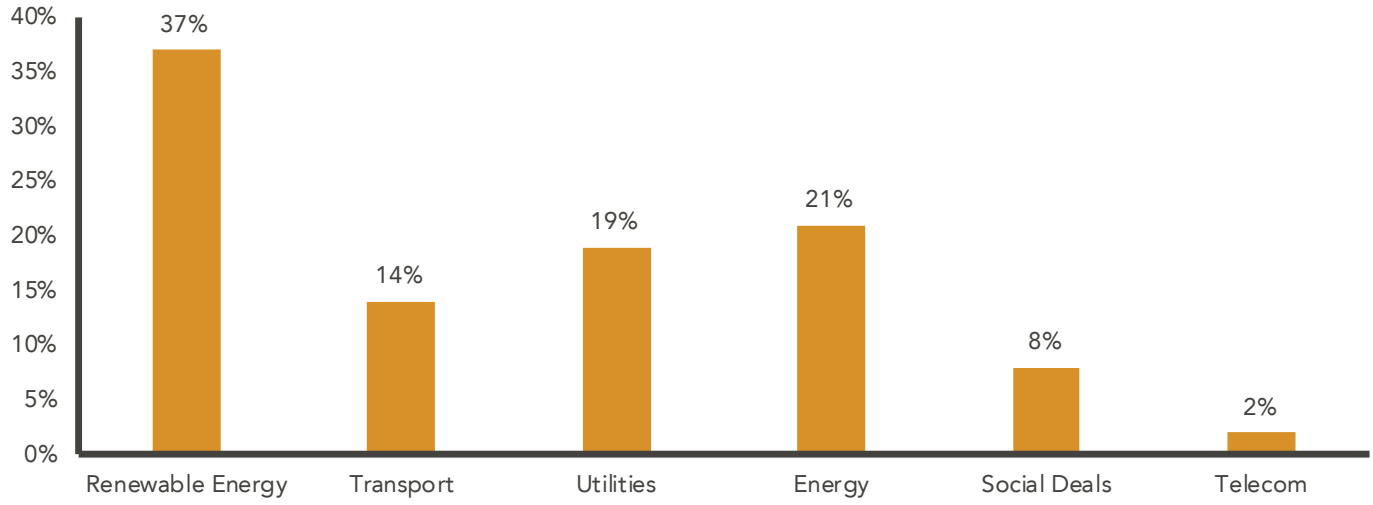
Due to data limitations and market inefficiencies, estimating the size of the global infrastructure market is difficult. According to Preqin, unlisted infrastructure assets under management represent $418 billion as of June 2017.

Exhibit 18: Unlisted Infrastructure AUM by Geography: $418B



Source: Preqin 2018 Outlook

Exhibit 19: 2017 Deals by Sector



Source: Preqin 2018 Outlook

Exhibit 20: Index Data through December 2017

	Dow Jones Brookfield	FTSE Global Core 50/50	S&P Global Infrastructure	FTSE Global Core Infrastructure Index
Inception date	Jan. 2003	Dec. 2009	Dec. 2001	Dec. 2005
Full market cap	$1,145.3B	$2,078.2B	$1,365.1B	$2,009.2B
# of Stocks	102	226	74	227
# of countries	22	36	17	35
Weighting method	Free-float Single stock max of 10%	Free-float Single stock max of 5%	Modified-Cap Sectors capped, single stock max of 5%	Free-float Single stock max of 5%
Category	Pure-play	Core, Pure-play, Broad	Core, Pure-play, Broad	Core
Industry Exposures (%)				
Utilities	37%	46%	40%	40%
Energy	29%	13%	19%	22%
Transportation	20%	31%	39%	27%
Diversified, others	14%	10%	2%	11%
Geographic Exposures (%)				
N. America	58%	58%	53%	72%
Europe	27%	16%	28%	9%
Japan	0%	5%	2%	8%
Asia ex-Japan	13%	17%	16%	10%
Latin America	2%	4%	1%	1%
Mid-East, Africa	0%	0%	0%	0%
Other	0%	0%	0%	0%

Sources: Dow Jones, S&P, FTSE

NOTES

[1] Poole, Jr. Robert. "Privatization," The Library of Economics and Liberty. www.econlib.org/library/Enc/Privatization.html
[2] Cohen, Gershon. "The development of PPP financing in the UK." *Investing in Infrastructure* (Chapter 40).
[3] Colonial First State Global Asset Management
[4] J-Curve Effect: the internal rate of return of a fund will be low or negative in its early life due to costs associated with management of the fund and deploying capital without realization of a gain.
[5] As of August 1, 2011, the OECD member countries are Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.
[6] Organization for Economic Co-operation and Development ("OECD"), January 2008. "Infrastructure to 2030."
[7] McKinsey Global Institute, June 2016. "Bridging Global Infrastructure Gaps." www.un.org/pga/71/wp-content/uploads/sites/40/2017/06/Bridging-Global-Infrastructure-Gaps-Full-report-June-2016.pdf
[8] OECD, July 2017. "Investing in Climate, Investing in Growth"
[9] American Society of Civil Engineers 2017 Report Card
[10] Worldwide privatization proceeds between 1988 and August 2015 were $3.26 trillion. This amount does not include the privatizations done through distribution of free vouchers, which was common in Eastern Europe in the 1990s. See William L. Megginson, "Privatization Trends and Major Deals in 2014 and Two-Thirds 2015," *The PB Report 2014/2015*. Privatization Barometer, www.privatizationbarometer.net.
[11] Australian unlisted open-end infrastructure performance data dates back twenty-two years. U.S. private open-end performance data dates to 2006.
[12] Rreef America LLC, July 2011. "A Compelling Investment Opportunity: The Case for Global Listed Infrastructure Revisited." realestate.dws.com/content/_media/Research_The_Case_of_Listed_Infrastructure_Revisited_7_11.pdf
Pure- play: companies that own/operate infrastructure assets that naturally exhibit fundamental infrastructure characteristics, such as high barriers to entry and relatively inelastic demand.
Core: infrastructure companies that exhibit some fundamental infrastructure characteristics by virtue of regulation or contracted agreement.
Broad: reflects a more thematic interpretation of the sector including infrastructure-related businesses, such as construction and diversified communications which can assume some operating risk.
[13] Rreef America LLC, July 2011. "A Compelling Investment Opportunity: The Case for Global Listed Infrastructure Revisited." realestate.dws.com/content/_media/Research_The_Case_of_Listed_Infrastructure_Revisited_7_11.pdf
[14] Preqin data on 138 closed-end funds
[15] Preqin as of August 2018

PREPARED BY MARQUETTE ASSOCIATES

180 North LaSalle St, Ste 3500, Chicago, Illinois 60601
CHICAGO I BALTIMORE I PHILADELPHIA I ST. LOUIS

PHONE 312-527-5500
WEB marquetteassociates.com

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