

Infrastructure for Institutional Investors Insights into a maturing asset class

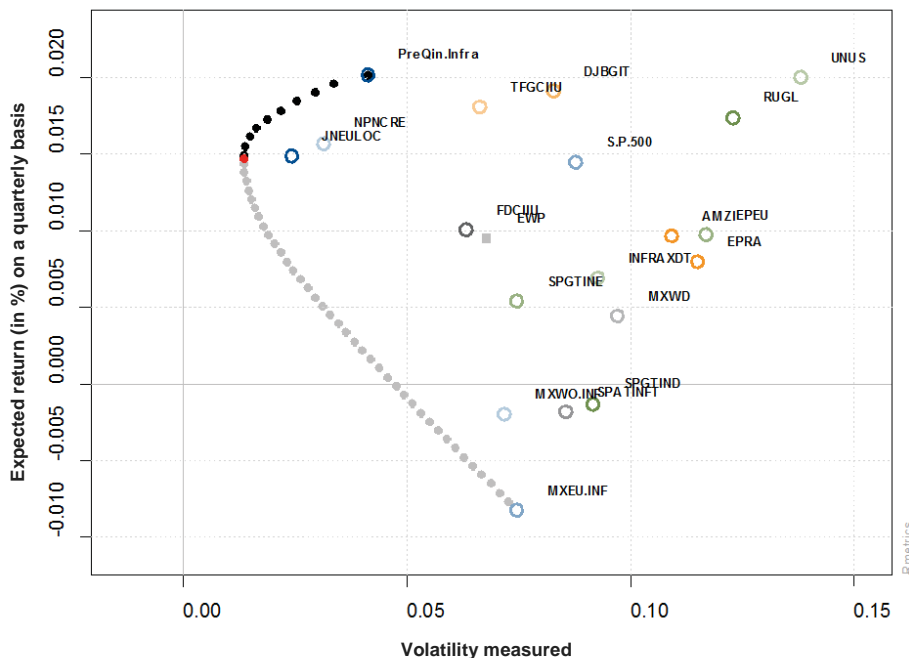


This research summarizes general economic characteristics of infrastructure investments, sheds light on according risks and benefits and shows routes on how to obtain exposure to this asset class from an institutional perspective.

Report Highlights

- Infrastructure is gaining importance in institutional portfolios, but overall exposure to unlisted infrastructure is still low at an estimated 1.1% of pension assets (OECD 2016)¹ compared to other alternative asset classes, especially real estate and private equity.
- Empirical analysis suggests that unlisted infrastructure investments are beneficial for risk diversification and yield enhancement.
- However, investment offerings in unlisted infrastructure are limited compared to e.g. real estate.
- The nature of infrastructure investments requires a holistic risk assessment and management of the political/regulatory and contractual/legal dimensions.
- The route chosen (direct/indirect, listed/unlisted, equity/debt) to obtain exposure has a significant impact on the risk and return profile, also depending on investors' overall investment volume and experience with infrastructure investments.

The diagram depicts indices of different asset classes, which shows that non-listed infrastructure (equity) investments improve a portfolio's efficiency – at a comparable risk, a higher return can be expected.



Sources: Bloomberg and for indices used see appendix

Analysts

Gökhan Aydınli
+49 30 27891 236
g.aydinli@scopeanalysis.com

Press

André Fischer
+49 30 27891 147
an.fischer@scopeanalysis.com

Related Research

[Infrastructure Debt to Become Insurers' Darling?](#)

December 2015

[Project Finance Outlook 2017: Policy Concerns Weigh on Credit Performance](#)

November 2016

Scope Analysis GmbH

Lennéstraße 5
10785 Berlin

Phone +49 30 27891 0
Fax +49 30 27891 100
Service +49 30 27891 300

info@scopeanalysis.com
www.scopeanalysis.com

[in](#) [tw](#) Bloomberg: SCOP

¹ Annual Survey of Large Pension Funds and Public Pension Reserve Funds Report on Pensions Funds' long-term investments – 2015. OECD sample contains 77 pension funds with combined total assets of USD 7.8tr, thereof unlisted infrastructure equity and debt investments amounting to approx. USD 85.6bn.

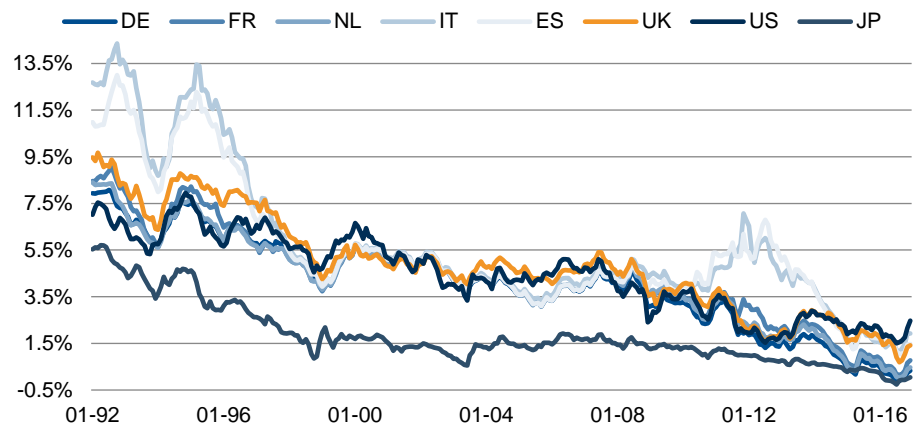
Hunt for yield pushes investors into alternative investments

Infrastructure as an institutional asset class

Introduction

The continued low interest rate environment, resulting in negative yields in parts of the government and corporate bond market poses challenges for institutional investors' yield targets and forces them to adapt their investment strategies. Alternative investments have gained considerable momentum in this context and real asset investments like real estate, aviation and infrastructure are now an integral part of institutional asset allocation.

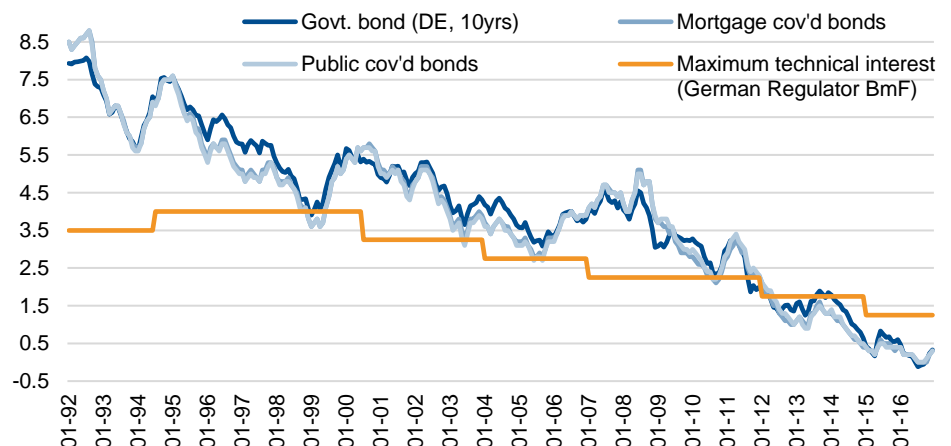
Figure 1: Govt. Bonds (10 yrs. maturity) yields, international comparison



Source: Macrobond, chart: Scope

Viewed on a global scale, there are conflicting forces affecting infrastructure: an increasing gap between the demand and supply of infrastructure services, stemming from growing urban populations on the one hand, and continuous wear and tear and thus accelerating obsolescence of infrastructure assets on the other. Public financing of large-scale infrastructure projects is also held back by the ongoing tightening of public budgets in the wake of past expansive deficit spending, and huge cost overruns and massive project delays.

Figure 2: Comparison of various German bond yields vs statutory interest rates for new insurance contracts (set by German Ministry of Finance – BmF)



Source: Bundesbank (as of Dec 2016), chart: Scope

Significant positive spillover from infrastructure investments

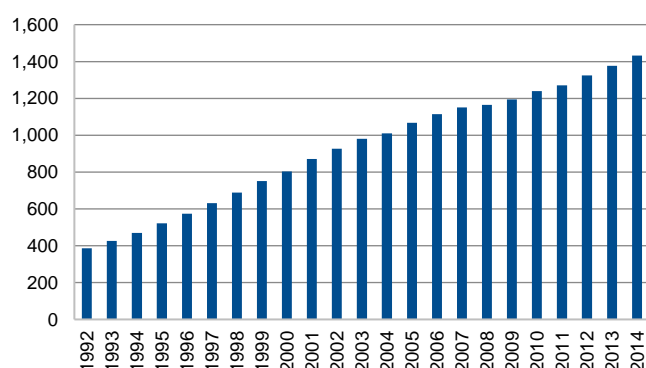
Infrastructure and the economy

The effect of infrastructure on the attractiveness, competitiveness, sustainability, and growth of macro (i.e. national) economies and micro economies (cities, metropolitan areas, municipalities) has long been a subject of academic and professional research.

Accordingly, there is sound economic evidence backing the conclusion that efficient and high-quality infrastructure ensuring reliable, uninterrupted power and water supply and mobility improves public living standards by providing access to essential resources such as safety, energy, education and care (Weber et al., 2016). Or put differently: the positive spillover effects of infrastructure are significant and have a measurable multiplier effect (FRBSF, 2012).

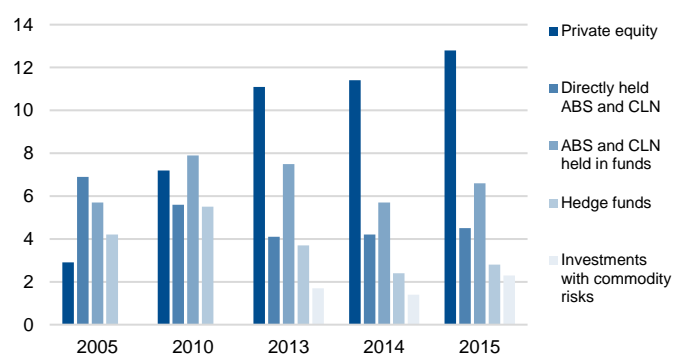
Figure 3: Total and alternative investment volumes of German primary insurers (incl. pension funds and retirement schemes – Figures provided by German Insurers' Association GDV)

Total investment volume (EUR bn)



Source: GDV, illustration Scope

New investments in selected alternatives (EUR bn)



Source: GDV, illustration Scope

Widening gap between necessary and required investment spending

However, there is a widening gap between the necessary infrastructure investments and the current level of expenditure. This gap is not restricted to developing or emerging markets. Problems, with electricity supply and the transportation and water systems have been reported in developed cities like Tokyo, Paris, Washington, and Los Angeles, providing anecdotal evidence of the global scale of "technologically outdated, woefully inadequate, increasingly fragile" critical infrastructure (McKinsey, 2016).

Strong demand but limited funding

This gap can provide an incentive for financial investors to fund long-term infrastructure projects. Infrastructure providers, respectively developers such as utility or construction companies, are funding those projects from a strategic perspective. Unlike real estate institutional investors identified indirect infrastructure related investments just recently as appropriate investment alternative. Furthermore increasing (stock) market volatility and historically low government and corporate bond yields are driving institutional investors into alternative investment segments, with real estate being the most prominent example.

Institutional investors therefore show an increasing appetite for diversification into long-term assets. OECD statistics, for instance, show that total pension assets more than doubled from USD 25tr in 2002 to USD 55tr in 2012 (BIS, 2014). The development of German insurers' investment volumes since 1992, as shown in Figure 3, evidently supports this development.

Table 1: LPFs Total investment

Country	Total investment (USD bn)	# Pension funds
United States	1,238.30	10
Netherlands	741.00	3
Canada	266.60	3
Singapore	210.20	1
United Kingdom	197.30	4
Denmark	161.10	2
South Africa	137.10	2
Australia	122.60	4
Japan	105.00	1
Sweden	88.30	1
Brazil	85.90	3
Germany	82.30	2
Chile	81.00	2
Finland	41.50	1
Mexico	41.10	1
Israel	28.00	2
France	25.60	1
Italy	20.70	3
Indonesia	15.00	1
Nigeria	10.80	3
Turkey	9.30	1
Spain	6.10	4
Croatia	4.90	2
Portugal	4.20	2
Romania	3.20	4
Russia	1.30	1
Total	3,728.40	64

Source: OECD

Generating adequate risk adjusted returns more challenging

Ultimately, investors are increasingly faced with the need to generate sufficient returns for growing asset volumes while yields are continuously declining. Infrastructure investments are among the options that institutional investors (non-banks, especially, insurers) are considering in their quest for stable and reliable cash flows, long-term returns with low correlation to traditional asset classes, appropriate risk-adjusted and inflation hedged cash yields, and greater portfolio diversification (Lokmanis, 2016).

Share of infrastructure still small

The infrastructure exposure of institutional portfolios is still strikingly small compared to exposure to traditional investments. This contrasts with recent growth dynamics in alternative investment asset classes. Pension funds' exposure to infrastructure debt and equity was just 0.5% in 2012, according to the OECD. The 2015 OECD Large Pension Fund Survey puts the share of unlisted infrastructure investments held by the largest pension funds at 1.7% and public pension reserve schemes at 1.1% of total assets, respectively, while (based on 34 survey respondents) fixed income investments stood at 54.9%, listed equity at 29.8% and alternatives and other assets at 13.6% as of 2014 (OECD, 2015).

Out of the entire OECD sample comprising 64 large pension funds (LPF) with a combined investment volume of approximately USD 3.7tr and 25 public pension reserve funds (PPRF) with total investments of ca. USD 6.6tr, 17 organisations have allocated approximately USD 1.3tr to unlisted infrastructure. It is worthwhile noting that more than 80% of this exposure stems from three countries with Australia and Canada being well known for their mature private infrastructure funding markets.

Table 2: LPFs Total investment

	Total investment USD m (2014)	Thereof unlisted infrastructure	# of funds	%
LPF	1,903,124	52,793	31	2.8%
Australia	120,760	9,443	4	7.8%
Brazil	65,922	4,266	2	6.5%
Canada	194,299	20,154	2	10.4%
Chile	46,049	0	1	0.0%
Denmark	46,075	507	1	1.1%
Finland	41,517	125	1	0.3%
France	25,587	0	1	0.0%
Israel	28,059	283	2	1.0%
Japan	105,049	210	1	0.2%
Mexico	41,109	0	1	0.0%
Netherlands	741,014	13,376	3	1.8%
Portugal	4,212	57	2	1.3%
Romania	1,152	0	1	0.0%
Russia	1,259	0	1	0.0%
South Africa	133,491	400	1	0.3%
Spain	5,895	8	2	0.1%
Turkey	9,327	345	1	3.7%
United Kingdom	62,972	3,338	1	5.3%
United States	229,376	281	3	0.1%
PPRF	572,262	21,701	10	3.8%
Argentina	55,495	0	1	0.0%
Australia	89,577	6,629	1	7.4%
Canada	250,559	13,378	2	5.3%
Chile	7,944	0	1	0.0%
Finland	71,819	738	2	1.0%
New Zealand	21,473	322	1	1.5%
Sweden	75,395	634	2	0.8%
Total	2,475,386	74,493	41	3.0%

Source: OECD

Nevertheless, given the institutional hunt for yield and the diversification benefits of real assets, infrastructure investments are now considered an integral part of institutional asset allocation. In Scope's view, the prevailing global low interest rate environment will sustain the surge in demand from long-term institutional investors. Looking at the past ten years, investment volumes and fund offerings in the unlisted infrastructure sector (total equity raised: approx. USD 275 bn) are still significantly lower than in the real estate

sector (total equity raised: approx. USD 506 bn). However, growth momentum for unlisted infrastructure is picking up. This is based on the capital available for investment in such investment vehicles (often called “dry powder”) (see Table 3).

Table 3: Equity raised and estimated “dry powder” of unlisted real estate investment vehicles (left table) vs unlisted infrastructure vehicles (right table)

Country	Total funds raised Last 10 yrs (USD m)	Est. dry powder (USD m)	#
US		90,481	35
Singapore		10,345	4
Canada		5,420	1
UK		5,664	4
France		4,894	2
Germany		541	1
Hong Kong		3,142	2
Switzerland		1,822	1
Total		122,308	50

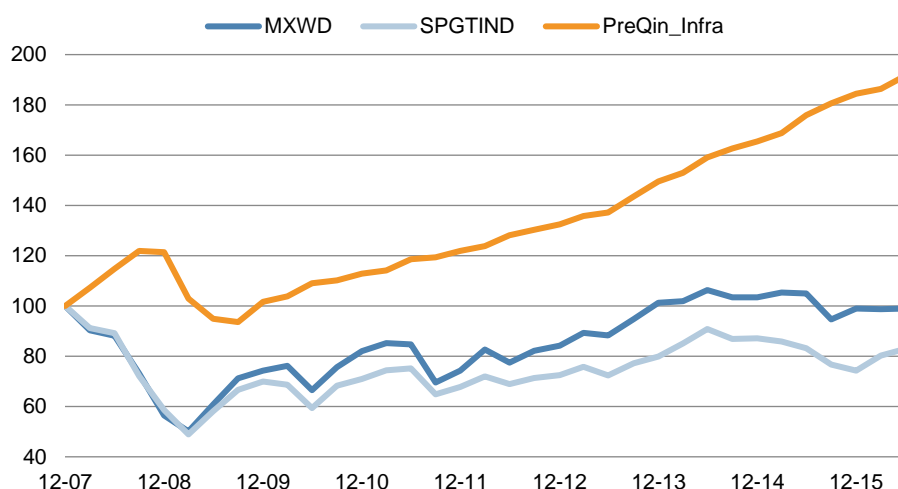
Country	Total funds raised Last 10 yrs (USD m)	Est. dry powder (USD m)	#
US	126,209	48,401	17
UK	56,388	19,172	10
Canada	25,863	12,362	1
France	24,339	14,404	6
South Korea	13,929	4,348	2
China	6,376	5,635	4
Australia	3,784	1,743	2
Netherlands	3,673	1,152	1
Brazil	2,939	1,336	1
Singapore	2,672	1,063	1
Switzerland	2,428	697	1
Denmark	2,214	1,949	1
India	1,821	744	1
Philippines	1,500	1,373	1
Germany	1,127	1,148	1
Total	275,260	115,527	50

Source: PreQin, tables: Scope

Infrastructure – a global asset class

As mentioned earlier, there is a considerable gap between the infrastructure required and current levels of investment. The demand for reliable modern infrastructure is increasing - not only in the developing and emerging markets with significant economic and strong population growth. Even highly advanced economies such as Canada, Germany and the US experience huge infrastructure problems, which are mostly attributable to outdated and obsolescent infrastructure.

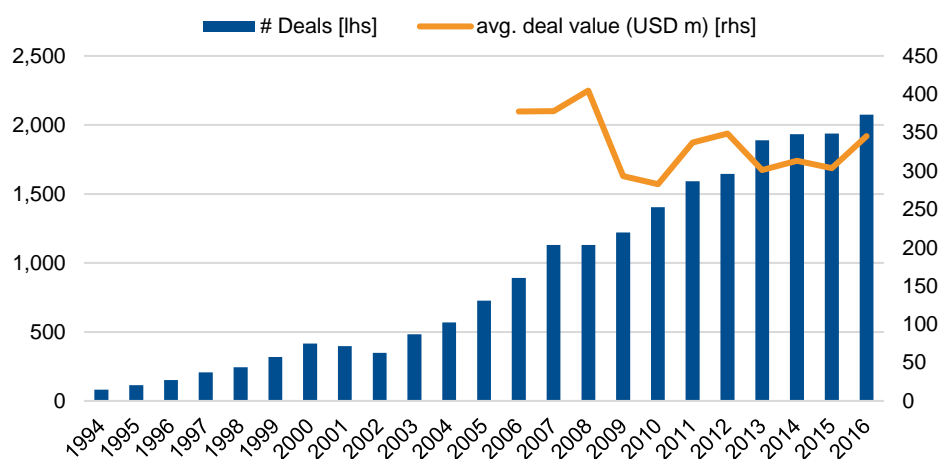
Figure 4: Global equity (MSCI World MXWD) vs listed (SPGTIND) and unlisted (PreQin_Infra) infrastructure (past performance)



Source: Bloomberg, PreQin, own Calculations

A recent report by McKinsey Global Institute (McKinsey, 2016) estimates global spending on transportation, energy, water and telecommunication infrastructure at an astounding USD 2.5tr per year, which is nevertheless far short of the (estimated) USD 3.3tr annual spending which would be needed from 2016 until 2030 to maintain the current level of infrastructure in line with expected growth prospects, i.e. based on growth-adjusted maintenance expenditures only.

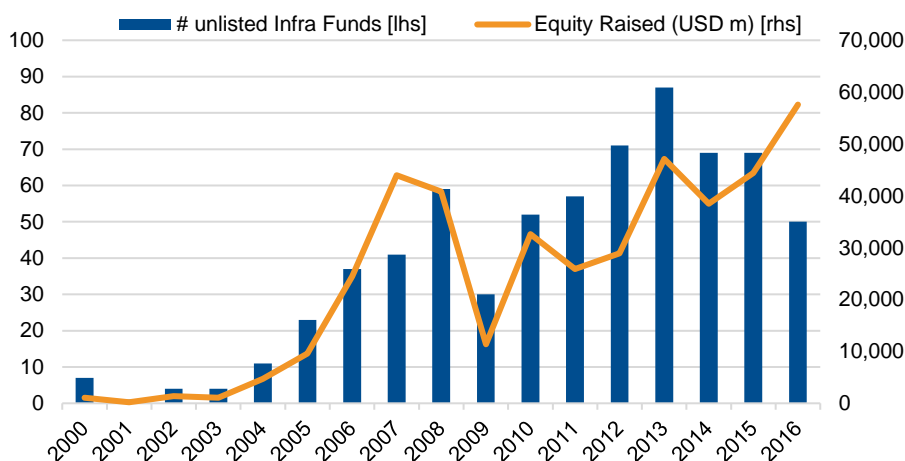
Figure 5: Development of unlisted infrastructure and average deal sizes



Source: PreQin

The strong increase in the number of transactions in the past two decades is a clear indication of the global trend. For instance, while the data aggregator and provider PreQin counted 891 single deals in the unlisted infrastructure universe in 2006, this had increased to 2,075 ten years later. The average size of infrastructure deals remained largely constant over time in a range of roughly USD 300m to USD 400m.

Figure 6: Number of unlisted infrastructure funds and equity raised 2000-2016

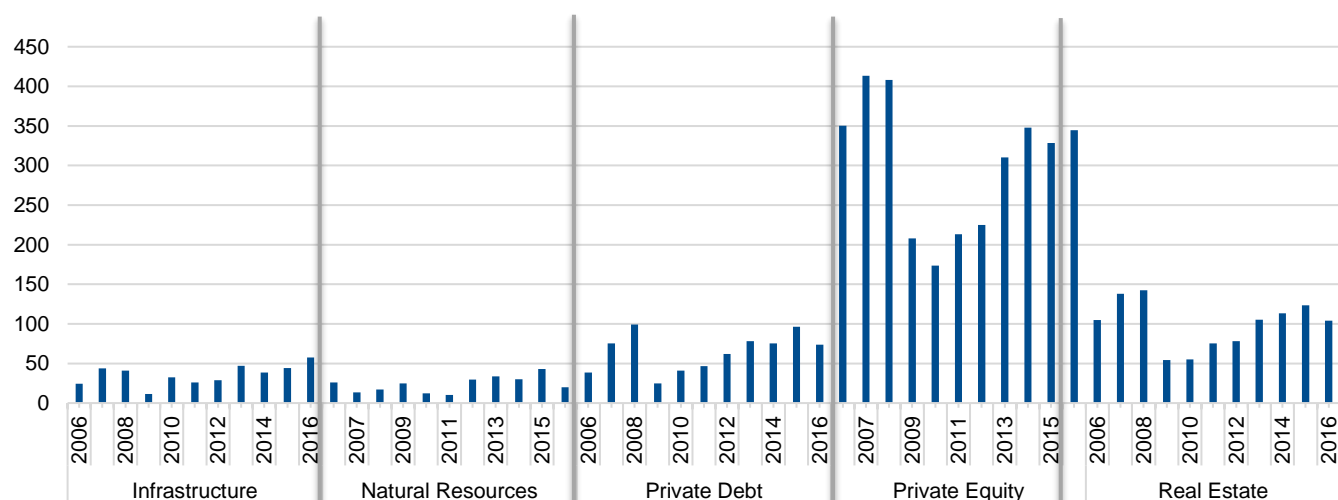


Source: PreQin

Along the same lines, the number of unlisted infrastructure funds on offer increased considerably in the period 2000-2016. While PreQin counted 37 fund offerings in 2006 with equity raised totalling USD 24.5bn, ten years later this figure had increased to 50 fund offerings (peaking in 2013 with 87 offerings) and aggregate equity raised of USD 57.6bn.

However, compared to the overall volume of equity raised by other alternative unlisted asset classes, the funds invested in infrastructure assets are still significantly lower than the main alternative asset classes, private equity and real estate.

Figure 7: Equity raised for various alternative unlisted asset classes 2006-2016 (in USD bn)



Source: PreQin

Looking at the aggregate deal sizes over the past 20 years, the PreQin data reveals the following split by geographic region and project type. Scope has removed defence-related assets and assets in the aircraft and shipping segments from the original data series (see Figure 7).

Table 4: Infrastructure deals (split by region and type) 1994-2017 (ytd)

Region / Project stage	Total deal size (USD m)	Total equity invested (USD m)
Europe	1,264,101	110,691
Brownfield	204,335	14,718
Greenfield	561,033	27,121
Secondary Stage	498,733	68,851
North America	980,452	95,586
Brownfield	198,326	20,237
Greenfield	342,183	25,621
Secondary Stage	439,942	49,728
Asia	620,205	24,880
Brownfield	143,229	3,357
Greenfield	357,594	16,049
Secondary Stage	119,382	5,474
Australasia	287,507	25,937
Brownfield	33,864	761
Greenfield	112,342	7,743
Secondary Stage	141,300	17,432
Africa	287,029	17,141
Brownfield	54,386	2,705
Greenfield	213,642	13,587
Secondary Stage	19,002	849
South America	229,301	10,060
Brownfield	53,195	1,107
Greenfield	124,922	4,235
Secondary Stage	51,183	4,718
Total	3,668,595	284,293

Source: PreQin, table: Scope

Besides the very high leverage, it is immediately obvious that, from a regional perspective, Europe has been the biggest market for infrastructure deals with total deal size of approximately USD 1,3tr. Here, greenfield and secondary infrastructure are the largest sub-segments.

A closer look at European infrastructure is given in Table 3, which provides a more detailed overview of fund flows in the same time span as in Figure 5.

In the past two decades, the energy sector – comprising traditional, renewable, and nuclear resources as well as power plants, refineries, storage and distribution facilities and networks – has accounted for the highest proportion of infrastructure investment. Investment in greenfield projects dominate, totalling ca. USD 304bn, followed by secondary stage investments amounting to approx. USD 210bn.

The second largest investment segment in Europe is the transportation sector. Aggregate volume in this sector was in excess of USD 410bn for the period 1994-2016.

This infrastructure sub-sector is the only one which displays an almost even distribution of deal sizes across project phases with approx. $\frac{1}{3}$ for each phase. Looking at equity investments, however, this distribution shifts, with a clear preference for secondary investments.

Table 5: European infrastructure deals by stage and sector

Project stage/ Sector	Total deal size (USD m)	Total equity invested (USD m)
Greenfield	561,033	27,121
Transportation	139,799	9,779
Power	304,720	13,653
Communication networks	3,723	27
Social infrastructure	77,479	3,280
Water / Waste / Sewerage	35,312	381
Secondary Stage	498,733	68,851
Transportation	132,374	17,296
Power	210,398	20,677
Communication networks	60,743	6,789
Social infrastructure	13,892	793
Water / Waste / Sewerage	81,326	23,296
Brownfield	204,335	14,718
Transportation	137,986	10,170
Power	36,552	3,142
Communication networks	1,222	163
Social infrastructure	25,835	1,188
Water / Waste / Sewerage	2,739	55
Total	1,264.101	110,691

Source: PreQin, own calculations, table: Scope

Some Stylized Facts

Defining infrastructure as an institutional asset class can become a difficult task given the complex and versatile nature of infrastructure related assets. A common differentiation is being made between “economic” and “social infrastructure”, whereas **economic infrastructure** encompasses facilities or physical structures which are required for the effective operation of a business, municipality, or economy. The following table shall demonstrate the broad spectrum of infrastructure assets, their relative frequency in terms of construction, size and complexity, the scale and scope of government influence and whether capital market transactions have been observed in Germany:

Table 6: Economic and social infrastructure segments and basic characteristics

Segment	Sub-segment	Type	Relative frequency	Relative size	Relative complexity	Govt. influence	Capital market transactions*
Economic infrastructure	Power	Energy generation	Low	Small to large	Mid to high	Mid to high	Yes
		Storage					
		Transmission					
	Trans- portation	Highways, roads, bridges	High	Small to large	Low to high	High	Yes
		Railways	Mid	Mid	Mid to high	High	No
		Ports, airports	Low	Mid to large	Mid	High	Yes
		Deep-water transportation	Low	Mid to large	Mid to high	High	No
	Water / Waste / Sewerage		Low	Mid to large	Mid to high	High	Yes
	Communi- cations	Cable (broadband)	Low	Mid to large	Low to high	Low	Yes
		Wireless (broadband)					
Satellite (broadband)							
Social infrastructure		Educational facilities	Mid	Small to mid	Low	Mid	No
		Correctional facilities	Low	Small to mid	Low to mid	High	No
		Industrial facilities					
		Hospitals/healthcare	High	Small to mid	Low to mid	Low to mid	No
		Other public buildings					

Source and table: Scope Analysis

* Germany only

Public facilities, also known as **social infrastructure**, are frequently realized as PPPs (public private partnerships). In such cases, revenues are often generated by government concession payments. Furthermore, if revenue is contracted on the basis of “availability” (as opposed to “per use”), returns have a strong government bond character. Investments into infrastructure can then be differentiated using various criteria. Often, a distinction is made between **brownfield** and **greenfield investments**.

Infrastructure investments can be further divided into **primary** and **secondary** investments, a distinction used to describe investment in infrastructure assets at the construction and operational phases, respectively. Accordingly, the timing of investment in such assets has a decisive impact on the risk-return characteristics of the infrastructure investment / project.

Competitive advantage via market and demand dynamics

Demand drivers for infrastructure Investments

The future demand for infrastructure assets is driven / governed by different factors depending on the maturity of the respective economy.

Developing countries have different demand patterns from developed economies. While investment needs in the latter group are predominantly for replacement and maintenance, in developing countries future increases in demand will mainly be due to demographics. However, changing demographics will also affect developed countries, for instance in their need to care for a rising number of elderly people.

Demand is only one side of the equation though; funding that demand is the other side. The failure of prominent infrastructure projects has led to a reluctance to commit public funding, even though more investment is needed in economic and social infrastructure. This reluctance leads to sub-optimal or inadequate supply of civil infrastructure.

Infrastructure assets are clearly long-term by nature and often have (quasi-) monopolistic characteristics which impose high barriers to market entry. Additionally, demand for the utility or service tends to be inelastic, i.e. there will typically be rigidities in the adjustment of demand, for instance, in the event of price increases. With limited or no substitutes, demand for the infrastructure will remain relatively stable. Both market aspects and demand create competitive advantages for infrastructure assets.

Similar to real estate, the long-term characteristics of infrastructure are reflected in stable and predictable cash returns, which offer an inflation hedge either through contractual design or via regulatory pricing which links returns to changes in the inflation rate.

As outlined previously, demand for infrastructure assets is increasing and fund managers and other investment managers are successfully raising capital for infrastructure vehicles from insurers. Nevertheless, infrastructure investment is limited and “lacks what McKinsey calls ‘a sufficient pipeline of well-prepared, bankable projects that provide investors with appropriate risk-adjusted returns’” (Lokmanis 2016).

Thus, depending on their strategic approach to infrastructure investments, institutional investors are concerned about complex and costly project development processes, public concern about privatization and their lack of knowledge, expertise and resources for this asset class. Other dimensions of investment risk are transparency and legal concerns (see Table 4, Classification of risk).

From the investor’s perspective, “Infrastructure funds in the market are expanding in size and number and have begun offering investors broader options to meet varying risk and return needs” (Lokmanis, 2016).

Infrastructure investments in an institutional portfolio

Like public equity and other asset classes, infrastructure investments can be structured with varying degrees of conservatism, depending on the underlying assets and chosen strategy. To help institutional investors understand the risk-return characteristics of the various strategies, the infrastructure investment community has adopted terminology similar to that used by direct real estate funds—core, core-plus and value-add—to describe the range of strategic options (see Figure 8).

Economic drawbacks / risks

Besides risks inherent in almost any investment where the future outcome is unknown at the time of investment, there are some typical risks associated with infrastructure investments:

Risk-reward profile

- Increasing population density makes building, preserving and protecting the robust infrastructure required to meet the increasing demand from growing populations more difficult
- Greater exposure to political and regulatory risks due to the public / essential / political nature of infrastructure projects
- The inherent heterogeneity of infrastructure assets requires sub-sector investment strategies / asset allocation
- Lack of transparency / no clearing system as for equities and bonds
- The liquidity and fungibility of assets can be limited as premiums have to be inferred from pricing
- Valuations based on appraisals and / or expert opinions have a tendency to exhibit smoothing similar to that of other real asset classes such as real estate, aviation and shipping so additional care is needed to ensure a truly “fair value”
- The earlier the investment is made in the development phase, the higher the risk, greenfield vs brownfield, primary vs secondary (mixtures available)
- Limited availability of data
- Infrastructure development projects are notorious for cost overruns
- Political, technological, and administrative complexity at the interface between the private and public sectors (c.f. acceptance of PPP in Germany vs UK/US)
- Increasing risks from terrorist attacks, political upheaval

Table 7: Classification of Risk inked to infrastructure investments

Risk Category	Development phase	Construction phase	Operation phase	Termination phase
Political and regulatory	Environmental review	Cancellation of permits	Change in tariff regulation	Contract duration
	Rise in pre-construction costs (longer permitting process)	Contract renegotiation		De-commission
				Asset transfer
	Currency convertibility			
	Change in taxation			
	Social acceptance			
	Change in regulatory or legal environment			
Enforceability of contracts, collateral, and security				
Macro-economic and business	Pre-funding	Default of counterparty		
	Financing availability	Refinancing risk		
		Liquidity		
		Volatility of demand / market risk		
	Inflation			
	Real interest rates			
	Exchange rate fluctuation			
Technical	Governance and management of the project			Termination value differs from expected
	Environmental			
	Project feasibility	Construction delays and cost overruns	Qualitative deficit of physical structure / service	
	Archaeological			
	Technology and obsolescence			
	Force majeure			

Source: OECD (2015a), Illustration: Scope

Understanding infrastructure's role in the portfolio

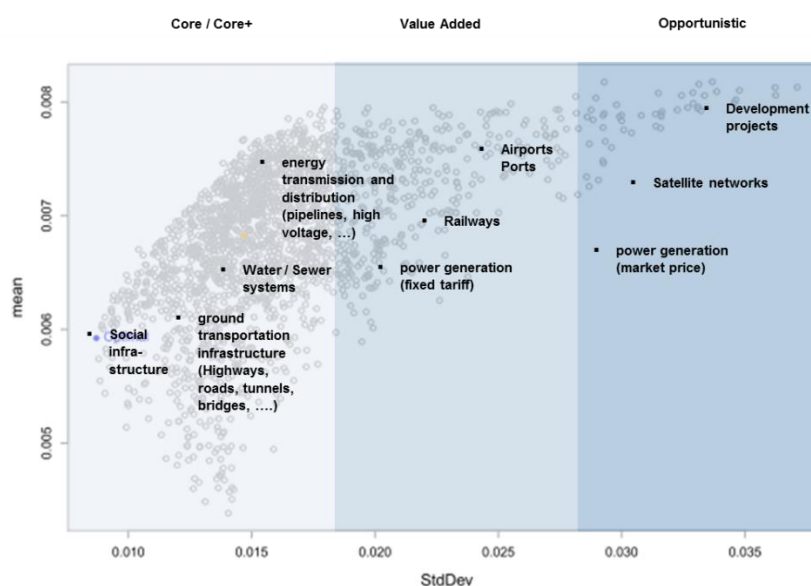
A real asset but not real estate

Infrastructure has only recently become widely accepted as an asset class in its own right. Since the initial consideration of how to handle infrastructure investments as part of institutional asset allocation in the 1960s, infrastructure has generally been regarded as a subsection of real estate investment. Although this seems appealing as infrastructure and real estate share certain related characteristics (such as indivisibility, heterogeneity), there are also significant differences which suggest that infrastructure should be treated as a stand-alone asset class (BIS, 2014).

The close links between infrastructure and real estate also prevail in a portfolio-centric approach to infrastructure. From a portfolio perspective, sector and geographic diversification is essential to mitigate the risks of infrastructure investments.

As with real estate, investors encounter infrastructure along a continuum of risk-return levels. The terms *core*, *value added* and *opportunistic* investment are commonly used to describe increasing levels of risk in the real estate sector. The ostensible similarity of both asset classes is also reflected in the risk-return terminology (see the appendix for an overview of infrastructure investments based on their risk-return profile).

Figure 8: Idealized risk-return profiles of infrastructure investments



For illustrative purposes only, chart : Scope

Small to mid-sized investors tend to invest in infrastructure via specialized fund and investment vehicles. Those commonly offer a broad spectrum of available investment flavors depending on the corresponding investment strategy and portfolio requirements of the investor: some focus on a specific sector (regulated assets, utilities, transportation, power generation, etc.), some on a region (OECD countries, non-OECD, country specific) while others concentrate on or the investment stage, e.g. greenfield vs. brownfield and/or primary vs secondary. Evidently the fund characteristics influence the target gross returns and whether they stem rather from cash flows or capital appreciation.

Characteristics of infrastructure as an institutional asset class

Due to their implicit long-term nature, infrastructure projects are especially appealing to organizations with defined future liabilities such as insurers, pension and endowment funds, i.e. infrastructure provides a good match for investors with a strong risk based ALM focus.

It can be challenging to understand the unique characteristics of the infrastructure asset class. For example, because this asset class is relatively new and information on the past performance of infrastructure funds is less readily available, investors have to conduct additional research on the fund manager or strategy. Also, understanding the investor's liquidity requirements and how an infrastructure fund is structured (i.e. open-ended or closed-end) is important before committing to a fund investment. Closed-end funds have a fixed investment term with limited early liquidity options and are commonly used by pension plans to access investable infrastructure assets. Open-ended funds, by contrast, offer a perpetual investment term and more flexible early liquidity options. As when exploring any new asset class, first-time investors should take the time to explore the pros and cons of infrastructure and, most importantly, understand its overall portfolio fit.

Routes to infrastructure investment²

Institutional investors can choose from a variety of approaches to obtain exposure to infrastructure, but the final choice often depends on their size or, to be more precise, the assets under management:

Assets under management
influence the type of exposure

Small and midsized pension plans (under \$3 billion) typically gain exposure to infrastructure through unlisted funds offered by major infrastructure investors that own assets globally. These funds provide a vehicle for investors that cannot access global infrastructure markets directly. Using this approach, pension plans can gain exposure without the need for large in-house investment teams, but management fees are generally higher than for public market strategies.

Large pension plans (between \$5 billion and \$25 billion) often use a combination of fund investments and co-investments with fund partners to build their portfolios. The portfolio is initially built through investments in direct infrastructure funds, which provide manager and asset diversification, and then supplemented by selected co-investments through which pension funds make minority investments in infrastructure projects. Co-investments enable plans to select investments in specific sectors and regions and have lower management fees than infrastructure funds. This can reduce a portfolio's overall management fee load. The increased investment complexity does, however, require additional in-house management resources.

Very large investors with \$25 billion or more in net assets have the financial firepower and in-house investment capabilities to build infrastructure portfolios by buying infrastructure assets directly, with transactions often running into billions.

Direct vs indirect investments / public vs private investments

A basic distinction can be made between listed and unlisted investment opportunities and evidently between equity- and debt-based approaches. Investors can invest in listed infrastructure companies or underwrite corporate or project bonds.

Public vs private / equity vs debt

² The following overview is taken from Lokmanis (2016)

Table 8: Routes to infrastructure: equity vs debt / public vs private / direct vs indirect

	Equity		Debt	
	Public	Private	Bond	Loan
Asset / security	Stocks	Direct investment (e.g. PPP)	Corporate	Project finance
	Listed funds	Co-investment	Government	
	Listed indices	Indirect investment (funds / indices)	Listed bonds	Private debt
Investment horizon	Short / mid	long	Short / mid	Mid / long
Exp. return* (% , p.a.)	5-9	10-15 (direct)	4-10 (corp.)	2-5
Exp. risk* (% , p.a.)		7-9 (indirect)	3-7 (govt.)	2-5

Source: Steinbeis Research Center for Financial Services (08/2012), table Scope

*Depending on financial strength / default probability.

Further listed investment opportunities are listed funds (mutual funds/ UCITS) or indices that track the movement of infrastructure-related equities. Portfolio diversification is normally easier via investment in listed companies that build and operate infrastructure. This route also effectively reduces regulatory and political risks.

Direct vs indirect investment

Moving away from stock markets and listed investments, another route is to invest in infrastructure projects either directly or with other investors as a co-investment. Direct infrastructure investments typically require a significant capital outlay, and have a very long time horizon, and higher liquidity risk. Political and regulatory risks are also higher in the case of direct investments. Most often these comprise public private partnerships (PPP) or project finance structures (Kaserer et al. 2012). A further indirect approach comprises investments that utilize unlisted funds in either closed-end or open ended fund structures.

While direct, unlisted investments have longer time horizons, liquidity risk is lower for listed instruments as they can generally be liquidated immediately via exchanges or similar clearing mechanisms.

Listed and unlisted investments evidently differ in terms of liquidity and tradability. Moreover, listed investments introduce additional stock market-related volatility and unlisted investments can entail possible regulatory requirements.

Current challenges for Institutional Investors

Recent investor surveys show increased interest in the unlisted, indirect investment route via e.g. alternative investment funds (AIFs) as defined by the EU's AIFMD. However, there is also a strong correlation between this interest and the availability of suitable investments. This can prove challenging with regards to infrastructure, in addition to the general scarcity of real assets seen across various asset classes and investment markets.

From a European and especially a German perspective, infrastructure investments in the renewable energy segment are of particular interest: The phasing out of feed-in tariffs in many western European energy markets and the shift to market-based offtake pricing will clearly be a point of concern in the near future.

Investors favour the unlisted, indirect route via AIFs

Knowledge of the assets and appropriate pricing of investments are other issues, especially for first time investors. In such cases, the availability and quality of a suitable partner network is especially important for prospective investors. The quality of such third parties such as technical and legal experts is particularly crucial for performance if in-house knowledge is limited.

Unlisted infrastructure from a portfolio perspective

Portfolio comprising stocks, bonds, and real asset indices

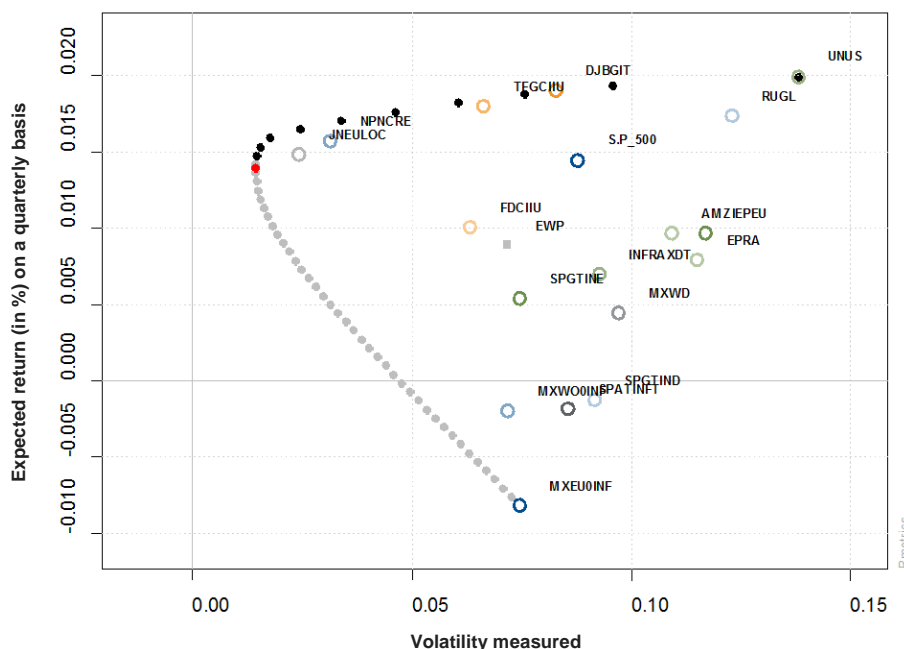
The following brief analysis is based on a basket of securities. The appendix explains the indices used. The quarterly raw data cover 34 quarters starting in March 2008 and ending in June 2016. The portfolio comprises 18 respectively 19 return time series. Hence the only difference between the assessments of the two asset portfolios is the additional non-listed infrastructure series provided by PreQin.

The selected series are intended to represent equity investments, government bond investments, and property and listed infrastructure assets. To assess the return dynamics of unlisted infrastructure, we utilize PreQin's quarterly index of transactions and NAVs of unlisted infrastructure partnerships.

Departing from a naïve risk-return approach with a "long-only" strategy, the beneficial effect of adding unlisted infrastructure (here the PreQin Infrastructure Index is used as proxy for that asset class) becomes clear as it pushes the efficient portfolio frontier north-west. In addition, the corresponding *equal weight portfolio (EWP)* moves in a north-westerly direction.

Figure 9: Efficiency effect of unlisted infrastructure

Balanced portfolio without unlisted infrastructure investments



Source: See appendix for indices used

These movements give some empirical support to the hypothesis that infrastructure is beneficial in an institutional portfolio setup. While listed infrastructure adds stock market volatility, non-listed infrastructure provides yield enhancement and risk diversification without additional volatility.

Risk-dampening effects probably stem from very long contractual cash flow projections, which are also indexed to inflation, and the low overall correlation of infrastructure investments with other asset classes.

However, the route to unlisted infrastructure via closed-end and/or open-ended vehicles brings in another aspect of crucial importance to the investor: the asset manager. A major portion of the yield enhancement resulting from adding unlisted infrastructure to a balanced portfolio comes from the skills of the manager in sourcing, execution and ongoing management of infrastructure investments.

Thus, as can be seen from similar property and real estate vehicles, the investor has the additional burden of identifying fund sponsors and asset managers who have the necessary skills, track record, and organizational setup to meet institutional investors' process requirements and yield expectations.

Furthermore, there are some important caveats to the analytic approach presented here. First and foremost, historical data is only available for a relatively short period. The entire analysis has been capped at 34 quarters as this is the period covered by the PreQin data series. Another fact to be aware of is the smoothing of project values (NAVs) over time as – unlike data on traded securities - these are not a function of supply and demand but rather surveyor-based expert opinions. As with unlisted property indices, de-smoothing is recommended. Lastly, capital structure has been completely disregarded. However investors often utilize leverage in their investment decision.

I. Appendix

Infrastructure Investments

Greenfield

- Typically invest in projects during the design and construction phases
- No previous structure existed
- Investors fund construction of the asset and maintenance during operation.

Brownfield

- Investments in assets with potential for improvement, refurbishment or expansion
- Investors participate in operational facility which may already be generating cash

Classification of infrastructure investments on the basis of risk-return profile

Core / Core+

Infrastructure consists of assets that provide essential services that are expected to produce a steady and predictable cash flow over a long period, such as utilities. In many cases, core infrastructure assets are natural monopolies that cannot easily be replicated, but for all assets defined as core assets, barriers to entry are very high and competition is therefore low.

Core / Core +
• Relatively stable rates of return are associated with economic regulation or long-term contracts
• High and sustainable barriers to entry
• Potential for long holding periods
• Consistent cash yield
• Limited potential for capital appreciation
• Regulated utilities, most social infrastructure
• Income yield (1-5 yrs.) 4-9%
• Target gross total return (IRR) 7-11%

Value Added

This category comprises regulated and unregulated assets, which can be more susceptible to changing economic conditions and other external pressures than core infrastructure assets. For example, at airports and in the rail sector, traffic and revenue can be affected by economic growth and slumps. Further, a higher percentage of returns on such assets are linked to capital appreciation rather than the yield generated.

Value Added
• May be regulated or unregulated assets
• May be more susceptible to movements in GDP and other external pressures
• Higher percentage of total return linked to capital appreciation rather than yield
• Income yield (1-5 yrs.) 5-10%
• Ports, airports, railways
• Some potential for capital appreciation
• Target gross total return (IRR) 9-12%
• May be regulated or unregulated assets

Opportunistic

In this category, infrastructure consists of unregulated assets and assets that may operate with only short-term contracts for their production, which involves a greater risk of cash-flow fluctuation. Hence, investors derive the majority of returns from appreciation of the assets, rather than cash flows. The capital appreciation is generated primarily by improving historical operating inefficiencies or previously poor cost controls. In certain cases, value-added assets involve a greater risk because global commodity prices influence production levels and can affect investment volume for some assets.

Opportunistic

- Often unregulated or uncontracted assets that may include greenfield risk
- Higher operational risk
- Exposure to pricing/volume risks
- Low current cash yield
- Commodity price exposure
- Turnaround assets
- Greenfield projects
- Income yield (1-5 yrs.) >10%
- Capital gain potential
- Target return (gross) >12%

Utilized Indices

Acronym	Description
PreQin_Infra	PrEQIn - Infrastructure Quarterly Index. Captures reported quarterly cash flow transactions and NAVs for 200 unlisted infrastructure partnerships; funds in the index have raised aggregate capital of over USD 230 bn.
MXEU0INF	MSCI Europe Infrastructure Index. Includes companies in the telecom, utilities, energy, transportation and social infrastructure sectors.
MXWO0INF	MSCI World Infrastructure Index. Includes companies in the telecom, utilities, energy, transportation and social infrastructure sectors.
MXWD	MSCI ACWI Equity Index. Includes emerging and developed markets.
JNEULOC	JPMorgan Gov't Bond EMU Index
S&P_500	S&P 500. Includes 500 leading companies and captures approximately 80% of available US large cap market capitalization.
SPGTIND	S&P Global Infrastructure Index
SPGTINE	S&P Global Infrastructure Index Euro
INFRAXTD	Deutsche Boerse Infrastructure Index - Performance/Total Return in USD
AMZI	Alerian MLP Infrastructure Index
DJBGIT	Dow Jones Brookfield Global Infrastructure Total Return Index
TFGCIU	FTSE GLOBAL CORE Infrastructure INDEX TR USD
FDCIU	The FTSE Infrastructure Index Series is designed to represent the performance of companies in a set of industries that FTSE defines as being involved in infrastructure. This index covers the developed markets.
SPATINFT	S&P Asia Infrastructure Index (TR)
RUGL	FTSE EPRA/NAREIT DEVELOPED Index
EPEU	FTSE EPRA/NAREIT Euro Zone Index
NPNCRE	The NCREIF index is the NCREIF total property index calculated to reflect the quarterly total returns in % on a compounded basis.
UNUS	The FTSE EPRA/NAREIT US Index is a subset of the EPRA/NAREIT Global Index and the EPRA/NAREIT North America Index and contains publicly quoted real estate companies that meet the EPRA Ground Rules.
EPRA	The FTSE EPRA/NAREIT Developed Europe Index, is a market capitalization-weighted index consisting of the most heavily traded real estate stocks in Europe. It is designed to reflect the stock performance of companies engaged in specific aspects of the European real estate business.

References

- | | |
|-----------------------|--|
| BIS (2014) | Understanding the Challenges for Infrastructure Finance |
| FRBSF (2012) | Economic Letters, Highway Grants: Roads to Prosperity? |
| GDV (2016) | Statistical Year Book of the German Insurers' Association |
| Kaserer et al. (2012) | Risk, Return and Cash Flow Characteristics of Private Equity Investments in Infrastructure |
| McKinsey (2016) | Bridging Global Infrastructure Gaps |
| OECD (2012) | Trends in Large Pension Fund Investment in Infrastructure |
| OECD (2015) | Annual Survey of Large Pension Funds and Public Pension Reserve Funds |
| OECD (2015a) | Risk and return characteristics of infrastructure investments in low income countries |
| PreQin (2017) | Subscriber access to www.preqin.com data platform |
| Steinbeis RCFS (2012) | Rendite- und Risiko-Profil bei Eigen- und Fremdkapitalinvestitionen in Infrastruktur |
| Weber et al. (2016) | Infrastructure as an Asset Class, Investment Strategy, Sustainability, Project Finance and PPP |
| Weisdorf (2007) | Infrastructure: A Growing Real Return Asset Class, CFA Institute |



Infrastructure for Institutional Investors

Insights into a maturing asset class

Scope Analysis GmbH

Headquarters Berlin

Lennéstraße 5
D-10785 Berlin

Phone +49 30 27891 0

info@scopeanalysis.com
www.scopeanalysis.com

Frankfurt am Main

Neue Mainzer Straße 66-68
D-60311 Frankfurt am Main

Phone +49 69 66 77 389-0

Disclaimer

© 2017 All rights reserved. Scope Analysis GmbH is not a rating agency subject to Regulation (EG) Nr. 1060/2009 as amended by Regulations (EU) Nr. 513/2011, (EU) Nr. 462/2013 (together, 'the rating agency regulations') and is not registered as a rating agency subject to the rating agency regulations. Ratings of asset management companies, investment funds and derivative issuers are not ratings subject to the rating agency regulations and therefore cannot be used for regulatory purposes by credit institutions, investment firms, insurance companies, reinsurance companies, institutions for occupational pension provisions, management and investment companies, managers of alternative investment funds, and central counterparties. Ratings by Scope Analysis GmbH are not a recommendation to purchase or sell an investment product and do not express an opinion over the value or the quality of investment funds, derivative issuers and management companies. Scope Analysis GmbH ensured as far as possible that the information underlying the rating is of satisfactory quality and comes from reliable sources, but did not verify each item of information as specified in the sources independently. Scope Analysis GmbH prepares, with the necessary duty of care, its independent and objective ratings as of the date the ratings are issued. Future events are therefore regarded as uncertain. Forecasts are based on estimates; hence, a rating does not represent a factual claim, but merely an opinion, which can also subsequently change and result in a rating adjustment. Scope Analysis GmbH is therefore not liable for damages resulting from decisions made from using the issued rating. The rating can only be seen by all involved parties as a factor in the investment decision and cannot replace the investor's own analyses and assessment. The rating therefore only represents an opinion on quality and does not under any circumstances provide a judgement on the risk-return profile of an investment and makes no indication as to whether involved parties will: make a profit, have invested capital returned or enter into specific risks of liabilities by investing in the investment fund. The information and data included herein is protected by copyright and other laws. To reproduce, transmit, transfer, disseminate, translate, resell, or store for subsequent use for any such purpose the information and data contained herein, contact Scope Analysis GmbH at Lennéstraße 5 D-10785 Berlin.